April 24, 1962 H. GRÜNERT 3,030,959

SURGICAL LANCET FOR BLOOD SAMPLING

Filed Sept. 4, 1959

Fig. 1

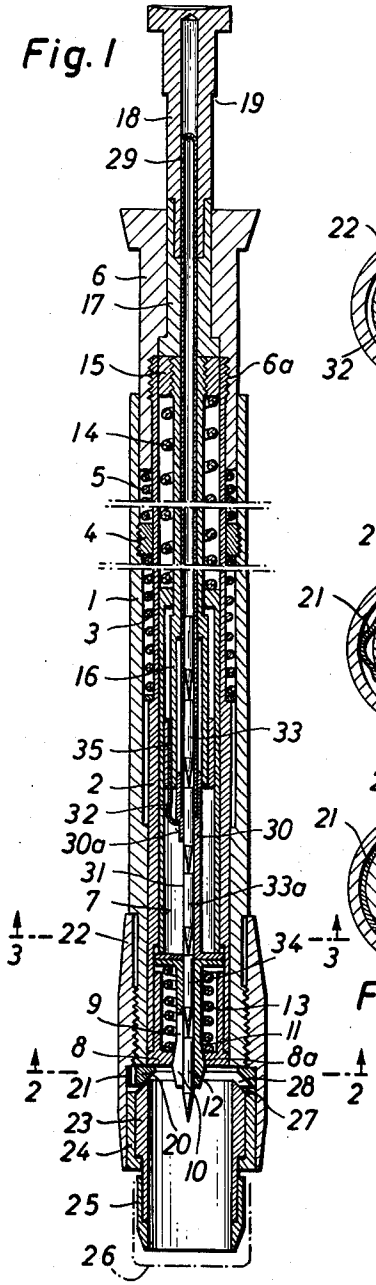


Fig. 3

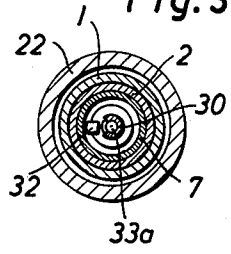
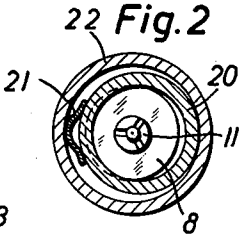


Fig. 2



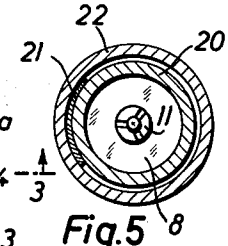
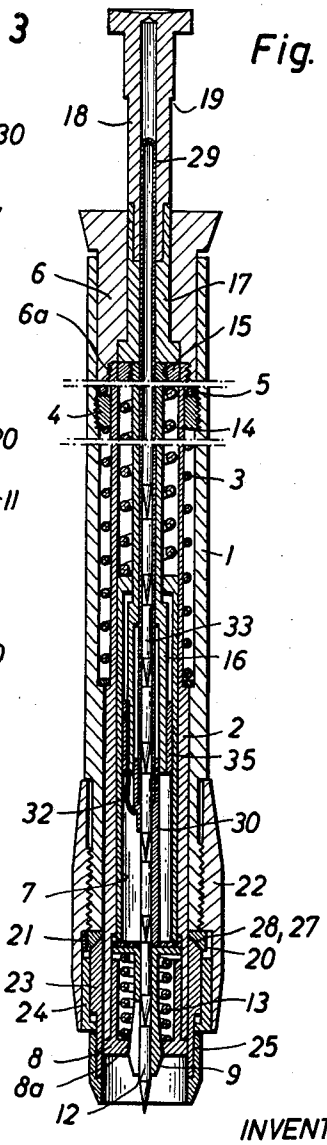


Fig. 5

Fig. 4



INVENTOR

H. GRÜNERT

BY

Lowry & Rinehart

ATTYS.

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SURGICAL LANCET FOR BLOOD SAMPLING

Helmuth Grunert, Koln-Hohenberg, Germany, assignor to Prameta, Prazisionsmetall- und Kunststofferzeugnisse, G. Baumann & Co., Koln-Ostheim, Germany, a firm

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9 Claims. (Cl. 128—329)

This invention relates to a device for cutting the human skin and more particularly to a puncturing device for obtaining blood samples by making incisions of small depth into the skin.

Devices for blood sampling of the surgical lancet type having the lancet or puncturing cannula arranged for replacement are known. In these devices, the lancet can be mounted on the front end of a firing pin which is under spring pressure, and in retracted position, can be retained by means of a contactor lever. Release is effected by means of a release member which may consist of a tipping lever. It is also known to provide the firing pin additionally with a retractile spring in order to moderate the impact of the firing pin in released position to prevent the puncturing cannula from being ejected. In prior art devices for blood sampling, the lancet must be replaced manually. To permit the replacement, it is generally necessary to remove parts of the device or swing them outward. Moreover, the known design of surgical lancets does not correspond to the constructional possibilities of ensuring sterility of the puncturing member.

An object of the invention is to provide a puncturing device wherein a spindle under spring pressure is capable of being locked in retracted position and released from this position by means of a release member. It is characterized in that the spindle is designed for housing a replaceable magazine containing a stock of needles and provided with a feeding device for the needle to be used. The magazine advantageously exhibits the shape of an elongated pencil lead and has the form of a sleeve, in the longitudinal axis of which the needles are stored one after the other in a line. Advancing of the needles into the spring collet is effected by a push member which, in operating position, extends into the path of the needle next following the used needle. As this needle is advanced, the needle preceding it is ejected. Retaining of the needle in position of use is accomplished by means of a spring collet which is slotted in axial direction.

The spindle is advantageously constructed as hollow and houses the spring collet at one end and the removable magazine on the other end. It is also capable of receiving one or several sleeves cooperating with one spring collet, the collet taking support on an abutment by means of a spring so that the needle is retained. The external spindle sleeve is equipped with a driving spring. Moreover, there is provided a return spring pulling the spindle and consequently the collet and the needle back after the incision has been made.

According to a further feature of the invention, release of the spindle being in cocked position is effected by exerting a pressure on that part of the device which is placed on the skin. To this end, this part may be designed as a sleeve which is arranged for displacement in longitudinal direction and cooperates with a ring kept in eccentric position under spring pressure and representing the support member for the cocked spindle.

The puncturing lancet of the invention exhibits several advantages with respect to the constructional design and the possibilities of manipulation and making painless incisions. It is known that especially the use of puncturing devices for mass examinations results in transmission of infectious diseases because the puncturing member cannot be kept sterile rapidly and safely.

This deficiency is removed in accordance with the invention by the fact that the used needle can be rapidly replaced by a new needle. In the magazine inserted into the puncturing device, there is available a number of sterile needles which can be brought into the position of use successively without the person handling the device coming into contact with the needles. Ejection of the used needles is effected forcibly so that contact with the non-sterile needles is likewise eliminated. The magazine, i.e. the sleeve containing the needles, is simply and rapidly inserted into the device without a contact between the operator and the individual needles taking place. Thus, here again sterile manipulation is ensured. The depth of incision can be easily adjusted. Of particular advantage is the release of the cocked spindle by exerting a pressure on the front surface of application, i.e. by pressing the entire device against the skin. In particular, release levers are eliminated thereby. All of the moving parts of the puncturing device are arranged in the interior of the housing. The housing itself may be made even and smooth on the outside. It is preferably given the shape of an elongated pencil. In this manner, the device can be easily handled and kept clean. The round shape of the puncturing member and its automatic retraction from the skin ensure painless incisions in contrast to the hitherto usual shapes of the incision member while fully achieving the effect desired.

With the above and other objects in view that will become apparent as the nature of the invention is better understood, the same consists in the novel form, combination and arrangement of parts hereinafter more fully described, shown in the accompanying drawing, and claimed.

In the accompanying drawing which illustrates one embodiment of the invention,

FIG. 1 is a longitudinal sectional view of the puncturing device of the invention;

FIGS. 2 and 3 are cross-sectional views along the lines 2—2 and 3—3 respectively of FIG. 1;

FIG. 4 is a longitudinal view of the puncturing device showing the spindle with the needle in its foremost puncturing position; and

FIG. 5 is a view corresponding to FIG. 2 with the spindle in released position.

Referring to the drawings, the puncturing device of the invention has a cylindrical housing 1 of elongated pencil-like shape that receives the spindle 2 in the form of a central tube that is arranged for displacement. The central tube 2 is under the action of a spring 3 tending to advance the tube. This spring surrounds the tube 2 and abuts at one end a stationary intermediate ring 4 which, for example, is mounted in the housing 1 adjacent the inner end thereof. The other end of the spring abuts an annular shoulder on the tube 2. A further spring 5 serves as a return spring and is located in the housing between the other side of the intermediate ring 4 and a grip member or pull knob 6 which is permanently connected with the central tube 2 by a threaded connection at 6^a. The forward part of the central tube 2 houses the spring collet 9. Arranged within a locking cap 8 inserted into the central tube 2 and permanently connected to the central tube is the spring collet 9 subdivided into springy jaws by longitudinal slots 10. These jaws have a cone 11 enlarging in forward direction and co-operating with the conical abutment 8^a of the locking cap 8. The spring collet 9 holds the puncturing needle 12. By means of the collet spring 13, the collet 9 is pulled towards the conical abutment 8^a of the sealing cap 8, thereby retaining the puncturing needle 12.

Arranged in the central tube 2 for longitudinal displace-

ment is a tube 7 which is under the action of a feeding spring 14 engaging at one end the end ring 15 which is permanently threadably connected with a feed tube 16. The tube lies against a flange of a feeding sleeve 30, which flange in turn takes support on the flange of the spring collet 9. Arranged in the pull knob 6 is a feed push member 17 in which sleeve 18 with a push knob is inserted. When inserting the sleeve 18, the spring 14 is tensioned and the force produced on the tube 7, acts upon the spring collet 9 against the action of the spring 13 thereby disengaging the chuck jaws 9 from the abutment 8^a to release the puncturing needle 12. The feed motion of the sleeve 18 is limited by the stop 19. When releasing the sleeve 18, the same is returned into its starting position by the feed spring 14. The collet spring 13 is capable of becoming fully effective again in that the jaws 9 press against the abutment 8^a in the sealing cap 8 and consequently clamp the needle 12 tightly. The springs 13 and 14 should be adapted to each other such that the spring 14, after compression, is capable of overcoming the tension of the spring 13.

In tensioned retracted position, the central tube 2 is retained by a press ring 20 which is held in eccentric position by the spring 21 as in FIGS. 1 and 2. Threaded on the cylindrical housing 1 is a head 22 in the front part of which a press sleeve 23 is arranged for displacement in a longitudinal direction. This press sleeve 23 is fitted in an intermediate sleeve 24 and is provided at the front end with a cap 25 fitted thereon. To provide a dust-proof cover, the press sleeve 23 may be provided with a sealing cap 26. The cap 25 of the press sleeve 23 represents the member to be pressed on the skin, and serves to release the central tube 2 held in cocked condition under spring load together with the puncturing needle 12 chucked in the spring collet 9. To this end, the press sleeve 23 is provided at its inner end with a chamfer or cone 27 cooperating with the inner cone 28 of the press 20 held in eccentric position.

The magazine has the form of an elongated pencil lead capable of receiving a predetermined number of needles in its sleeve 29. The sleeve 29 is arranged in the feed tube 16 which is held in retracted position by the spring 14. The front end of the sleeve 29 is telescoped into a feed sleeve 30, the bore of which corresponds to that of the sleeve 29. The feed sleeve 30 is provided with a longitudinal slot 31. The outer end of the feed tube 16, by means of an intermediate sleeve 35, carries a leaf spring 32 serving the advance of the needles and having its front end bent off at an angle. The bent-off part, in retracted position of the feed tube 16, rests on a surface 30^a of the feed sleeve 30 keeping the spring 32 away from the path of the needles. Actuation of the feed tube 16 is effected by the feed push member 17 which is displaceable in longitudinal direction and on which the sleeve 18 is fitted.

For charging the puncturing device with a new sleeve 29 containing a predetermined number of sterilized needles 33, the sleeve 18 is removed so that the sleeve 29 with needles can be inserted down to the stop provided at the feed sleeve 30. With the device in vertical position, the needles slide downwardly by gravity until the foremost needle 34 has reached the position shown in FIG. 1 if a needle 12 from the previous magazine is still contained in the spring collet 9. By pressing on the sleeve 18, the jaws 9 of the collet move out of engagement with the abutment 8^a. At the same time, the feed tube 16 is advanced together with the feed push member 17 by pressing the sleeve 18 forward. As the tube 16 is advanced, the spring 32 bent off at an angle is taken along, glides off from the surface 30^a and enters the path of the needles 33. The spring 32 engages the end face of the next following needle 33^a from behind. As the tube 16 is further advanced by the sleeve 18, the needle 33^a is likewise advanced until the spring 32 reaches a stop at the spring collet. The needle 34 has been advanced by the needle 33^a. The needle 12 was ejected, the needle 34 takes the

place of the needle 12 and the needle 33^a that of needle 34. By releasing the sleeve 18, the feed tube 16 automatically returns into its starting position under the action of the spring 14. The spring 32 is lifted out of the path of the needles by the surface 30^a and held in inactive position. At the same time, with spring 14 released, the collet spring 13 becomes effective so that the jaws 9 clamp the foremost needle.

To make the incision, the entire puncturing device is pressed with its front cap against the skin. Thereby, the press sleeve 23 is displaced inwardly and engages the inner cone 28 of the eccentrically located press ring 20 and moves the same into concentric position, which releases the central tube 2. The spring 3 becomes active and the tip of the needle 12 jumps beyond the front edge of the cap 25 and produces a puncture. This phase of movement is represented in FIG. 4. Thereafter, the then compressed return spring 5 immediately retracts the central tube 2 together with the spring collet 9 and the needle 12 so that the needle is again in the space enclosed by the press sleeve 23. The central tube 2 is then manually withdrawn into the housing using the pull knob 6 until the cap 8 again is seated behind the ring 20 and the spring 3 is again compressed. Now the used needle may be replaced by a new sterile needle from the magazine by advancing the sleeve 18 to the front stop and releasing it, whereupon it returns automatically into the starting position.

By adjusting the head 22, the depth of penetration of the needle may be adjusted by means of marks provided on the housing 1. The tension of the springs 3 and 5 may be varied by adjusting the intermediate ring 4 and the pull knob 6.

What is claimed is:

1. In a puncturing device for making an incision in the skin of a person, an elongated housing, a spring loaded hollow spindle slidable in the housing, means for holding the spindle in retracted position, means adapted to engage the aforesaid means to release the spindle, spring means for returning the spindle towards a partially retracted position, a needle magazine having needles therein arranged in end to end relation receivable in said spindle, chuck means for holding the foremost needle, and means for feeding the needles forwardly to the chuck means; said chuck means including a collet having needle gripping jaws and spring means for holding the jaw engaged with a needle, and the means for holding the spindle in retracted position including an eccentrically mounted ring in the outer end of the housing in the path of the spindle and a spring for normally holding the ring in its eccentric position.

2. A puncturing device as in claim 1, wherein the spindle releasing means includes a press sleeve slidably mounted in inclosing relation to the adjacent needle at the outer end of the housing and adapted to be moved into contact with the eccentric ring to center the ring relative to the housing and move it out of the path of the spindle.

3. A puncturing device as in claim 2, wherein the opposed faces of the ring and press sleeve have oppositely inclined surfaces to effect lateral movement of the ring into concentric position.

4. A puncturing device as in claim 1, wherein the spindle releasing means includes a press sleeve slidably mounted in inclosing relation to the adjacent needle at the outer end of the housing and adapted to be moved into contact with the eccentric ring to center the ring relative to the housing and move it out of the path of the spindle, the means for feeding the needles including a feed tube in which the magazine is mounted, a needle guide sleeve at the outer end of the feed tube having a side slot therein and a spring member carried by the feed tube and adapted to extend through said slot for engaging the rear end face of a needle in the magazine

and means for moving the feed tube and magazine toward the collet.

5. A puncturing device as in claim 2, wherein the opposed faces of the ring and press sleeve have oppositely inclined surfaces to effect lateral movement of the ring into concentric position, the means for feeding the needles including a feed tube in which the magazine is mounted, a needle guide sleeve at the outer end of the feed tube having a side slot therein and a spring member carried by the feed tube and adapted to extend through said slot for engaging the rear end face of a needle in the magazine and means for moving the feed tube and magazine toward the collet.

6. A puncturing device as in claim 1, wherein the spindle releasing means includes a press sleeve slidably mounted in inclosing relation to the adjacent needle at the outer end of the housing and adapted to be moved into contact with the eccentric ring to center the ring relative to the housing and move it out of the path of the spindle, the means for feeding the needles including a feed tube in which the magazine is mounted, a needle guide sleeve at the outer end of the feed tube having a side slot therein and a spring member carried by the feed tube and adapted to extend through said slot for engaging the rear end face of a needle in the magazine, means for moving the feed tube and magazine toward the collet, and spring means for restoring the last named means to normal position.

7. A puncturing device as in claim 2, wherein the opposed faces of the ring and press sleeve have oppositely inclined surfaces to effect lateral movement of the ring into concentric position, the means for feeding the needles including a feed tube in which the magazine is mounted,

a needle guide sleeve at the outer end of the feed tube having a side slot therein and a spring member carried by the feed tube and adapted to extend through said slot for engaging the rear end face of a needle in the magazine, means for moving the feed tube and magazine toward the collect, and spring means for restoring the last named means to normal position.

8. A puncturing device as in claim 1, wherein the spindle releasing means includes a press sleeve slidably mounted in inclosing relation to the adjacent needle at the outer end of the housing and adapted to be moved into contact with the eccentric ring to center the ring relative to the housing and move it out of the path of the spindle, and spring means for restoring the last named means to normal position.

9. A puncturing device as in claim 2, wherein the opposed faces of the ring and press sleeve have oppositely inclined surfaces to effect lateral movement of the ring into concentric position, and means for controlling the length of sliding movement of the press sleeve to vary the lenth of projection of a needle beyond the press sleeve.

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CERTIFICATE OF CORRECTION

Patent No. 3,030,959 April 24, 1962

Helmuth Grunert

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

In the heading to the printed specification, line 8, for "Nov. 9, 1959" read -- Sept. 5, 1958 --.

Signed and sealed this 28th day of August 1962.

(SEAL)
Attest:

ESTON G. JOHNSON
Attesting Officer

DAVID L. LADD
Commissioner of Patents