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54 **Dispenser guns.**

57 A dispenser gun having a rod-advancing mechanism of the tilting gripper kind employs a hardened steel rod (4) of circular cross-section and a sintered metal gripper (12) having a circular hole (21) through which the rod slides. The gripper has, on at least one side, an indentation (25,28; 31,32) having a generally arcuate base and running into the hole (21). The gripper when tilted grips the rod firmly without marking the rod.

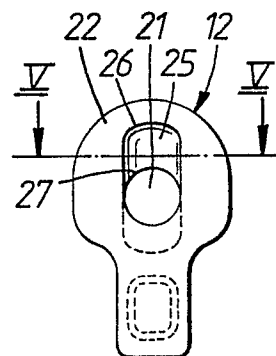


FIG. 2.

Description

DISPENSER GUNS

This invention relates to dispenser guns for dispensing viscous materials which may be of a thick liquid or a pasty nature, for example mastic caulking materials. Such guns often include rod advancing mechanisms of the kind including a one-way gripper arranged for reciprocation longitudinally of the axis of the rod and arranged to tilt relative to the axis of the rod between a rod-gripping position on the forward stroke of reciprocation of the gripper to advance the rod and a rod-release position on the rearward stroke of reciprocation of the gripper to allow the gripper to return without moving the rod. Various constructions of dispensers for viscous materials are known and one particular example is described in GB-1264311A. This describes a gun for expressing liquid or semi-liquid substances including a body, a rod mounted on the body for axial movement thereon, and a movable oneway gripper mounted on the body and arranged to advance the rod in the manner described above. In the majority of such guns the rod is of circular cross section and the gripper has a circular aperture through which the rod passes fairly freely. When the gripper is tilted to the gripping position there is, theoretically, only point contact at two places between the gripper and the rod, one place being on one side of the gripper at a point on the rod which is diametrically opposite to the first point and displaced along the rod axially. In practice it is found that, if the geometry is so arranged that there is adequate engagement between the gripper and the rod for a sufficient force to be transmitted from the gripper to the rod to express highly viscous material without the gripper slipping along the rod when it is in the rod gripping position, substantial scoring of the rod occurs. Such scoring inhibits the smooth return movement during which it is necessary for the rod to slide through the gripper freely.

The invention described in GB-1264311A, namely the provision of a hexagonal rod and a diamond shaped hole produces line contact between the edges of the hole and the faces of the rod but when high loads are applied scoring of the rod immediately occurs with this arrangement also.

A further effect of high loads with the previous guns described above is that the edges of the hole through which the rod passes and which engage the rod are deformed. The effect of this is that the gripper has to be tilted to a greater extent before gripping engagement between the gripper and the rod is achieved so that the initial travel of the member producing the tilting (such as a trigger) is wasted and less material can be dispensed on each forward stroke of the gripper.

Users of dispenser guns are requiring higher and higher forces to be applied to the material to be dispensed; this is partly to speed up dispensing and partly because many modern adhesive and sealing materials are inherently very viscous. Hitherto, it has been possible to increase loading only at the expense of scoring of the rods and deformation of

the grippers.

5 According to one aspect the present invention, a gun for expressing liquid or semi-liquid substances has a body, a parallel-sided gripper plate with a parallel-sided hole of circular cross-section, and a rod of circular cross-section which is a sliding fit in the hole, the gripper plate being mounted on the body and arranged for reciprocation longitudinally of the axis of the rod and arranged to tilt relative to the axis of the rod between a rod-gripping position on the forward stroke of reciprocation of the gripper to advance the rod and a rod-release position on the rearward stroke of reciprocation of the gripper to allow the gripper to return without moving the rod, and the gun is characterised by an indentation on one side of the gripper, the indentation having a generally arcuate base and running into the hole to provide an edge to the hole on the said one side of the gripper which is formed of two arcuate portions, one formed by the intersection of the hole and one face of the gripper and the other formed by the intersection of the base of the indentation with the hole.

10 15 20 25 30 35 40 45 According to another aspect of the present invention, a dispenser gun for expressing liquids has a body, a parallel-sided piston rod of circular cross-section mounted for reciprocation on the body and a rod-advancing mechanism comprising a gripper plate with a parallel-sided hole of circular cross-section through which the rod passes, and is characterised in that the mouth of the hole on one side of the gripper is bounded around at least part of its periphery by an arc of an ellipse, the geometry being such that on tilting of the plate the elliptical arc engages the rod along a substantial length of the arc. This may be achieved, with a parallel-sided gripper by providing, on the said side of the gripper, an indentation having a generally arcuate base and running into the hole to provide an edge to the hole on the said one side of the gripper which is formed of two arcuate portions, one formed by the intersection of the hole and one face of the gripper and the other formed by the intersection of the base of the indentation with the hole.

50 Preferably, there is a similar arc of an ellipse on the other side of the gripper plate. Thus, where the gripper plate is parallel-sided there may be a similar indentation on the other side of the gripper and positioned diametrically opposite to the first indentation.

55 60 It has been found that with such arrangements a very large force can be transmitted between the gripper plate and the rod without the gripper plate slipping on the rod and without any substantial scoring of the rod. The effect is to provide an edge on the gripper plate which, when the gripper is very slightly tilted, engages the rod over a substantial arc. It is found that adequate gripping can be achieved with the gripper tilting through only a very small angle relative to the rod while the difference in diameters between the rod and the hole through

which it passes can be kept very small. It is found that little or no scarring of the rod occurs even with the transfer of considerable forces. However, the situation can be yet further improved by making the rod of mild steel and hardening a thin surface layer thereof, for example by passing the rod through an induction furnace and rapidly cooling it, for example in an oil bath.

The or each indentation where provided may be a parallel-sided groove running into the hole or alternatively may be a part dome-shaped depression which overlaps the hole. Preferably the width of the indentation is approximately equal to the diameter of the hole.

The gripper is preferably made of metal by a sintering process but may be produced in other ways, for example by lost wax casting. The gripper may have a thickness which is approximately equal to the diameter of the hole.

The invention may be carried into practice in various way but one dispensing device for viscous materials and embodying the invention will now be described by way of example together with a modified gripper. These will be described with reference to the accompanying drawings in which:

Figure 1 is a side elevation of the dispenser;

Figure 2 is a rear elevation of the gripper of the dispenser shown in Figure 1;

Figure 3 is a side elevation of the gripper;

Figure 4 is a rear elevation of the gripper;

Figure 5 is a cross section on the plane V-V in Figure 2; and

Figure 6 is a view similar to Figure 2 of a modified construction of gripper.

The dispenser shown in the drawings, and particularly in Figure 1, comprises a barrel 1 to contain the material to be dispensed and having at one end a nozzle assembly 2 and at the other end an operating mechanism 3 by means of which a piston rod 4 can be advanced step by step along the axis of the barrel 1. The operating mechanism comprises a body portion 5 having a depending stock 6 which can be grasped in the hand and to which is pivoted a trigger-like member 7. On the side of the pivot 8 of the trigger member 7 remote from the finger-engaging portion 9 thereof is a stud 11 which engages an apertured plate 12 through the aperture in which the piston rod 4 passes with some slight clearance. The upper edge of the plate 12 rests against a shoulder 13 on the body portion 5 and the plate 12 is biased to the right as seen in the drawing by means of a compression spring 14. The piston rod also passes through a second apertured plate 15 which engages against a boss 16 on the body 5 and which is biased to the right as seen in the drawing by means of a compression spring 17. Although the mode of operation of such a mechanism is well known in this art it will be briefly described. When the trigger member 7 is squeezed in the hand towards the stock 6 the stud 11 tilts the plate 12 about its point of engagement with the abutment 13 until the upper and lower extremities of the aperture in the plate grip the upper and lower surfaces of the piston rod 4. On continued backward movement of the trigger member 7, the plate 12 moves forward with the piston rod

to advance the piston in the barrel 1. During this forward movement of the piston rod 4, the rod slides through the plate 15 which is tilted slightly about the stud 16 to allow free movement of the rod 4 through the aperture of the plate. On release of the trigger member 7, the spring 14 returns the plate 12 to the position shown in Figure 1, the plate sliding along the rod 4 which is prevented from moving in the reverse direction by the plate 15 resuming the position shown in Figure 1 and gripping the rod 4. The return movement of the plate 12 under the action of the spring 14 also returns the trigger member 7 to the position shown.

Reference will now be made to Figures 2 and 3 which show the gripper member or plate 12 in greater detail.

The gripper 12 is shown in greater detail in Figures 2 to 5 and it will be seen that it consists of a generally key-hole shaped thick plate which is made of sintered metal and in the broad part has a cylindrical hole 21 extending through it from the rear face 22 to the front face 23, the axis of the hole being normal to the two surfaces. On the narrow part of the front face 23 there is a boss 24 whose sole purpose is to identify the front face from the rear face to ensure that the gripper is assembled the correct way round. The rear face 22 is formed with a shallow groove 25 whose width is equal to the diameter of the hole 21 and which has a base which is an arc of a circle. The groove extends from a closed end 26 and runs into the hole 21 thus providing an intersection between the groove 25 and the hole 21 which is in the form of a non-circular arc 27. The front face 23 is formed with a groove 28 which is of identical form but which runs into the bottom of the hole 21 by comparison with the groove 25 on the rear face which runs into the top of the hole.

When the gripper 12 is mounted on the rod 4 which is a sliding fit therein (the term sliding being here used in its general and everyday sense of a fairly close but free moving fit rather than in its technically defined sense) force applied to the lower part of the gripper by the pin 11 will cause the gripper to tilt very slightly so that the curved edge 27 at the intersection between the groove 25 and the hole 21 above the rod and the intersection between the groove 28 and the hole 21 below the rod at the front of the gripper will engage the rod and these sharp edges will grip the rod 4 not at a point but over an arc. Accordingly the rod 4 is firmly gripped and considerable force can be applied to the trigger member 7 and hence through the pin 11 and a plate 12 to the rod 4 and hence to the piston in the barrel 1, thus increasing pressure on the contents in the barrel and causing it to be expressed through the nozzle 2.

In the modification shown in Figure 6 the grooves 25 and 28 are replaced by dimples 31 and 32 which are of part spherical form.

Tests have shown that it is possible to exert, in a gun of the construction shown in Figures 1 to 5, a force of at least 1000 kilograms on the material to be dispensed and that such loads can be applied repeatedly without noticeable marking of the rod or appreciable wear on the gripper. Investigations have

shown that contact between the rod and each engaging edge extended for as much as 170° making a total of as much as 340° of contact. Other tests on a gripper without any grooves showed that little or no gripping occurred and the gripper slid on the rod.

Claims

1. A gun for expressing liquid or semi-liquid substances having a body (5), a parallel-sided gripper plate (12) with a parallel-sided hole (21) of circular cross-section, and a rod (4) of circular cross-section which is a sliding fit in the hole, the gripper plate being mounted on the body and arranged for reciprocation longitudinally of the axis of the rod and arranged to tilt relative to the axis of the rod between a rod-gripping position on the forward stroke of reciprocation of the gripper to advance the rod and a rod-release position on the rearward stroke of reciprocation of the gripper to allow the gripper to return without moving the rod, characterised by an indentation (25; 31) on one side of the gripper, the indentation having a generally arcuate base and running into the hole (21) to provide an edge to the hole on the said one side of the gripper which is formed of two arcuate portions, one formed by the intersection of the hole and one face (22) of the gripper and the other (27) formed by the intersection of the base of the indentation (25; 31) with the hole (21).

2. A gun according to claim 1 in which there is a similar indentation (26; 32) on the other side of the gripper and positioned diametrically opposite to the first indentation (25; 31).

3. A gun according to claim 1 or claim 2 in which the rod (4) is of mild steel with a hardened surface layer.

4. A gun according to claim 1 or claim 2 or claim 3 in which the gripper plate (12) is of sintered metal.

5. A dispenser gun for expressing viscous materials having a body (5), a parallel-sided piston rod (4) of circular cross-section mounted for reciprocation on the body and a rod-advancing mechanism (3) comprising a gripper plate (12) with a parallel-sided hole (21) of circular cross-section through which the rod (4) passes, characterised in that the mouth of the hole on one side of the gripper plate is bounded around at least part of its periphery by an arc (27) of an ellipse, the geometry being such that on tilting of the gripper plate the elliptical arc engages the rod along a substantial length of the arc.

6. A dispenser gun according to claim 5 in which the gripper plate (12) is parallel-sided and there is, on one side (22) of the gripper plate, an indentation (25; 31) having a generally arcuate base and running into the hole (21) to provide an edge to the hole on the said one side of the

gripper plate which is formed of two arcuate portions, one formed by the intersection of the hole (21) and one face (22) of the gripper plate and the other (27) formed by the intersection of the base of the indentation with the hole.

7. A dispenser gun according to claim 6 in which there is a similar arc on the other side of the gripper plate.

8. A dispenser gun according to claim 7 in which the similar arc is provided by a similar indentation (26; 32) on the other side (23) of the gripper and positioned diametrically opposite to the first indentation.

9. A dispenser gun according to claim 6 or claim 7 or claim 8 in which the rod (4) is of mild steel with a hardened surface layer.

10. A dispenser gun as claimed in any of claims 6 to 9 in which the gripper plate (12) is of sintered metal.

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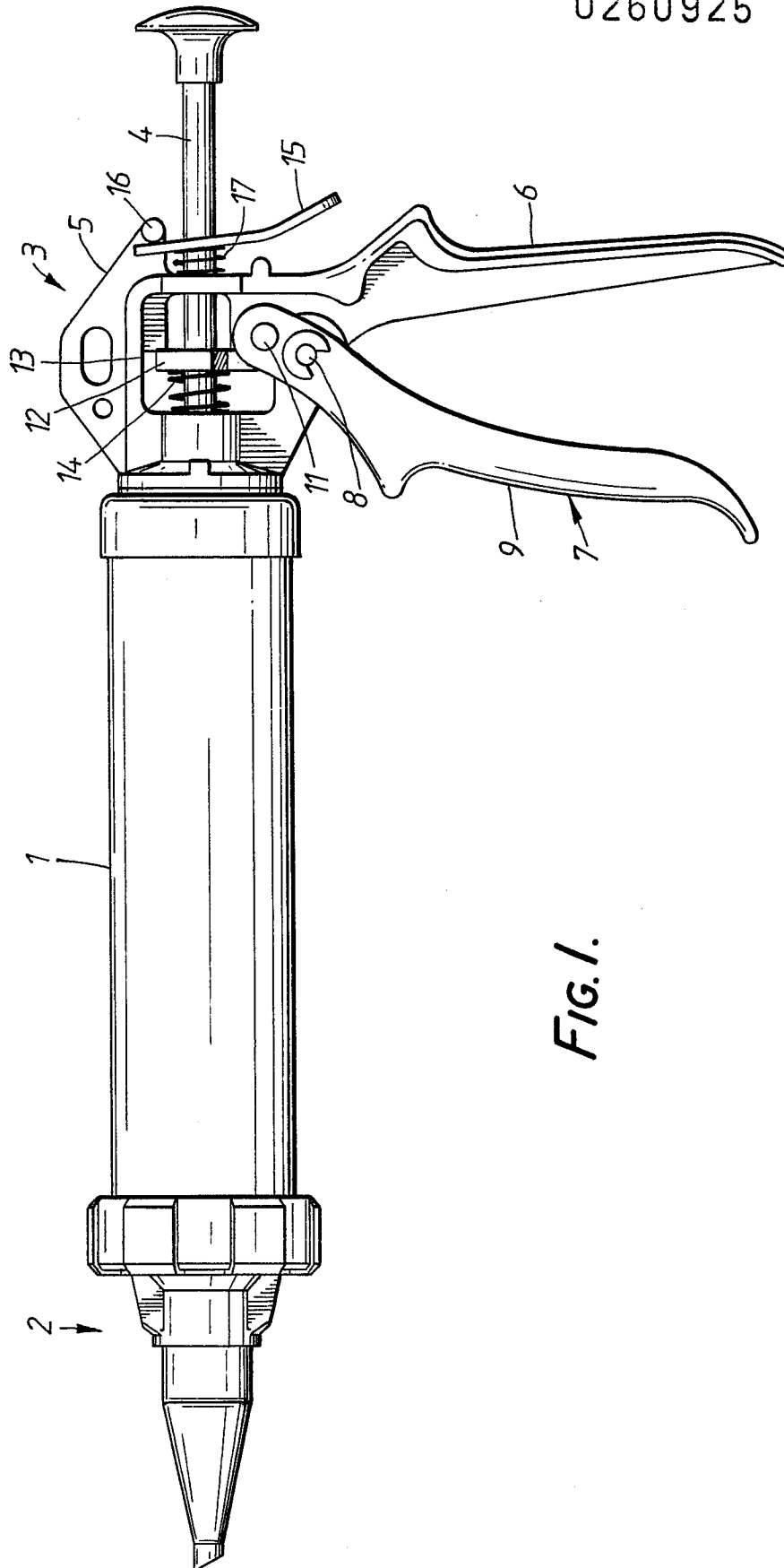


FIG. 1.

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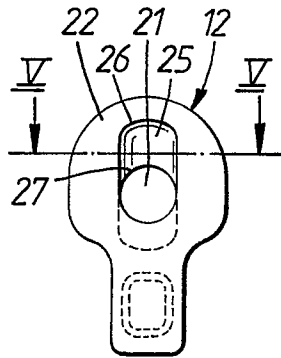


FIG. 2.

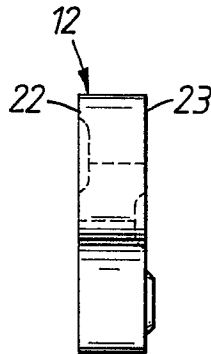


FIG. 3.

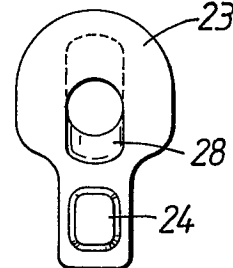


FIG. 4.

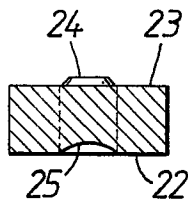


FIG. 5.

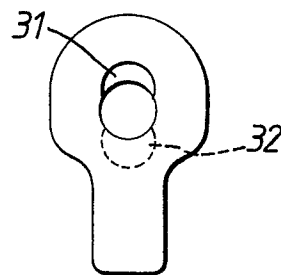


FIG. 6.



DOCUMENTS CONSIDERED TO BE RELEVANT			EP 87308131.9
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. 4)
D,A	<u>GB - A - 1 264 311</u> (COX) * Pos. 15 * --	1	B 65 D 83/00
A	<u>US - A - 3 933 273</u> (COX) * Fig. 2 * --	1	
A	<u>GB - A - 1 591 495</u> (SMITHKLINE CORP.) * Fig. 2 * -----	1	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int. Cl. 4) B 05 C 17/00 B 65 D 83/00 E 04 F 21/00 G 01 F 11/00
Place of search	Date of completion of the search	Examiner	
VIENNA	14-12-1987	MELZER	
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	