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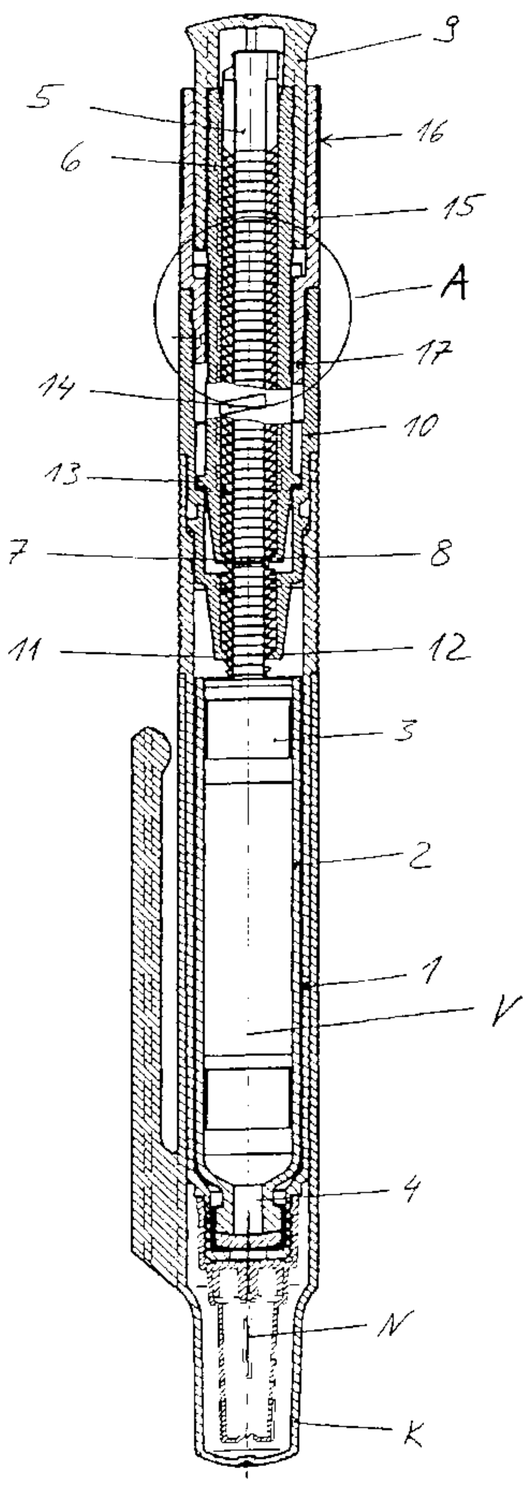
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(54) Titre : DISPOSITIF POUR L'ADMINISTRATION D'UN PRODUIT INJECTABLE
(54) Title: DEVICE FOR ADMINISTERING AN INJECTABLE PRODUCT



(57) Abrégé/Abstract:
The invention relates to a device for the dosed administration of an injectable product. Said device comprises a housing with a reservoir for the product and a plunger that expels the product from the reservoir when displaced in an advance direction

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(57) Abrégé(suite)/Abstract(continued):
towards a reservoir outlet. A drive element can be displaced along an axis of displacement, thereby pushing the plunger in the direction of advance. A dosing element is mounted in the housing to be glidingly movable, preferably in a rotatable manner, along the axis of displacement in order to adjust a product dosis to be released during administration. The device according to the invention is further characterized in that a bearing surface between the dosing element and the housing is lubricated and that at least one lubricant reservoir is disposed on the one bearing surface.

ABSTRACT

The invention relates to a device for administering an injectable product in doses, said device comprising: a casing, comprising a reservoir for the product; a piston, which displaces product towards a reservoir outlet and out of the reservoir when it slides in an advancing direction; a drive member, which may be slid along a sliding axis, thereby pushing the piston in the advancing direction; and a dosing member, which is mounted in the casing and may be slid, preferably rotated, about the sliding axis of the drive member, for setting a product dosage which may be delivered when the product is administered, wherein a bearing surface between the dosing member and the casing is lubricated, and at least one lubricating agent reservoir is provided on the one bearing surface.

DEVICE FOR ADMINISTERING AN INJECTABLE PRODUCT

The invention relates to a device for administering an injectable product as set forth in the preamble of claim 1.

An injection apparatus such as the invention also relates to is known from WO 97/36625 and DE 199 00 792 C1. The injection apparatus comprises: a casing; a product reservoir including a piston accommodated in it such that it can slide and which displaces product from the reservoir when it slides in an advancing direction; a drive means; and a dosing means.

The drive means comprises a drive member which can slide in the advancing direction and a driven member which is prevented from sliding counter to the advancing direction but which is slaved by the drive member when the drive member slides in the advancing direction, thereby pushing the piston in the advancing direction, such that product is displaced from the reservoir. The deliverable product dosage is set by means of a dosing means.

The dosing means comprises the drive member and the dosing member for setting the distal end position of the drive member. The dosing member is mounted in the casing, rotatable about the sliding axis of the drive member. It preferably comprises a dosing stopper revolving spirally about the sliding axis, preferably with a continuous course and a constant gradient relative to the sliding axis of the drive member, said drive member abutting said dosing stopper when it slides into the distal position, i.e. the rotational angular position of the dosing member determines the distal position of the drive member.

The deliverable product dosage is selected by rotating the dosing member, preferably in discrete steps. To this end, the dosing member locks in rotational angular locking positions formed at regular intervals between the casing and the dosing member. Rotating the dosing member between two adjacent locking positions corresponds to the smallest settable product dosage.

The object of the invention is to provide a device for administering an injectable product, in particular of the aforementioned type, which enables a user to easily dose a product, wherein the dosing precision and accuracy of the previously known device is at least to be maintained. In particular, easy rotation of the dosing member is to be ensured.

This object is solved by the subject of claim 1, by lubricating a bearing surface between the dosing member and the casing and providing at least one lubricating agent reservoir on one bearing surface.

By lubricating the bearing surface, friction between the dosing member and the casing is reduced. The movement, preferably rotation, of the dosing member which has to be performed for dosing is made easier for the user. By arranging at least one lubricating agent reservoir, sufficient lubricating agent can be provided for a secondary supply of lubricating agent to not be required during the entire usable life of the device. Lifetime lubrication is ensured. This simplifies using the device.

The lubricating agent reservoir is preferably provided in the immediate vicinity of the bearing surface. It is preferably formed by a hollow space in the dosing member or in the casing.

The dosing member is preferably mounted in the casing, rotatable about the sliding axis of the drive member and secured against sliding axially. Particularly preferably, there is no longitudinal play between the dosing member and the casing. This ensures exact dosing in the device. A high surface pressure therefore prevails in the bearing surface between the dosing member and the casing. This high surface pressure results in a high torque which, however, is effectively reduced by lubricating.

Particularly preferably, the dosing member is mounted on the casing, secured against sliding axially, via an annular bulge. The annular bulge is preferably arranged on the surface area of the dosing member which is in contact with the casing, said annular bulge protruding into a recess in the surface area of the casing. In this way, an undercut is produced between the dosing member and the casing. In principle, however,

the annular bulge could also be provided on the casing. A surface of the annular bulge at an angle to the sliding axis forms a bearing surface for the axial mount of the dosing member. Preferably, this surface is lubricated and at least one lubricating agent reservoir is provided on it. The lubricating agent reservoir is arranged such that the lubricating agent situated in it comes into contact with the bearing surface when the dosing member is rotated.

Preferably, a second bearing surface for the axial mount of the dosing member is also lubricated and at least one lubricating agent reservoir is provided on it.

This second bearing surface can be formed by another surface of the annular bulge or by another surface of the dosing member or the casing.

The annular bulge is preferably provided on the dosing member and axially held in a recess in the casing. The dosing member is particularly preferably arranged within the casing such that the annular bulge radially projects from the outer surface area of the dosing member into an annular groove provided on the inner surface area of the casing.

The lubricating agent reservoir is preferably formed by a flattening of the annular bulge. Particularly preferably, the annular bulge is interrupted at the point at which the lubricating agent reservoir is provided. The interruption in the annular bulge creates a hollow space between the dosing member and the annular groove in the casing. Lubricating agent can be stored in this hollow space. One advantage of the lubricating agent reservoir is that, while the lubricating agent is pressed away from the bearing surface as the dosing member is assembled in the casing, the bearing surface however runs via a lubricating agent reservoir during rotation such that constant re-lubricating is ensured. The lubricating agent also remains at the desired point after assembly.

Preferably, a number of lubricating agent reservoirs are arranged in uniform distribution over the circumference of the dosing member or the casing. This ensures that the bearing surface is better lubricated. Particularly preferably, four lubricating agent reservoirs are provided.

Grease is preferably used as the lubricating agent, particularly preferably Molykote grease. The lubricating agent reservoirs are provided as pockets of grease.

A preferred example embodiment of the invention is explained below by way of figures. There is shown:

Figure 1 an injection device comprising a dosing means, in a longitudinal section; and

Figure 2 a dosing member comprising a lubricating agent reservoir in accordance with the invention, corresponding to Detail A from Figure 1.

Figure 1 shows an injection apparatus, in the example embodiment an injection pen, in a longitudinal section. Figure 2 shows Detail A from Figure 1.

The injection apparatus comprises a casing including a front casing sleeve 1 and a rear casing sleeve 10 fixedly connected to the front casing sleeve 1. The front casing sleeve serves as a receptacle for an ampoule 2. A liquid product in the form of an active agent solution, for example insulin, is contained in the ampoule 2. Furthermore, a piston 3 is accommodated in the ampoule 2. By sliding the piston 3 in the advancing direction towards an ampoule outlet 4, the product is displaced from the ampoule 2 through its outlet 4 and delivered through an injection needle n, also if the size of the needle is 31G or a higher Gauge number. The front casing sleeve 1 is protected by a cap K. The needle N is protected again by a needle cap.

The piston 3 is slid in the advancing direction by a drive means accommodated in the rear casing sleeve 10. The drive means comprises a toothed rack 5 as a driven member which acts directly on the piston 3,

and a drive member 6. The drive member 6 mounted in the rear casing sleeve 10 such that it can be linearly slid along the sliding axis V in and counter to the advancing direction of the piston 3. A cover 9, which is connected to the drive member 6 such that it can slide and freely rotate, protrudes backwards out of the casing.

A dosing member provided as a sleeve body is connected to the rear casing sleeve 10, secured against sliding but rotatable about the common longitudinal axis which corresponds to the sliding axis V. The dosing member 15 protrudes into the rear casing sleeve 10 via a front sleeve portion 17. Its rear sleeve portion protrudes out of the rear casing sleeve 10. The rear sleeve portion of the dosing member 15 is provided with a contour 16 so that it can be rotated with a secure manual grip.

As is seen most clearly in an overview of Figures 1 and 2, an annular bulge 20 provided on the front sleeve portion 17 and latched into a circumferential recess 19 on the inner surface of the rear casing sleeve 10 serves to fix the dosing member 15 such that it is secured against sliding. A bearing surface L1 of the annular bulge 20 comes into contact with an undercut surface of the recess 19 of the rear casing sleeve 10. A second bearing surface L2 is formed between the rear end of the rear casing sleeve 10 and a circumferential, radially protruding projection of the dosing member 15. The dosing member 15 mounted in the casing, secured against axially sliding, between the bearing surfaces L1 and L2.

In front of the contour 16, the dosing member 15 bears a clearly visible dosage scale running around its outer surface area, said scale being adjusted to established rotational angular positions in which the dosing member 15 locks against the rear casing sleeve 10. The locking mechanism between the dosing member 15 and the rear casing sleeve 10 is formed by elevations on the outer surface of the front sleeve portion 17 of the dosing member 15, and cavities 23 are formed in the inner surface of the rear casing sleeve 10. The cavities 23 are circumferentially arranged on a level, alongside each other, at equal angular intervals on the inner surface of the rear casing sleeve 10. In the fixed rotational angular locking positions of the

dosing member 15, the number of elevations are accommodated precisely in the respectively opposing cavities in the inner surface of the rear casing sleeve 10.

When the injection apparatus is completely assembled, as shown in Figure 1, the drive member 6 protrudes through the dosing member 15. The dosing member 15 concentrically surrounds a distal portion of the drive member 6 and also of the driven member 5. The cover 9 protrudes via a sleeve portion into an annular gap formed between the drive member 6 and the dosing member 15. The cover 9 also bears a marking in its surface region protruding out of the dosing member 15, which in co-operation with the marking on the dosing member 15 enables the total amount of product administered from the ampoule 2 to be determined exactly, even after a number of complete rotations of the dosing member 15.

The maximum dosage path length which the drive member 6 and the toothed rack 5 can travel in the advancing direction, and therefore also the maximum product dosage which may be delivered in an injection, also if the size of the needle is 31G or a higher Gauge number, is set by rotating the dosing member 15.

The smaller the axial play of the dosing member 15 in the rear casing sleeve 10, the more exact the dosage of the device. The dosing member 15 is preferably accommodated in the rear casing sleeve 10 with no play. This, however, increases the surface pressure in the bearing surfaces L1, L2, such that a higher torque would be required from the user to set the dosage. By lubricating at least the one of the slide bearing surfaces L1, L2, this torque can be reduced. Since at a high surface pressure the lubricating agent would be displaced from the bearing surfaces L1, L2 during assembly or operation, lubricating agent reservoirs F are provided which establish a contact between the bearing surface L1 or L2 and the lubricating agent.

A lubricating agent reservoir F is formed by an interruption in sections of the annular bulge 20. This results, in sections, in an intermediate space between the dosing member 15 and the casing sleeve 10. This

intermediate space can be filled with lubricating agent, in particular grease, and serves a lifetime lubrication for the bearing surface L1. Preferably, a number of lubricating agent reservoirs F are arranged in uniform distribution over the circumference. The more lubricating agent reservoirs F are provided, the more often the bearing surface L1 brushes over a lubricating agent reservoir F when rotated. The section in accordance with Figure 2 runs through the annular bulge 20 in the upper region of the drawing and through a lubricating agent reservoir F in the lower region of the drawing.

Figure 2 does not show a development of a lubricating agent reservoir F in which the volume is increased by additionally providing a cavity in the dosing member 15 in the region of the interruption in the annular bulge 20. Figure 2 also does not show the variant in which the annular bulge 20 is arranged on the rear casing sleeve 10. The lubricating agent reservoir F is provided in an analogous way. Lubricating agent reservoirs F can also be provided in the bearing surface L2, analogously to the lubricating agent reservoirs in the annular bulge 20. Preferably, they are formed by recesses in the radial facing surface of the dosing member 15 or of the rear end surface of the rear casing sleeve 10. Preferably, lubricating agent reservoirs F are only provided in the bearing surface L1. They can, however, also be provided in the bearing surface L2. Particularly preferably, lubricating agent reservoirs F are situated in both bearing surfaces L1 and L2.

Before the dosing member 15 is assembled, the region 22 of the rear casing sleeve 10 indicated in Figure 2 by a broken line is provided with lubricating agent. When, to assemble it, the dosing member 15 is pushed into the rear casing sleeve 10, the lubricating agent remains behind in the region of the lubricating agent reservoirs F and ensures that the bearing surfaces L are lubricated when the dosing member 15 is rotated.

Dosing is performed in a proximal end position of the drive member 6, foremost with respect to the advancing direction, in which position a stopper cam or collar 13 protruding radially from the outer surface area of the drive member 6 abuts a stopper formed by the rear casing sleeve 10. In this proximal end position of the drive member 6, the dosing member 15 is rotated about the sliding axis V relative to the rear

casing sleeve 10 until it has reached the desired dosing or rotational angular locking position. In this dosing position, a slight dosing interval remains between another collar or cam which likewise projects from the outer surface area of the drive member 6 and forms the dosing stopper (and shall therefore be called the dosing cam 14 in the following) and the proximal facing side 18 of the dosing member 15 opposite said dosing cam 14. The drive member 6 can be retracted counter to the advancing direction, relative to the rear casing sleeve 10 and therefore also relative to the piston 3, by the dosing interval. It is retracted manually by pulling on the cover 9. The dosing interval is equal to the dosage path length when the product is subsequently administered.

When the drive member 6 is slid back or retracted, the toothed rack 5 remains in its sliding position relative to the casing, assumed during the dosing process. The toothed rack 5 is secured against sliding counter to the advancing direction by blocking means 11 and 12 provided on the rear casing sleeve 10. The blocking means 11 and 12 are locking cams provided on each of the front ends of an elastically flexible tongue, and protrude from their tongue radially inwards towards the toothed rack 5. The blocking means 11 and 12 each co-operate with a row of teeth of the toothed rack 5 facing them, such that they allow the toothed rack 5 to slide in the advancing direction and prevent it from sliding counter to the advancing direction using a positive-lock blocking mesh. Once the drive member 6 has been retracted, it can be slid in the advancing direction by the dosage path length, thereby slaving the toothed rack 5 and the piston 3, such that a dosed amount of the injectable product is displaced from the reservoir 2.

WE CLAIM:

1. A device for administering an injectable product in doses, said device comprising:
   a) a casing (1), comprising a reservoir (2) for said product;
   b) a piston (3), which displaces product towards a reservoir outlet (4) and out of said reservoir (2) when it slides in an advancing direction;
   c) a drive member (6), which may be slid along a sliding axis (V), thereby pushing said piston (3) in said advancing direction;
   d) a dosing member (15), which is mounted in said casing (1) and may be slid, preferably rotated, about said sliding axis (V) of the drive member (6), for setting a product dosage which may be delivered when the product is administered,

   wherein

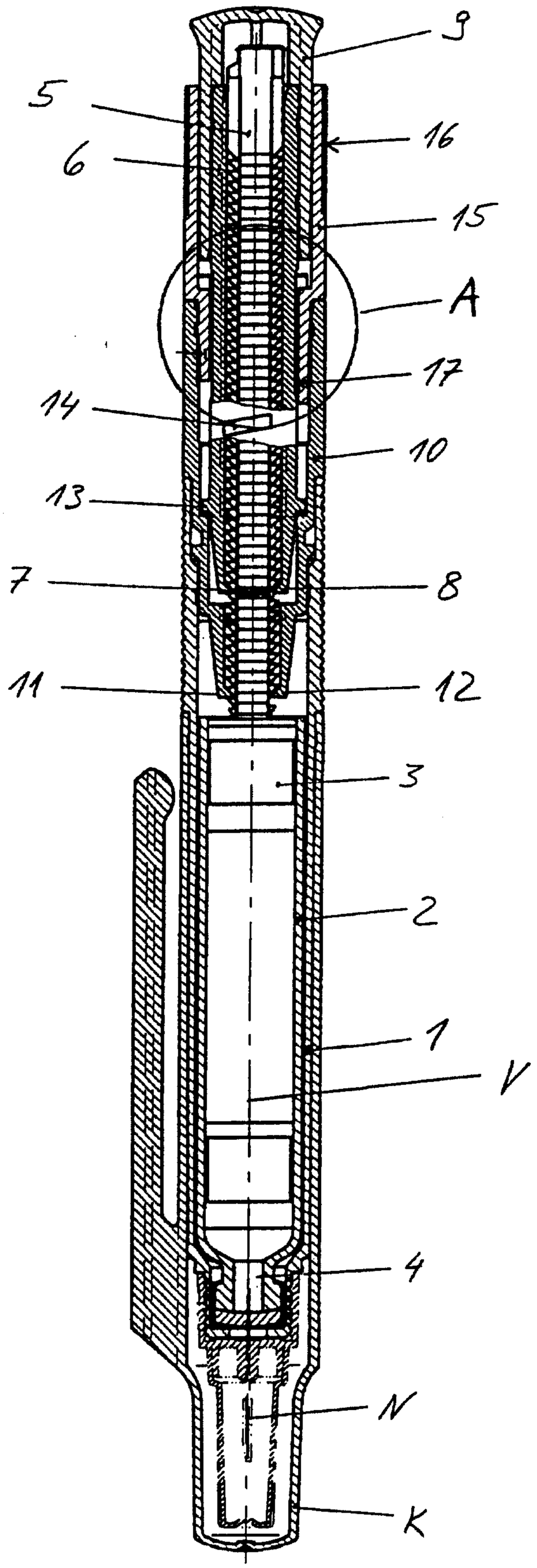
   e) a bearing surface (L) between said dosing member (15) and the casing (1) is lubricated; and
   f) at least one lubricating agent reservoir (F) is provided on said one bearing surface (L).

2. The device as set forth in the preceding claim, wherein the dosing member (15) is mounted on the casing (1) via an annular bulge (20), such that it can slide axially, and the bearing surface (L) is formed by at least one surface of said annular bulge (20).

3. The device as set forth in the preceding claim, wherein the annular bulge (20) is provided on the dosing member (15) and is axially held in an annular groove in the casing (1).

4. The device as set forth in any one of the preceding two claims, wherein said at least one lubricating agent reservoir (F) is formed by a flattening of the annular bulge (20).

Fig. 1



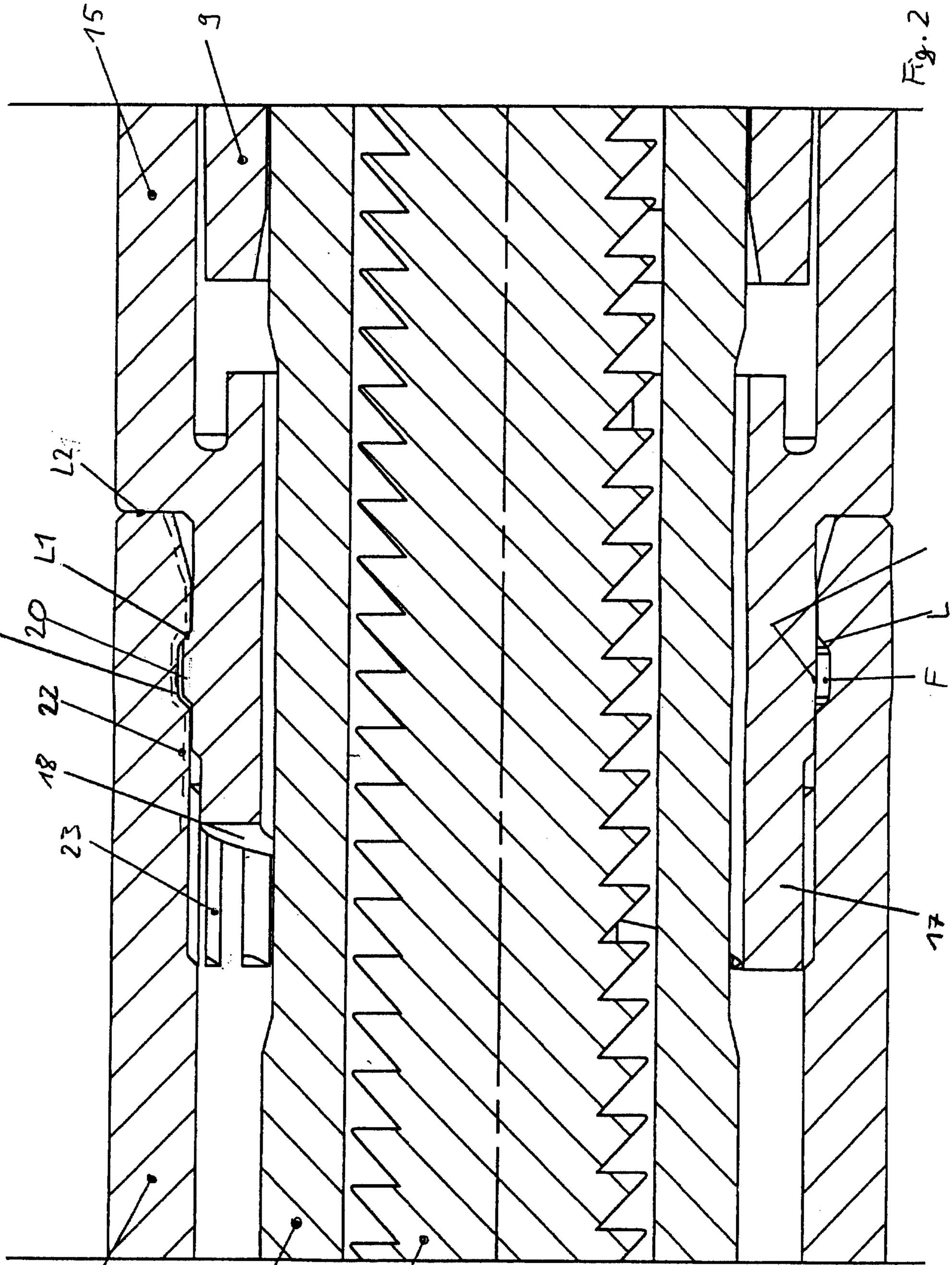
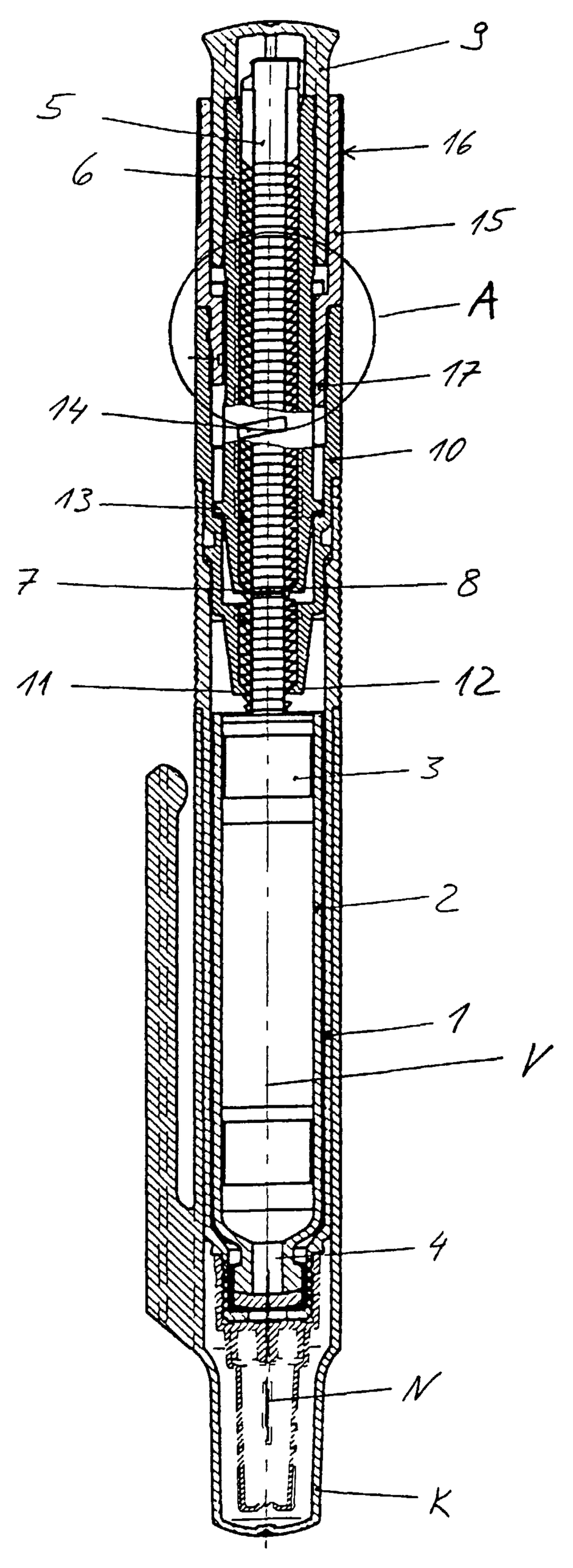


Fig. 2


9
5
16
6
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A
17
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8
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12
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2
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V
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N
K