July 28, 1959 I. A. SPEELMAN 2,896,628

BLOOD LANCETS

Filed June 12, 1957

FIG.1

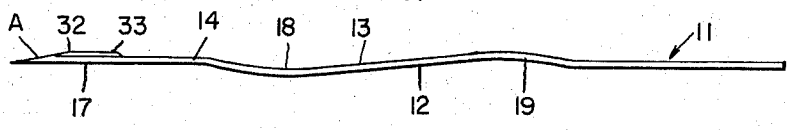


FIG.2

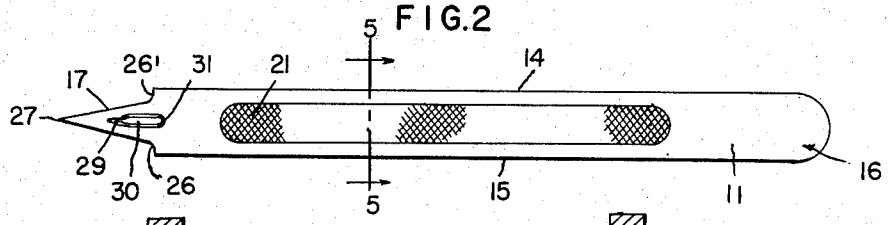


FIG.4

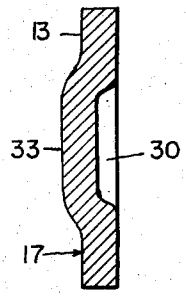


FIG.3

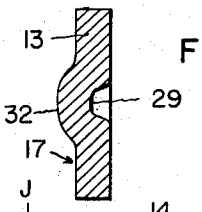


FIG.5

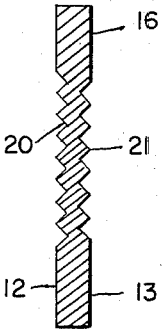


FIG.6

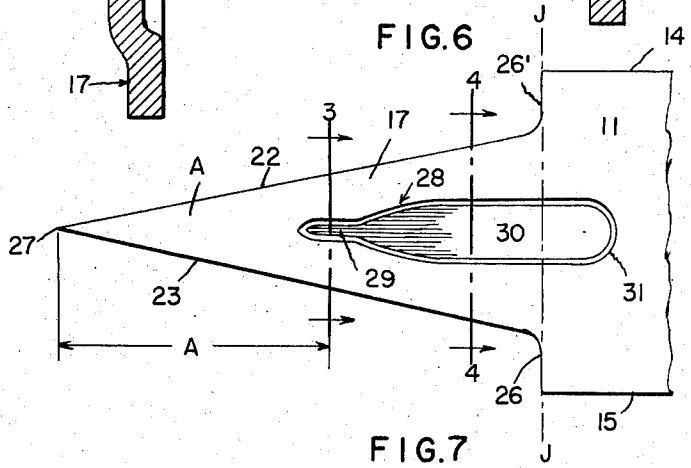


FIG.7

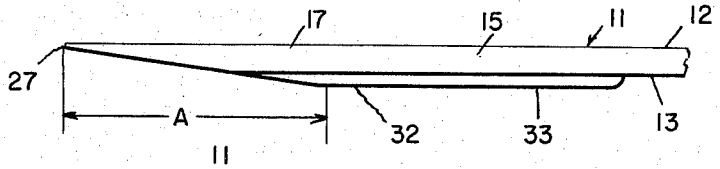
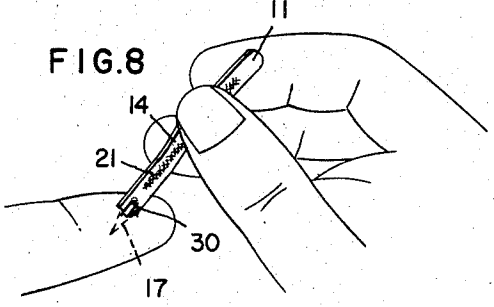


FIG.8



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BLOOD LANCETS

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Application June 12, 1957, Serial No. 665,227

3 Claims. (Cl. 128—314)

This invention relates to disposable medical blood-letting lancets, and more particularly to those devices that are constructed to enable blood samples to be withdrawn from the superficial capillaries of the body by piercing or puncturing the skin of an individual so that the blood which leaves the capillaries can be collected on the surface of the skin. Such devices are usually strips of metal pointed at the end that is to pierce the skin of the patient. Such devices have to be made as inexpensive as possible because they are used only once and then discarded, so it is an object of this invention to devise such a lancet that can be made significantly cheaper than any heretofore.

The points of such devices have to be sharp in order to puncture the skin readily, but when they are made sharp as by grinding, it is a relatively expensive process; so it is another object of this invention to devise ways and means for making the point sharp without the use of grinding. When such devices, with the small sharp point puncture the skin and are withdrawn, there is a tendency for bleeding to stop too quickly so that enough blood is not obtained. In such instances, the incision has to be squeezed by the physician but this tends to cause the emission besides blood of either serum, juices, or lymph which dilutes the blood and thus causes the blood sample taken not to be a true sample of the blood. So it is a further object of this invention to devise ways and means for stimulating outflow of a sufficient quantity of undiluted blood from the incision to give an ample sample of true blood. A further object is to devise means for spreading the skin opening formed by the point of the lancet to an extent greater than the normal thickness of the lancet. Such present devices have to be made of metal sufficiently thick to be strong enough not to break or bend excessively. So it is another object of this invention to devise ways and means for reinforcing the metal so that thinner than ordinary metal can be used satisfactorily. The thinner the piercing point, the better, yet there is a limit to the thinness of the metal that can be used; so it is a further object of this invention to devise ways and means whereby the normal thickness of the piercing point can be lessened without expensive sharpening.

These objects, and others that appear hereinafter, can be realized by a narrow linearly extending strip of stainless steel or similar metal stamped by a die to provide a strip having a main or shaft body with marginal edges and side faces, which body terminates in a tapered or pointed portion adapted to enter the patient's skin. The pointed portion is reinforced by a reinforcing rib pressed from the portion to present a projecting rib extending from one face of that portion and presenting a corresponding depression or groove in the other face. If further reinforcement is needed, it is proposed to put knurling on each face of the lancet, but the knurling on the face is out of register with the knurling on the opposite face, for thus substantially reinforcing the lancet body. The rib extends inwardly toward the shaft portion. If the puncture needs further widening, the rib can terminate in a basin-like expansion of the rib, so that the ovoidal shape of the reinforcing pressed-in part is shaped more or less like a pork chop or a handled pan. The shape may also be likened to a mandolin. Instead of grinding the point to sharpen it, this invention teaches that it is sufficient merely to swage or hammer the point so that the latter forms a polyfaced point, whereupon no ground edge is needed, and hammering of the puncturing point to thin it can be done by the same die that stamps the rib to extend from the body.

The invention is illustrated in the accompanying drawings in which—

Figure 1 shows a view looking down on an edge of the disposable lancet of this invention;

Fig. 2 shows a plan view of a side face of the lancet;

Fig. 3 shows a cross-sectional view taken along the line **3—3** in Fig. 6;

Fig. 4 shows a cross sectional view taken along the line **4—4** of Fig. 6;

Fig. 5 shows a cross-sectional view along line **5—5** of Fig. 2;

Fig. 6 is a magnified partial plan view of the pointed end of the lancet;

Fig. 7 shows a magnified partial edge view looking at the pointed and swaged end of Fig. 6; and

Fig. 8 is a perspective view, somewhat enlarged and out of proportion, for better visibility, showing how the lancet is used. All of these figures show the lancet many times its actual size. The actual size of the lancet is 1½" long and ⅛" wide.

In the drawings, the lancet is shown to be a thin strip of metal having a main body or shaft portion **11** with two opposite faces **12** and **13** respectively, and two opposite marginal edges **14** and **15** respectively. The body is provided with a rear portion **16** and a tapered or pointed portion **17** more or less aligned but therebetween there are two oppositely curved portions **18** and **19**. On each face **12** and **13** of the curved portions, are diamond-patterned knurlings or knurled areas **20** and **21** respectively.

Coming now to the pointed portion **17** that has intersecting edges, it is seen from the drawings that its marginal edges **22** and **23** lie at about a 23° intercepted angle and also lie at angles to edges **14** and **15**. Between lower edge **23** and edge **15** is a shoulder **26**, and between upper edge **22** and edge **14** is another shoulder **26'** forming stops limiting the degree of penetration of the pointed portion **17** into the patient. The edges **22** and **23** intersect and near their normal point of intersection, one of the faces, such as **13**, is swaged or smacked down or hammered, as at A, for the purpose of providing a sharp piercing or puncturing point **27** that need not be ground or otherwise sharpened.

The pointed portion **17** has stamped out therefrom on one face **12** and indented into its other face **12**, an area that, in curbstone language, has been called a "pork-chop" or a "cutlet," indicated at **28**. It has a leg or neck portion **29**, and a chop or wider portion or pan **30** terminating in a curved head portion **31**. The head portion preferably terminates, as shown in Fig. 6, on the shaft or main body **11** to cross the juncture line J—J of that shaft and its pointed portion **17** for the purpose of reinforcing the pointed portion from bending at that junction. The cross-sectional shape of the leg or neck portion **29** of the pan portion **28** is shown as a blood-flow channel or groove on one side of the pointed portion and on the other a reinforcing rib **32** in Fig. 3, and the cross-sectional shape of the chop or wider portion **30** is shown in Fig. 4. The shape of the pork-chop or cutlet could be variously described as mandolin-shaped or frying-pan shaped. If the latter, the neck **29** would be the

pan handle and the portion **30** of the pan, so in Fig. 4 that laterally extending part into which the rib **32** of Fig. 3 merges, will be called pan **33**. It should be noted that the projecting rib **32** and pan **33** give an effective thickness to the body portion **11** that is two or more times the thickness of the body portion itself. Comparing the width of the rib **32** and the pan **33**, it can be seen that their width increases incrementally as the point is departed from. Their corresponding depression provides a blood-conducting outflow channel.

Looking now at Fig. 5, the knurlings **20** and **21** are shown. They can be used additionally to reinforce the thin metal lancet, and I have found that if the respective knurlings **20** and **21** are non-aligned or out of register as shown in this figure, their reinforcing effect is increased.

The disposable lancets are sold while maintained in sterile condition secured between two strips of paper sealed together. The technician tears off an end of the paper strip to expose the end of the lancet which is then withdrawn from its position between the sheets, and being sterile, is then ready for use. The tip of the second finger is grasped at the first joint by the technician's thumb and forefinger. The finger to be pierced or punctured is milked down in order to increase the circulation and engorge the fingertip with blood. The fingertip is first cleansed with a gauze pad moistened with an antiseptic and then dried so that the blood will form into a rounded drop. The finger has been held firmly after milking and cleansing and is then punctured by a quick but deliberate stab with the lancet at the tip or the side of the finger. The incision is to be made deep enough to avoid the necessity of making repeated punctures since one deep incision is less painful than repeated stabbings.

The first drop of blood is to be wiped away as it may contain tissue juices or may be contaminated with substances clinging to the skin surfaces. Blood containing such tissue juices and foreign substances are not representative samples of the patient's blood. So after the first drop of blood is wiped away, further drops are obtained by gentle application of pressure. Heavy pressure may cause the flow of tissue juices which dilute the blood and create erroneous results. Thereafter after the required amount of blood is obtained an antiseptic pad is placed on the incision, and the patient released.

In the puncturing or piercing operation, the technician stabs the reduced thinness point of the pointed section **17** of the lancet into the patient's finger (or other part of the body as may be desirable) deep enough so that the pointed section enters the punctured finger far enough or deep enough so that the rib **32** and at least some of its pan **33**, lie beneath the surface of the finger. The reason for this is to stretch the incision opening made by the poly-faced point **27** by the entry thereinto of the rib and its pan-like projection. This stretching of the incision causes no more pain than the initial stab, yet it serves the useful purpose of making sure that sufficient blood flows from the opening, to give a good test specimen. The piercing point **27** enables the incision to be made more readily and cleanly. It is rather difficult to make a sharp point on such a small instrument, so a feature that contributes to practical manufacture is the swaged inclined face A, on at least one of the faces of the tapered-edge point **27**, and this swaging or hammering can take place when the die also presses out the rib **32** and its corresponding depression **29**.

Since the lancet is to be disposable, it must be made as cheaply as possible. The swaging of an inclined face on the tapered point is one feature that keeps down the cost over grinding a sharp edged point, for it has been found that by swaging the thickness at the extreme point can be reduced significantly. The lancet can be made of a strip of stainless steel, so it is important in keeping down the cost of manufacture, to be able to use as thin a sheet of steel as possible. To that end, it has been found that by suitable die-pressed reinforcement and point-swaging steel as thin as .010 inch can be used that neither breaks nor bends. The piercing point, by the swaging or smacking down, can be made as thin as .002 of an inch at the same time that the reinforcing rib is die-stamped. So I avail myself of .010" thickness I need for the shaft or body portion of the lancet for rigidity, yet I get .004 or less at its piercing point for easy penetration. This extreme thinness would not spread the incision sufficiently to assure a free flow of blood but the incision is made large enough by the rib and particularly with the pan of the pork chop attached to the rib. Other reinforcements include the knurled sections **20** and **21** on the side faces of the lancet. It is surprising how much these contribute reinforcingly, especially if the respective knurlings are non-aligned, as shown in Fig. 5. Aligned knurlings will reinforce but non-aligned knurlings reinforce better.

A supplemental feature of the reinforcement is the pork chop **28** with its mandolin or frying pan shape comprising a handle or rib portion **29** and its pan portion **30**. That part of the pointed portion **17** that is narrow is reinforced by the rib **32**, whereas as the pointed portion **17** widens, it is reinforced by the progressively widening pan-shaped reinforcement **30**. This is one reason why the terminal end **31** of the pan **30** is some distance along the shaft **11** to the right of the juncture line J—J. But, as has been said, the shape of the pork chop has another function, namely, of stretching the skin around the puncture, since as the lancet enters the patient's finger, the puncture opening is progressively stretched first by the narrower rib **29**, and then increasingly by the widening outside **33** of the pan **30** (Fig. 4). This gives a free blood-flow conducting outlet and channel for obtaining the blood specimen, yet no additional pain is caused the patient because it seems that the only pain is at the instant of puncture irrespective of the increasing width of the puncture opening caused by the pork chop projections **29** and **33** extending laterally from the face **13** of the lancet.

As this invention my be embodied in several forms without departing from the spirit or essential characteristics thereof, the present embodiment is therefore illustrative and not restrictive, since the scope of the invention is defined by the appended clams rather than by the description preceding them, and all changes that fall within the metes and bounds of the claims or that form their functional as well as conjointly co-operative equivalents, are therefore intended to be embraced by those claims.

This is a continuation in part of application, Serial No. 518,555 filed June 28, 1955 and now abandoned.

I claim:

1. A disposable lancet of metal of uniform thickness having a substantially rectanguler main body portion with opposing faces terminating in a pointed portion with intersecting edges, and means carried by the pointed portion for both reinforcing the point and for enlarging the puncture in the patient's skin to an extent substantially greater than the thickness of the metal from which the lance is made, wherein the point on the pointed portion is swaged from one side to present a poly-faced unground point thinner than the thickness of the matal from which the lancet is made.

2. A disposable lancet of metal having a main body portion terminating in a pointed portion, and means associated with the pointed portion for both reinforcing the point and for enlarging the puncture in the patient's skin to an extent substantially greater than the thickness of the body of the lancet, which means comprise a depression on one face of the pointed portion and a corresponding projection of the opposite face with the depression shaped to have a pan part connected with the handle part that is rib-shaped in cross-section.

3. A disposable lancet of metal having a main body portion terminating in a pointed portion, means associated with the pointed portion for both reinforcing the point and

for enlarging the puncture in the patient's skin to an extent substantially greater than the thickness of the body of the lancet, and knurled serrations on each face of the man body with the impressed part of the knurling on one face being out of register with the impressed part of the knurling on the other face, whereby the body portion is thus reinforced so that thinner metal can be used than otherwise.

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