Aug. 21, 1951 G. W. JACOBY, JR 2,565,309

HYPODERMIC NEEDLE SHARPENER

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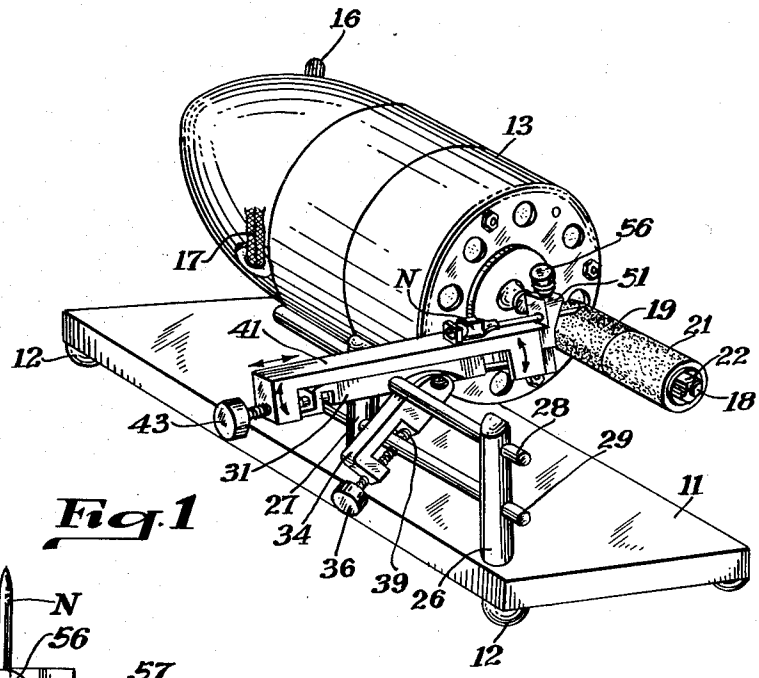


Fig. 1

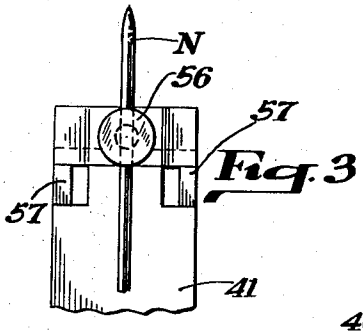


Fig. 3

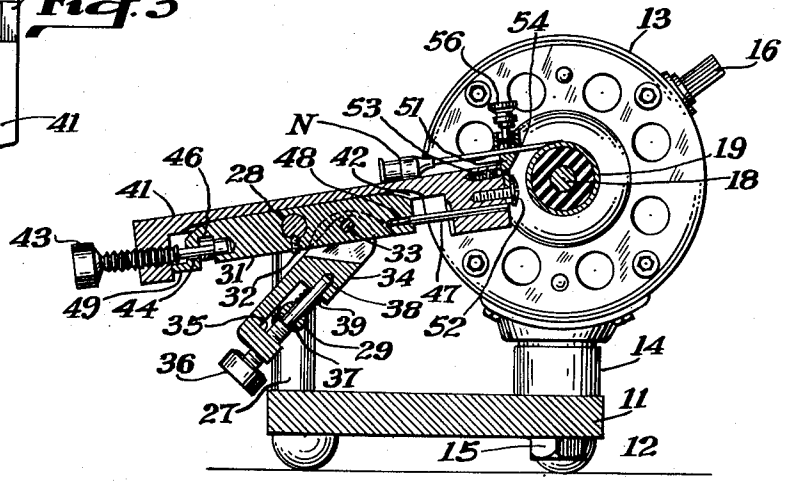


Fig. 2

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## HYPODERMIC NEEDLE SHARPENER

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10 Claims. (Cl. 51—92)

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This invention relates to the art of reclaiming hypodermic needles by refacing. In its preferred form the invention is embodied in a machine which is particularly adapted for rapid and efficient sharpening of hypodermic needles, which is adapted for needles of various gauges and sizes and which is especially suited for operation by unskilled personnel.

The ultimate objects of the invention are to eliminate as far as possible the pain caused by the use of dull or improperly sharpened hypodermic needles; to increase the precision of hypodermic injections; to obviate waste attendant upon discarding of needles which may be sharpened and re-used; and to reduce loss of time resulting from inefficient sharpening operations. More proximate objects of the invention are to reclaim hypodermic needles; and to point needles precisely, quickly, easily, and economically. A further object of the invention is to provide a machine especially adapted to the achievement of the aforementioned objects.

By way of amplification of the above, it may be pointed out that for maximum precision and minimum pain in use of hypodermic needles, they must be very sharp and the point must be of accurate form without burrs or roughness. Since needles rapidly become dulled in use and are expensive, they are often used when not in proper condition. In view of the difficulties attendant upon accurate sharpening of such needles, they are often discarded when dull, or are improperly resharpened.

There is, therefore, a great need for a system which will make readily available to those who use hypodermic needles a simple, practical, and efficient way of sharpening these needles and maintaining them in first-class condition. My Patent No. 2,429,357 for a hypodermic needle sharpener discloses a machine which represents a great advance in solving this problem, but further experience has demonstrated the need for refinement of this machine, particularly to facilitate the obtaining of superior results by persons who are not especially skilled in sharpening needles, such as nurses, dental attendants, and others. This invention is the product of study devoted to improving and in some respects simplifying the apparatus disclosed in the above-mentioned patent with a view to providing an apparatus which will produce a sharper and more precise point on the needle and which is better adapted for use by persons who are not especially skilled in the rather difficult art of sharpening fine instruments.

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The difficulty of the problem arises largely from the rather minute structure of the needle and the necessity therefore for very fine and precise refacing of the end of the needle shaft.

The manner in which the objects of the invention are achieved, the novel features of the invention, and the advantages thereof will be best understood by reference to the appended specification in which the preferred mode of carrying out the invention is described.

Referring to the drawings:

Fig. 1 is a perspective view of a needle sharpening device in accordance with the invention;

Fig. 2 is a vertical sectional view of the same; and

Fig. 3 is an enlarged view of a detail.

The apparatus comprises a base 11 preferably supported on rubber feet 12. A small motor 13, which may be a type commonly used for electric fans and other appliances, is fixed to the base by means of a post 14 which is formed with a shoulder resting against the base and with a threaded portion passing through the base which receives a nut 15 to clamp the motor to the base. The motor is provided with a switch 16 and a cord 17. The motor shaft is extended to form a spindle or arbor 18 on which a sharpening element comprising a grinding cylinder 19 and a polishing cylinder 21 is retained by compression between a nut 22 and a collar on the shaft. The cylinders 19 and 21 may be rubber sleeves covered with cylinders of abrasive paper or cloth which are retained by axial compression of the rubber, and are not essentially different in character except that the wheel or stone 19 is coated with a coarser abrasive than the wheel 21, the abrasive on the grinding wheel 19 being of a fine grade such as 280 to 340 grit adapted to form and sharpen the point of the needle, and the wheel 21 being coated with an extremely fine abrasive, 500 grit or finer, to perform a smoothing and polishing operation after the grinding.

The apparatus includes means for clamping the shaft of the needle N and reciprocating it over the abrading element, this means comprising a reciprocable carriage incorporating mechanisms for adjusting the relation of the needle to the abrasive stones to secure the proper angle or bevel of the point of the needle and means for feeding the needle into engagement with the stone. Obviously, an arrangement for this purpose may be widely varied in structure. A form of apparatus which is simple in structure and light in weight which has been devised for the purpose comprises two uprights 26 and 27 fixed

to the base and bored to receive two rods 28 and 29 slidable in the uprights. A support 31 fixed to the rod 28 by a setscrew 32 is pivoted by a pin 33 to a clevised adjusting member 34 formed with a clearance slot 35 for the rod 29. An adjusting screw 36 passes through a transverse bore in the rod 29 and is formed with a shoulder 37 bearing against the rod. The portion of the screw 36 beyond the shoulder is unthreaded and extends into a bore 38 in the member. A coil spring 39 urges the member 34 upwardly, but, as will be apparent, it may be drawn downwardly by adjustment of the screw 36. This adjustment is provided to facilitate setting and fixing the angle between the point of the needle and the abrading element. The spring also allows for depression of the needle against the abrasive by manual force thereon.

A needle slide 41 is mounted on the support 31 to slide toward and away from the abrading element, being formed with a groove 42 on its under surface which receives the support. A feed screw 43 is threaded in the end of the slide 41 and is formed with an unthreaded end portion passing through an opening 44 in the support. A pinch collar is fixed on the feed screw within a slot 46 in the support so that the feed screw is rotatable in the support but incapable of axial movement relative thereto, so that rotation of the screw moves the slide 41 toward or away from the abrading element. A pin 47 fixed in the inner end of the slide is received in a bore 48 in the support to retain the slide in engagement with the support. A projection 49 on the outer end of the support engages the slide to prevent movement of the body of the slide against the abrasive wheel.

The limits of movement of the needle carriage defined by the posts 26 and 27 are such that the needle N may traverse substantially the entire length of the abrading element 19, 21.

Means are provided on the inner end of the slide 41 to clamp or hold a hypodermic needle during the sharpening operation. While this structure may take various forms, it is desirable that it accommodate needles of various gauges and lengths and hold them positively. Of course, no substantial force is involved in this light abrading operation, but the angular relation of the needle to the stone and the pressure thereon should be capable of accurate regulation. Also, it is highly desirable for precise work that the needle be clamped near its point. An important feature of the invention lies in the provision of means whereby the needle may be rotated about its own axis to bevel the face produced by the sharpening and thereby create a razor edge. In the form illustrated, the needle holder comprises a small block 51 retained against the end face of the slide 41 by a shouldered screw 52 which serves as a pivot for the block. A spring-urged ball detent 53 normally holds the block 51 in an upright position. The needle N is inserted through an aperture 54 in the block which is parallel to the pivot of the block and formed with a V bottom, and is clamped therein by a screw 56 threaded into the upper end of the block. The bore 54 is large enough to accommodate needles of large size. The block is formed with lateral flanges 57 which embrace the end of the slide 41 but are spaced slightly therefrom so that the block 51 may be rotated preferably some ten degrees to each side of its normal upright position defined by the detent 53.

The operation of the device may be commenced with the slide 41 in an intermediate part of its range of movement. The needle shaft is clamped in the block 51, projecting therefrom about ¼ to ½ inch, ordinarily, and the set screw 36 is adjusted so that the needle is nearly tangent to the upper surface of the stone, the exact angle depending upon the angle of the face which it is desired to form.

Most hypodermic needles are formed with a flat face on the butt which is in alignment with respect to the axis of the needle with the ground face. This face may thus be correctly opposed to the abrasive wheel by resting the butt of the needle against the upper surface of the slide 41 as the needle is clamped.

The motor is energized by the switch 16 and the feed screw 43 is turned to bring the needle into light engagement with the grinding wheel 19. The carriage is then reciprocated by hand to effect a light grinding operation on the needle, which may in some cases require slight additional feed of the needle by means of the screw 43. The needle is reciprocated over the stone 19 for a few seconds and is then traversed onto the polishing wheel 21 on which it may again be traversed for several seconds. Then, by grasping the clamp screw 56 the needle holder 51 may be rotated slightly to each side about the axis defined by the screw 52 to bring the edges of the ground surface into engagement with the polishing stone and form a razor edge thereon. The clamp screw may then be released and the needle withdrawn. The whole operation takes only a few seconds, and the angle of the support ordinarily need not be changed as long as a succession of needles of the same face angle is being sharpened. The rotation of the needle holder 51, in sharpening the edges of the ground surface of the needle, is relatively slight, and the natural resilience of the needle is such that the resting of the butt of the needle upon the member 41 does not interfere with the rotation of the needle.

It is preferable to set the angle of the support so that the needle is supported very slightly above the abrasive wheel so that the angle of the face can be accurately estimated, but the needle is not in contact with the wheel. This may be done with the motor in operation, then by a slight manual pressure on the screw 56 the needle may be held in engagement with the abrasive, the spring 39 yielding slightly to permit this action. The pressure of the needle on the abrasive may be very accurately gauged in this manner and the refacing operation is facilitated, since releasing the pressure on the carriage causes the needle to rise from the drum so that it may be more readily transferred from the grinding cylinder 19 to the polishing cylinder 21. It will be appreciated that there will ordinarily be a slight difference in the diameter of these cylinders and there may be a slight gap between them, so that the needle is traversed between one and the other more easily if it is not in actual contact with the abrasive.

More particularly where the operator is experienced in the use of the machine, the angle of the support may be set so that the needle is clear of the drum and the point at which the needle engages the drum may be determined by the length of needle which is allowed to project from the clamp. It is possible, therefore, to perform the operations described above with a device such as disclosed herein without adjusting the position of the slide 41 or varying the setting of the adjusting screw 36, and therefore the relative mo-

tion of the slide 41 with respect to the carriage and the angular adjustment of the carriage may be omitted, the form of the face of the needle being determined by the position of the needle in the holder and the needle being brought into engagement with the abrasive wheel by utilizing the yielding properties of the resilient mounting. The adjustments, however, are believed to be advantageous and desirable, particularly where the machine is to be used by personnel who are not especially skilled.

By the arrangement in accordance with the invention by which the needle is held adjacent its point so that it is firmly held and no substantial deviation of the needle due to its inherent flexibility can occur very precise refacing is easily accomplished. Another advantage of clamping the needle near the point lies in the fact that no changes in the set-up are required for needles of different length and the apparatus is adapted to sharpen needles which are not provided with the conventional butt.

It will be apparent to those skilled in machine design that the physical form and structure of the apparatus may be widely varied while retaining the principles of the invention and the advantages thereof. The specific embodiment of the invention disclosed herein is to be regarded as merely illustrative and not as limiting the scope of the invention, which is defined by the appended claims.

I claim:

1. A device for sharpening hypodermic needles comprising a power-driven abrading element, means for holding a hypodermic needle in a plane generally normal to the axis of rotation of said element and with the axis of the needle substantially tangential to the surface of the abrading element, means for supporting the holding means in adjustable fixed relation to the said element, means for guiding the holding means for translative movement of the needle over the element, the supporting means comprising extensible means for adjustably fixing the angle of the needle to the surface of the element engaged by the needle, and means for feeding the needle into engagement with the element.

2. A device for sharpening hypodermic needles comprising a power-driven abrading element, means for holding a hypodermic needle in a plane generally normal to the axis of rotation of said element and with the axis of the needle substantially tangential to the surface of the abrading element, means for supporting the holding means in fixed relation to the said element, means for guiding the holding means for translative movement of the needle over the element, the supporting means comprising extensible means for fixing the angle of the needle to the surface of the element engaged by the needle, and means for feeding the needle into engagement with the element.

3. A device for sharpening hypodermic needles comprising a power-driven abrading and polishing element, means for holding a hypodermic needle in a plane generally normal to the axis of rotation of said element and with the axis of the needle substantially tangential to the surface of the abrading element, extensible means for supporting the holding means in adjustable angular relation to the said element to adjust the angle of the needle to the surface of the element engaged by the needle, means for guiding the supporting means for translative movement of the needle over the element, and means supporting the needle for rotation relative to the first-named supporting means while the needle is engaged with the abrading element.

4. A device for sharpening hypodermic needles comprising a power-driven abrading element, means for holding a hypodermic needle in a plane generally normal to the axis of rotation of said element and with the axis of the needle substantially tangential to the surface of the abrading element, extensible means for supporting the holding means in adjustable fixed relation to the said element, means for guiding the supporting means for translative movement of the needle over the element, the supporting means comprising means for adjustably fixing the angle of the needle to the surface of the element engaged by the needle, means for feeding the needle into engagement with the element, and means supporting the needle for rotation relative to the first-named supporting means while maintaining the needle in engagement with the abrading element.

5. A device for sharpening hypodermic needles comprising a power-driven abrasive element, a carriage reciprocable along an axis, means for holding a hypodermic needle on the carriage in a plane generally normal to the axis of rotation of said element and with the axis of the needle substantially tangential to the surface of the abrading element, and means for displacing the needle relative to the carriage to adjust the needle into engagement with the abrasive element, the reciprocation of the carriage effecting movement of the needle transversely of the direction of movement of the abrasive element relative to the needle, and means supporting the needle for rotation about an axis in the direction of displacement of the needle relative to the carriage.

6. A device for sharpening hypodermic needles comprising a power-driven abrasive element, a carriage reciprocable along an axis, extensible means on the carriage for holding the shaft of a hypodermic needle, extensible means for varying the angular position of the carriage about the axis to engage the needle with the surface of the abrasive element, and resilient means associated with the second-named extensible means for facilitating engagement of the needle with the abrasive element, the reciprocation of the carriage effecting movement of the needle transversely of the direction of movement of the abrasive element relative to the needle.

7. A hypodermic needle sharpening device comprising a power-driven abrading drum, a carriage mounted for reciprocation parallel to the axis of the drum including clamping means adjacent the drum adapted to grip the shaft of a hypodermic needle with the point thereof adjacent the drum and with the shaft substantially perpendicular to the axis of the drum, the carriage including extensible means for translation of the needle and extensible means for rotation of the carriage in a plane normal to the axis of rotation of the drum, the means extensible for rotation of the carriage including resilient means so arranged that the needle may be manually pressed into engagement with the drum.

8. A device for sharpening hypodermic needles comprising a rotative abrasive element, a carriage comprising spaced elements mounted for reciprocation along a line parallel to the axis of rotation of the abrasive element, needle holding means comprising a first member mounted upon one of the carriage elements for rotation in a plane generally normal to the axis of rotation of

the abrasive element, and a second member slidably mounted upon the first member for motion towards and away from the abrasive element, the needle being mounted upon the second member, and an extensible link connected between the first needle holding member and the remaining carriage element for adjusting the angular position of the needle holding means.

9. A device for sharpening hypodermic needles comprising a rotative abrasive element, a carriage comprising spaced elements mounted for reciprocation along a line parallel to the axis of rotation of the abrasive element, needle holding means comprising a first member mounted upon one of the carriage elements for rotation in a plane generally normal to the axis of rotation of the abrasive element, and a second member slidably mounted upon the first member for motion towards and away from the abrasive element, the needle being mounted upon the second member, and a link connected between the first needle holding member and the remaining carriage element for adjusting the angular position of the needle holding means, the link including resilient means facilitating rotation of the needle holding means.

10. A device for sharpening hypodermic needles comprising a rotative abrasive element, a carriage comprising spaced elements mounted for reciprocation along a line parallel to the axis of rotation of the abrasive element, needle holding means comprising a first member mounted upon one of the carriage elements for rotation in a plane generally normal to the axis of rotation of the abrasive element, a second member slidably mounted upon the first member for motion towards and away from the abrasive element, and



a third member for gripping the shaft of a needle adjacent the point thereof mounted upon the second member for rotation in a plane normal to the direction of sliding motion, and a link connected between the first needle holding member and the remaining carriage element for adjusting the angular position of the needle holding means, the link including resilient means facilitating rotation of the needle holding means.

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