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SCARIFICATOR

2,542,828

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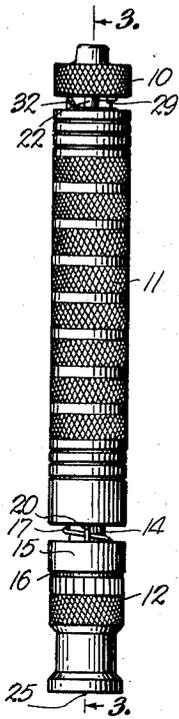


Fig. 1.

Fig. 2.

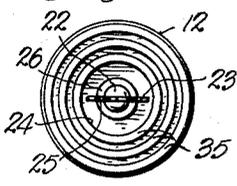


Fig. 7.

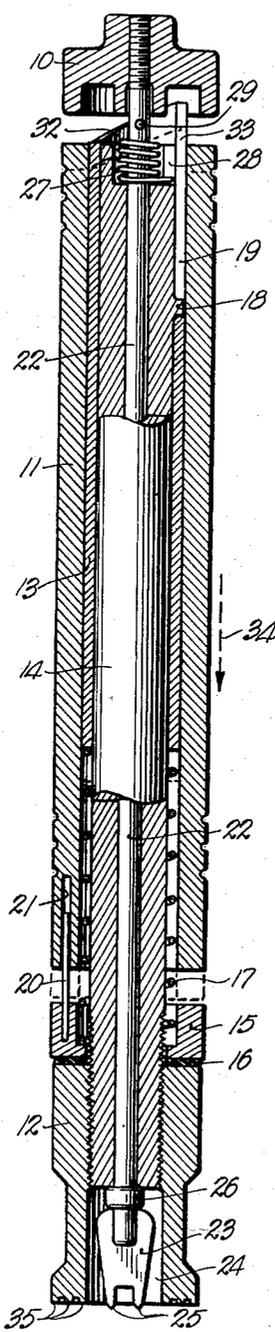
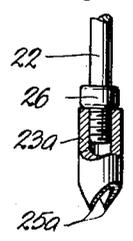


Fig. 3.

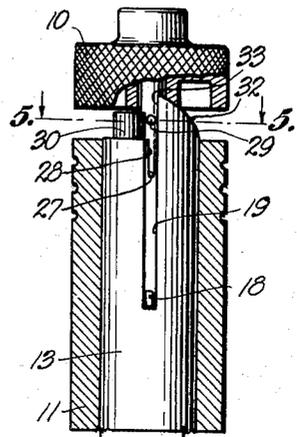


Fig. 4.

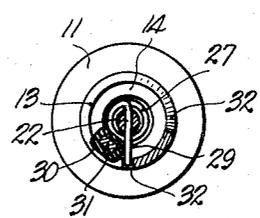


Fig. 5.

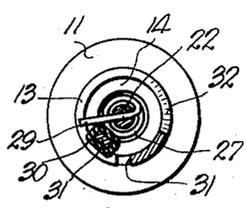


Fig. 6.

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# UNITED STATES PATENT OFFICE

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## SCARIFICATOR

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14 Claims. (Cl. 128—333)

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This invention relates in general to surgical instruments, and it deals more particularly with instruments for producing superficial abrasions into or through the epidermis for the purpose of making allergy scratch tests or the like.

Skin testing has proved very important in the development and progress of the science of allergy. As a matter of fact the use of diagnostic skin tests now is a routine procedure in the study of nearly every suspected allergic patient.

One of the most common methods of testing is the scratch method, wherein a number of small, superficial abrasions are made in the epidermis, care being taken not to scratch deep enough to draw blood; allergens (i. e., extracts of the various materials suspected of being possible offending agents) are applied to the abrasions and the patient's skin reaction to the different substances is observed. It is, of course, very important that the scratches be of uniform length and depth in order that the results of different tests can be compared and proper diagnosis made on the basis thereof.

Most allergists heretofore have been making the necessary scratches with a needle, sharp or semi-sharp cutting instrument; however, it takes a highly skilled technician to produce the type of scratch needed, and even those who are well trained find it difficult to produce scratches of uniform size and depth. A novice usually finds it impossible to consistently produce uniform and proper scratches.

It is, therefore, an object of the invention to provide an improved instrument designed for allergy scratch tests which insures scratching the epidermis or outer layer of skin without drawing blood.

Another object of the invention is to provide a scarificator that will produce an essentially painless scratch and therefore may be used without difficulty on children and adults hypersensitive to pain.

A further object is to provide a device that will consistently reproduce a scratch of uniform length and depth into the epidermis.

Still another object of the invention is to provide an instrument of the character indicated which requires little or no technical skill on the part of the operator, and hence, even in the hands of an untrained novice, gives consistently successful and uniform results.

A still further object is to provide a scarificator that is adjustable to produce scratches of different depths to accommodate same in the texture of

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the patient's skin, depending upon age, body location and general skin texture.

Other and further objects of the invention, together with the features of novelty whereby the objects are achieved, will appear in the course of the following description.

In the accompanying drawings which form a part of the specification and are to be read in conjunction therewith, and in which like reference numerals are employed to identify like parts of the various views,

Fig. 1 is a side elevational view of a scarificator embodying my invention,

Fig. 2 is a bottom view of the same instrument,

Fig. 3 is an enlarged longitudinal cross section of the instrument taken along the line 3—3 of Fig. 1 in the direction of the arrows,

Fig. 4 is a sectional elevation of the instrument taken at 90° from the plane of Fig. 3 and showing the mechanism in cocked condition,

Fig. 5 is a transverse cross section taken along the line 5—5 of Fig. 4 in the direction of the arrows,

Fig. 6 is a sectional view similar to Fig. 5 but showing the instrument in an uncocked or normal condition, and

Fig. 7 is a sectional elevation of a modified form of cutting element for my device.

Referring first to Fig. 1, the basic elements of my scarificator comprise a knob or cap 10, a cylindrical case or barrel 11 and a base or skin contacting head 12. These parts may be knurled as shown, or otherwise surface marked to afford a good hand grip and facilitate manipulation of the instrument. Viewed as a whole, the instrument is an elongated, cylindrical unit only slightly larger than a conventional fountain pen.

Tightly fitted within the bore of the barrel 10 (for example with a force fit) is a sleeve-like liner 13 which in turn supports an axially slidable hollow stem 14. This stem projects from the lower end of the barrel and has the head 12 of my instrument screw threadedly secured to its lower-most extremity. Encircling the stem between the head and the end of the barrel is a collar 15 and a cushioning washer 16 of rubber or rubber-like material. A coiled compression spring 17 around the shaft with one end abutting against the bottom of sleeve 13 and the opposite end in a cup-like recess in collar 15, urges the stem downwardly relative the barrel; the downward travel of the stem is limited, however, by a radial projection or stop 18, disposed in a longitudinal slot 19 cut in the sleeve 13. This slot

and projection serve also to prevent rotation of the stem and attached head relative to the barrel. A longitudinal pin 20 carried by collar 15 and loosely received in a hole 21 in the barrel, prevents rotation of the collar.

Journalled for rotation in the hollow stem is an elongated shaft 22 which has knob 10 screw threadedly secured to its upper end. At its lower end the shaft is split axially to receive a thin knife blade 23 which is disposed in a relatively deep recess or socket 24 in the head 12 with only the prongs 25 below the bottom surface plane of the head.

The knife may be permanently secured in place on the shaft, for example by welding, but preferably it is frictionally held by the inward tension of the bifurcated leg of the shaft straddling it. In either case, it is held in spaced relation to the end of the stem 14 by an integral collar 26 on shaft 22.

Fig. 7 illustrates a modified form of cutting element that may be employed in place of knife 23. This comprises a tubular member 23a screw threadedly secured to the lower end of shaft 22 in abutment with the collar 26. The lower end of the tube is cut off along two oblique intersecting planes to form points 25a, these being sharpened and functioning in exactly the same way as will be described hereinafter in connection with the points of knife 23.

Returning now to the upper end of the shaft 22, this is encircled by a coiled spring 27 which has one end anchored in a slot 28 in the stem 14 and the other end anchored to the shaft by passing it through a hole disposed crosswise therein, the latter end extending beyond the shaft and forming a radial finger 29. The spring is tensioned to apply a torque on the shaft tending to rotate same in a counter-clockwise direction as seen in Figs. 5 and 6.

The rotation of the shaft is limited to somewhat less than one complete revolution by stop 30 in the path of finger 29. This stop comprises a rubber bushing supported on an upwardly projecting lug 31 formed integral with stem 14. The radial finger 29 also projects over the edge of sleeve 13, a portion of which slopes upwardly as shown at 32 to form a step or catch 33 spaced circumferentially from one side of stop 30 a sufficient distance to permit finger 29 to occupy a position therebetween as shown in Fig. 5.

It will be convenient at this point to describe the operation of my scarificator and the manner in which it is used incident to the making of allergy scratch tests. Assuming the parts are in "uncocked" position, as shown in Figs. 3 and 6, the barrel 10 is held in one hand, and, with the other hand knob 10 is rotated clockwise (Fig. 6) relative to the barrel until finger 29 abuts against the opposite side of stop 30 (see Fig. 5). The purpose of this is to "wind" spring 27 and then hold the shaft captive or in cocked condition with the spring wound under tension. During winding which it will be seen requires somewhat less than one full turn of the knob, finger 29 rides up the inclined surface 32 drawing stem 14 axially of the barrel and compressing spring 17. When the finger passes the crest of the incline, spring 17 snaps the stem 14 and shaft 22 downwardly relative the barrel bringing the finger between stop 30 and the vertical edge or catch 33 so that shaft 22 now can turn in neither direction. The instrument now is in cocked condition.

With the scarificator thus cocked, it is held with one hand by the barrel 11 and the lower end

(that is, the face of member 12) is pressed gently against the area of skin surface that has been selected to be scratched. This causes the points 25 of the knife to depress the epidermis very lightly. As the downward force on barrel 11 is increased, the head 12 can advance no further, being in abutment with the body, and instead, the barrel travels axially a short distance relative to the stem 14 as indicated by the arrow 34 which slides the catch 33 downwardly relative finger 29 until the finger is clear of the catch; as soon as this occurs, spring 27 rapidly rotates shaft 22 (and with it, knife 23) back to the point where finger 29 abuts stop 30 as shown in Fig. 6. This rapid rotation causes points 25 to travel a circular path, scribing a slight, circular scratch on and into the epidermis.

In practice the application of the instrument to the skin and the depression of the barrel to release the cocked mechanism is, it will be appreciated, a single, swift, gentle movement. The downward pressure required to release the mechanism is not great but insures that the instrument is applied to the body with sufficient force to insure that head 12 is in firm contact with the skin. No injury can occur through application of too much pressure inasmuch as the penetration of the points 25 is in all cases limited by the distance they project beyond the plane of the skin engaging face of head 12, it being understood further that they always are released for rotation when the downward pressure on the head reaches a predetermined value. This insures that on successive operations of the scarificator, all scratches are of uniform depth and their length obviously will always be the same. Thus, when a group of scratches are treated with differing allergy test substances, a very reliable indication of the relative reaction of the patient to the various substances is obtained, no allowance having to be made for variations in the preparation of the skin for tests inasmuch as such variation is eliminated.

The rapidity with which each scratch is made, coupled with the very superficial character of the scratch, makes it practically impossible for the patient to sense or feel the making of the scratch. The sensory impression resulting from the gentle pressure exerted by head 12 on the annular region around the knife, dominates that resulting from the scratching operation itself to such an extent as to still further minimize the latter. For these reasons, the instrument eliminates a major difficulty which heretofore has characterized scratch allergy tests, particularly in the case of children and adults very sensitive to pain.

The depth of the scratch may easily be altered simply by turning head 12 on the stem 14 so that the points 25 extend below the plane of the skin-engaging surface a greater or less distance than shown. I provide this face with annular ribs 35, partly to obtain good traction with the skin and partly because the downward pressure exerted on head 12 then causes each of the ribs to make an impress in the skin and bring a flush of color temporarily to the area around the circular scratch. It should be understood that the scratch itself is so shallow that it often is very difficult to see with the naked eye, but my ribs cause it to be encircled by an easily "discernible target" which is of great assistance to the diagnostician in locating the area in which to apply the allergens. Except for the advantages thus gained the annular ribs are, of course, not abso-

lutely essential, it being obvious that the skin-engaging surface of the head 12 may be flat or otherwise configured.

From the foregoing it will be seen that this invention is one well adapted to attain all the ends and objects hereinbefore set forth, together with other advantages which are obvious and which are inherent to the device.

It will be understood that certain features and subcombinations are of utility and may be employed without reference to other features and subcombinations. This is contemplated by and is within the scope of the claims.

Inasmuch as many possible embodiments of the invention may be made without departing from the scope thereof, it is to be understood that all matter herein set forth or shown in the accompanying drawings is to be interpreted as illustrative and not in a limiting sense.

Having thus described my invention, I claim:

1. In a scarificator, a support having a recess in one face thereof, a shaft rotatably mounted in said support and carrying a blade in said recess, the axis of the shaft being perpendicular to the plane of one face of the support, said blade having a plurality of separate cutting edges spaced equidistant from said axis, all of said edges projecting out of said recess and extending the same distance beyond the plane of said one face, and means for rotating the shaft relative the support.

2. In a scarificator, a support having a recess in one face thereof, a shaft rotatably mounted in said support and carrying a blade in said recess, the axis of the shaft being perpendicular to the plane of one face of the support, said blade having a plurality of separate cutting edges spaced equidistant from said axis, all of said edges projecting out of said recess and extending the same distance beyond the plane of said one face, means for rotating the shaft relative the support, and stop means limiting the rotation of said shaft to less than one complete revolution.

3. A scarificator comprising a rotatable shaft, a thin, flat blade on the end of said shaft disposed in a plane passing through the axis of the shaft, said blade formed with a pair of integral prongs disposed on opposite sides of said axis and equidistant therefrom, the tips of said prongs lying along a line perpendicular to said axis.

4. A scarificator as in claim 3 wherein the end of said shaft is split axially to form two legs between which said blade is wedged and held by friction.

5. A scarificator comprising a rotatable shaft, a thin, flat blade on the end of said shaft disposed in a plane passing through the axis of the shaft, said blade formed with a pair of integral prongs disposed on the opposite sides of said axis and equidistant therefrom, the tips of said prongs lying along a line perpendicular to said axis, and a stationary skin-engaging shroud around the orbit of said tips limiting the distance the tips can penetrate the skin.

6. In a device of the kind described, a support having a recess in one face thereof, a shaft rotatably mounted in said support and carrying a blade in said recess, the axis of the shaft being perpendicular to the plane of one face of the support, said blade having a cutting edge spaced laterally from said axis and projecting out of the recess beyond the plane of said one face, a source of rotative power connected to said shaft tending to turn same about its axis, a stop hold-

ing the shaft against rotation, and mechanism controlled by the application of said one face of the support to an abutment surface to automatically withdraw said stop when the face is in firm contact with the surface.

7. In a device of the kind described, a support having a recess in one face thereof, a shaft rotatably mounted in said support and carrying a blade in said recess, the axis of the shaft being perpendicular to the plane of said one face of the support, said blade having a cutting edge spaced laterally from said axis and projecting out of the recess beyond the plane of said one face, a source of rotative power connected to said shaft tending to turn same about its axis, a stop holding the shaft against rotation, said support having a handle by which said one face of the support can be pressed against an abutment surface, and pressure sensitive means operative to withdraw said stop when the pressure of said one face on said surface reaches a predetermined value.

8. A device as in claim 7 wherein said one face of said support has thereon ribs arranged in a symmetrical pattern relative the axis of said shaft.

9. In a device of the kind described, a rotatable shaft journaled in a hollow stem, a head on one end of the stem having a face normal to the axis of the shaft and, in that face, a recess encircling the end of the shaft, a cutter in said recess secured to one end of the shaft for rotation therewith, said cutter having a cutting edge projecting from the recess beyond the plane of said face, a barrel encircling the stem and slidable axially thereof, mechanism for rotating said shaft in said stem, and means connected to said mechanism and barrel to render said mechanism operative responsive to movement of the barrel axially of the stem.

10. A device as in claim 9 wherein said head is screw threadedly secured to said stem whereby it is adjustable axially of the stem to vary the position of said one face relative to said cutter.

11. A device as in claim 9 having a pin and slot connection between said stem and barrel preventing rotation thereof relative to one another.

12. In a device of the kind described, a rotatable shaft journaled in a hollow stem, a head on one end of the stem having a face normal to the axis of the shaft and, in that face, a recess encircling the end of the shaft, a cutter in said recess secured to the end of the shaft for rotation therewith, said cutter having a cutting edge projecting from said recess beyond the plane of said face, a barrel encircling the stem and slidable axially thereof, and a latch between said shaft and barrel effective to permit or prevent rotation of the shaft in the stem depending upon the axial position of the barrel relative the stem.

13. In a device of the kind described, a rotatable shaft journaled in a hollow stem, a head on one end of the stem having a face normal to the axis of the shaft and, in that face, a recess encircling the end of the shaft, a cutter in said recess secured to the end of the shaft for rotation therewith, said cutter having a cutting edge projecting from the recess beyond the plane of said face, a source of rotative power connected to said shaft tending to rotate same in said stem, a barrel encircling the stem and slidable axially thereof, and a latch between said shaft and barrel effective to permit or prevent

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rotation of the shaft depending upon the axial position of the barrel relative the stem.

14. In a device of the kind described, a rotatable shaft journaled in a hollow stem, a head on one end of the stem having a face normal to the axis of the shaft and, in that face, a recess encircling the end of the shaft, a cutter in said recess secured to the end of the shaft for rotation therewith, said cutter having a cutting edge projecting from the recess beyond the plane of said one face, a barrel encircling the stem and slidable axially thereof, resilient yieldable means between the stem and barrel urging the barrel away from said head, a stop limiting the distance the barrel can move away from the head whereby said barrel normally occupies a predetermined position relative to the head, a source of rotative power connected to said shaft

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tending to rotate same in said stem, a second stop holding said shaft against rotation when the barrel is in said predetermined position, said barrel being connected to said second stop and effective to withdraw same when the barrel is shifted axially of the stem from said predetermined position against the force of said yieldable means.

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#### REFERENCES CITED

The following references are of record in the file of this patent:

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