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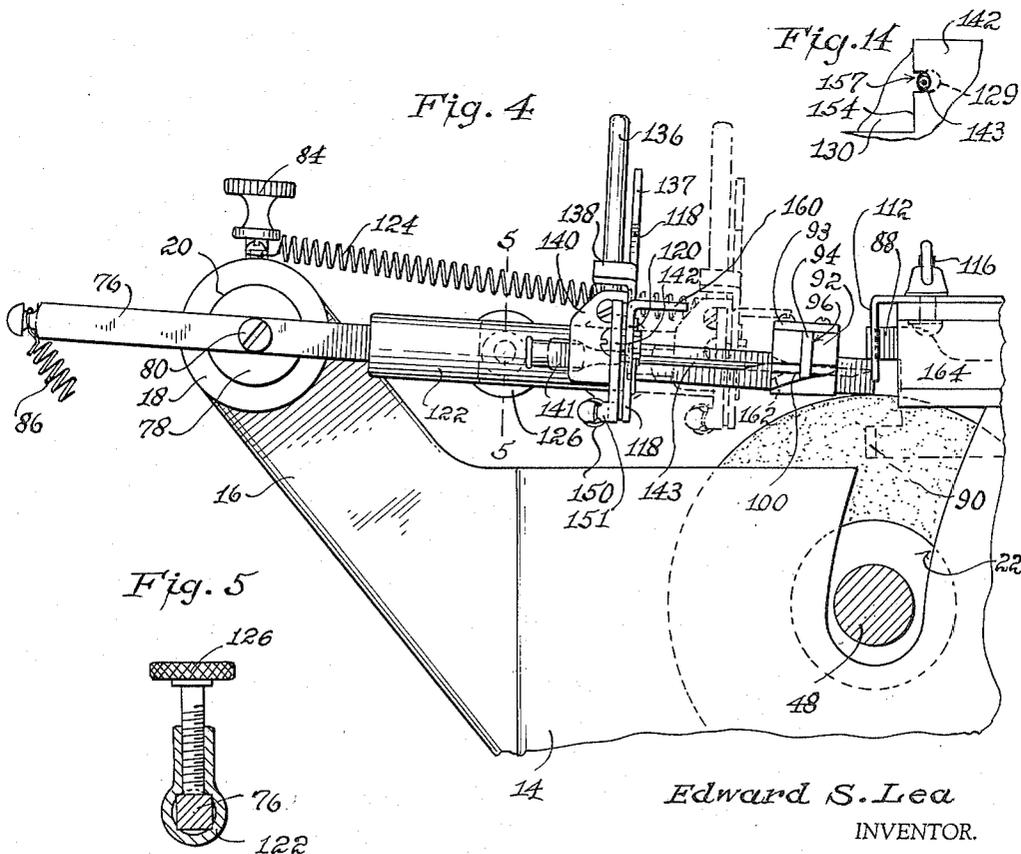
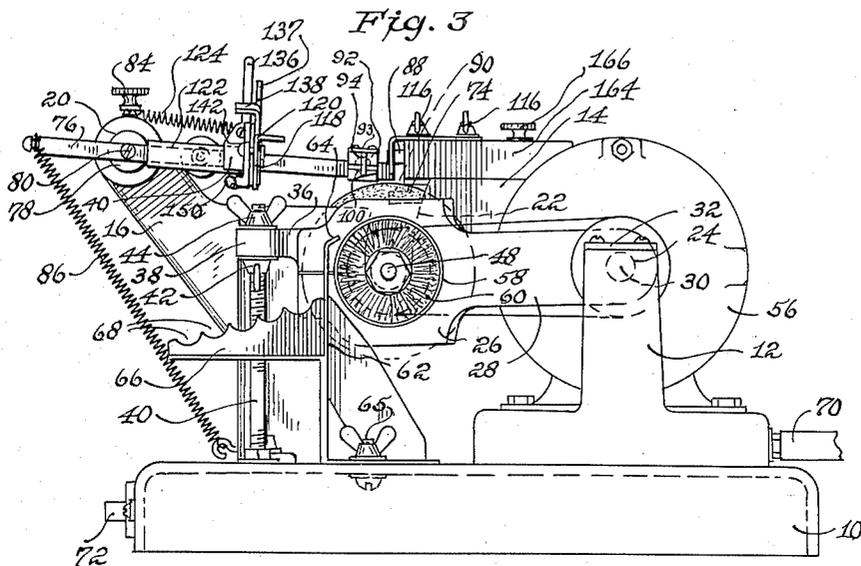
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MACHINES FOR GRINDING HYPODERMIC NEEDLES

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MACHINES FOR GRINDING HYPODERMIC NEEDLES

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8 Claims. (Cl. 51—98)

This invention relates to devices and equipment for sharpening the ends of hypodermic needles, and one of the principal objects of the invention is to provide a relatively simple and inexpensive machine for grinding pointed ends on hypodermic needles in which the entire surfaces of the pointed ends will be smooth and free from any burrs or roughness which might tear a vein or impede the insertion of the needle.

Another object of the present invention is to provide a machine of the character mentioned which can be adjusted to grind a pointed end on a hypodermic needle of any desired taper and with which, when so adjusted, an unlimited number of needles can be successively, expeditiously, and uniformly ground to the precise taper for which the machine has been adjusted, irrespective of the lengths and diameters of the needles to be ground, and irrespective of the skill or lack of skill of the persons performing the grinding operations.

A further object of this invention is to provide a machine of the character mentioned and means associated therewith for automatically gripping needles of various diameters, in correct position to be ground.

A still further object of the present invention is to provide a machine of the character mentioned and means cooperative with the needle holder for accurately placing a needle to be ground in correct relation with the grinding wheel, irrespective of the length of the needle.

Another, and important, object of this invention is to provide in a machine of the character mentioned positive means for axially withdrawing a needle in the needle holder to the correct position in relation to the grinding wheel for grinding the edges of the initial arc after the first grinding operation and grinding the needle to a sharp point.

A further object of the invention is to provide in a machine of the character mentioned positive means for effecting limited rotation of a needle being ground to correct alternation positions in relation to the grinding wheel for edge grinding and pointing.

Still further objects of this invention include means for adjusting the grinding wheel in relation to contact with a needle; lateral adjustment of the needle holder across the grinding wheel as the surface of the wheel becomes worn; and the combination of a hand rest and point polishing wheels to insure the delicate polishing necessary to preserve a finished needle point.

Other objects and advantages of my improved grinding machine will be apparent from the following specification and reference to the accompanying drawings forming a part hereof, in which

Fig. 1 is a top plan view of one embodiment of a grinding machine in accordance with my invention;

Fig. 2 is a front elevation of the machine shown in Fig. 1;

Fig. 3 is a side elevation as viewed from the right of Figs. 1 and 2;

Fig. 4 is an enlarged detail side view of the grinding

mechanism, as viewed from the section line 4—4 of Fig. 1, and with a hypodermic needle in the needle carrier;

Fig. 5 is a transverse section taken on the line 5—5 of Fig. 4;

Fig. 6 is an enlarged sectional plan view, looking down upon Fig. 7, and taken substantially on the line 6—6 of Fig. 2;

Fig. 7 is an enlarged detail view similar to Fig. 4, but showing the hypodermic needle in the needle holder and in position for grinding the initial arc in the end of the needle;

Fig. 8 is a side elevational section of the needle holder, taken on the line 8—8 of Fig. 6;

Fig. 9 is an enlarged view of the tapered end of a hypodermic needle after the initial grinding, the edge grindings and pointing being indicated in dotted lines;

Fig. 10 is a side view of Fig. 9, the axially withdrawn position of the needle for edge grindings and pointing, and also a needle position for a short point, being indicated in dotted lines;

Fig. 11 is an end view of Figs. 9 and 10;

Fig. 12 is an enlarged portion of the needle holder, as shown in Fig. 8;

Fig. 13 is an enlarged detail view of the needle centering elements; and

Fig. 14 is another view of the elements shown in Fig. 13.

Referring to the drawings in which like numerals designate like parts in the several views my improved grinding machine for hypodermic needles includes a base 10 having formed or otherwise secured thereon a pair of vertical supports 12 at one side of the base, and a vertical casing 14 at one end extending from the intermediate portion toward the opposite side of the base from the supports 12. A single standard 16 extends upwardly from one end of the casing 14, and outwardly at an angle, terminating in a transverse boss 18 having a central bore 20. A slot 22, the edges of which are in the form of arcs struck from the center of the bearings 24 in the upper ends of the supports 12, is formed in one side of the casing 14. A frame 26 having spaced arms 28 is journaled in the bearings 24 through pintles 30 secured by caps 32. At the other side of the frame 26 are bearing supports 34 and 36, the latter extending outwardly to provide a bearing 38 for a vertical support rod 40 which is secured at its lower end to the base 10 and is threaded along its upper portion for engagement with thumb nuts 42 and 44 located on the top and bottom sides respectively, of the bearing 38, which has a vertical opening through which the upper end of the rod 40 projects. A bearing member 46 is mounted within the supports 34 and 36 and a shaft 48 extends through a central bore in this bearing. A pulley 50 is mounted on one end of the shaft 48 and a belt 49 extends therefrom to another pulley 52 carried by the shaft 54 of an electric motor 56 mounted on the base 10. A polishing wheel 58 and a circular brush 60 are mounted on one end of the shaft 48. A needle rest 62 extends vertically from the base 10 to the upper periphery of the polishing wheel 58 and is of sufficient width to span both the polishing wheel and the brush 60. An over-hanging angular portion 64 of the needle rest facilitates the polishing operation. Its base is slotted and is adjustable toward and from the polishing wheel and brush through bolts 65. Attached to the needle rest 62 at its intermediate portion is a hand rest 66, which may be formed of any suitable material. A number of corrugations 68 are formed in the upper surface of the hand rest for engagement with the edge of a hand holding a needle to be polished, thereby facilitating the steadiness required in preserving a sharp point on a needle. An electrical connection 70 and a control switch 72 complete the ma-

chine, apart from the needle grinding instrumentalities which will now be described.

A grinding wheel 74, containing a suitable abrasive material is mounted on the end of the shaft 48 opposite the polishing wheel 58, the shaft 48 extending through the slot 22, and the grinding wheel being inside the casing 14, which has a closed bottom for trapping oil which may leak from the grinding wheel.

An elongated support, in the form of a square rod 76 is pivotally mounted, at a point rearwardly from its intermediate portion, on the standard 16 by means of a sleeve 78 secured to the support by a bolt 80, and which sleeve is slidably mounted in the bore 20 of the boss 18. The sleeve 78 is provided with a longitudinal groove 82 (Fig. 1) in its outer wall and is held fixed in any axially adjusted position by means of a set-screw 84, the end of which engages the groove 82. A helical spring 86 is attached to the rear end of the support 76 and to the base 10. This spring urges the rear end of the support downwardly in a vertical plane. The other end of the support extends approximately to the center of the grinding wheel 74, and in approximate tangential relation with the periphery of the wheel, but in an offset position relative to the wheel. The spring 86 urges the forward end of the support upwardly, but its vertical movement in each vertical direction is limited by the stops 88 and 90 carried by the casing 14, these stops being fixed and non-adjustable.

A hypodermic needle holder 92 is fixedly attached to one side of the support 76 and extends laterally above at least a portion of the peripheral surface of the grinding wheel 74, in any laterally adjusted position in relation to the wheel. A needle gripping member 94 is slidably mounted in a vertical groove 96, which extends centrally and lengthwise of the holder and intersects a vertical shoulder 98 formed near the end of the holder opposite the support 76. The gripping member is slidably held in the groove 96 by a cover 93 secured by screws or other suitable means to the holder 92. A relatively short transverse slot 100 extends across the holder to the shoulder, and is located a short distance below the groove 96. The end of the needle gripping member is widened at the end adjacent the grinding wheel and is provided with an inner inclined surface 102 arranged to face the shoulder 98, as shown more clearly in Fig. 12. The body of a hypodermic needle 143 is inserted axially from the rear and transversely through the slot 100, and the inclined surface 102 will force a needle of any diameter into a corner 104, formed by the intersection of the groove 96 with the vertical shoulder 98, on each side of the transverse slot 100, thus automatically adapting the gripping action to needles of various diameters, as indicated by the dotted lines in Fig. 12. The needle gripping member 94 extends axially across the support 76 and terminates in a handle portion 106 which is provided on its outer end with a head 108. A helical spring 110 is mounted on the handle between the head 108 and the end of the needle holder 92. This spring urges the inclined surface 102 toward the shoulder 98, and will automatically force a needle of any diameter into the corner 104, thereby rigidly gripping the needle in correct position for the point grinding operation.

When a needle is first inserted into the holder 92 the gripping member 94 is held relaxed therefrom, and it is moved axially toward the grinding wheel until the tip of the needle abuts a stop 112 adjustably mounted on the casing 14. In Figs. 1 and 3 this stop is shown extended to its maximum distance. In Figs. 4 and 6 and 7 the stop is shown in its fully withdrawn position, which permits the grinding of a longer taper than when extended. The stop 112 is rigidly held in any adjusted position through slots 114 and bolts 116. If desired the stop 112 may be provided with a graduated indicator, as shown at 117, to gauge the adjustment of the stop.

A needle to be ground is first inserted into a needle carrier 118, which includes a plate 120 slidably mounted

for longitudinal movement on the support 76, in perpendicular relation thereto, through a sleeve 122 which is carried by the plate 120 and slidably but non-rotatably mounted on the support 76. A helical spring 124 is connected to the plate 120 and to the boss 18 and urges the plate and associated parts rearwardly. A set screw 126 in the sleeve 122 engages the support to hold the needle carrier in any desired position on the support 76. The plate 120 is provided with a central opening 128 (Fig. 6) in which is journaled the hub of a rotatable member 130. This member 130 is provided with a central opening 129 of a diameter slightly greater than that of any hypodermic needle to be ground. A flange 132 is secured to the forward face of the rotatable member 130 by screws 134 to hold it in position rearwardly of the plate 120. This rotatable member 130 is provided with a radial handle 136 which projects outwardly between two stops 138 carried by the fixed plate 120, to limit the rotative movement of the member 130, to which is fixed a pair of spring fingers 140 for gripping the large end 141 of a conventional hypodermic needle 143. The stops 138 are arranged to permit the precise, necessary rotation of a needle for grinding the edges to a smooth, sharp point.

Another plate 142 is slidably mounted on the fixed plate 120, rearwardly of the rotatable member 130, by means of slots 144 and headed screws 146 and 148, the latter being inserted in plate 120, as more clearly shown in Fig. 6. A helical spring 150 is attached to angular projections 151 and 152 carried by the slidable and fixed plates, respectively. This spring urges the slidable plate 142 transversely toward a needle in the carrier. As more clearly shown in Figs. 2, 13 and 14, the slidable plate 142 is provided at its intermediate portion with a vertical shoulder 154 in the edge of which is a notch 157 of slightly greater width than the diameter of the largest needle in use, but of slightly less width than the diameter of the small end 155 of a conventional hypodermic needle handle portion. The notch may be semi-circular at its closed end, and it is arranged to center a needle 143 which projects through the opening 129 of the rotatable member 130 with the shoulder 98 in the holder 92, against which the needle will be gripped when being ground. As shown in Figs. 1, 2 and 3, no needle is in the carrier or the holder. As shown in Fig. 4, a needle 143 has been placed in the carrier 118, and the dotted lines show the carrier moved forwardly to bring the tip of the needle into abutting engagement with the stop 112. In Fig. 6 the needle is shown in full lines in position for grinding of the initial arc in the end of the needle, as shown in the side view Fig. 7. The dotted lines in Fig. 6 show the needle 143 withdrawn to the correct position for grinding the edges of the initial arc to a sharp point.

As shown in Fig. 13 the shoulder 154 is in contact with the reduced handle portion of a hypodermic needle, and it will be seen that it has forced the body of the needle against the far edge of the opening 129 in the rotatable member 130. In Fig. 14, the needle has been withdrawn to the position indicated in dotted lines in Fig. 6, the body of the needle being engaged by the end of the slot 157, and forced against the far edge of the opening, the same as when the handle portion was engaged by the shoulder 154. As already mentioned, the centering arrangement shown in Fig. 13 is in effect during the grinding of the initial arc in the end of the needle, with the needle in axially extended position, whereas, the centering arrangement shown in Fig. 14 is for grinding the edges of the initial arc to a sharp point, with the needle in axially withdrawn position. However, it should be understood that in the latter position the needle must be rotated a limited distance in each direction to permit the grinding of the edges at an angle to each other. This rotation is effected by means of the handle 136 carried by the rotatable member 130, and the rotation is limited in each direction by engagement of the handle with the stops 138.

Although the needle is gripped both by plate 142 and the gripping member 94, the large square portion 141 of the needle handle is held between the spring fingers 140 during the entire grinding operation, and these fingers, being rigidly attached or carried by the rotatable member 130 force rotation of the needle within the gripping devices referred to when member 30 is rotated manually. It will be seen in Fig. 6 that when the needle 143 is withdrawn a distance equal to the thickness of the slidable plate 142, the spring 150 will instantly force the plate toward the needle and to the position shown in Fig. 14.

In the operation of my improved hypodermic needle grinding machine, the carrier will normally be in the position shown in Figs. 1 and 3, unless it is secured forwardly of that position by the setscrew 126, as, for example, in Fig. 4. In either case, the operator will manually push the slidable plate 142 out of needle engaging position and insert a hypodermic needle from the rear through the opening 129 in the rotatable member 130 until the end of the reduced handle portion 155 abuts the rear face of that member, as clearly shown in Fig. 6. The plate 142 is then released, and the spring 150 instantly brings the shoulder 154 into contact with the handle, as shown in Fig. 13. With the set-screw 126 and the gripping member 94 in released position the carrier 118 is moved forwardly, inserting the needle 143 through the slot 100 of the holder 92 until the movement of the carrier is stopped by contact of the tip of the needle with the stop 112, as indicated in dotted lines in Fig. 4. The set-screw 126 is then tightened against the support 76 to fix the carrier in that position, and the handle 136 is moved to a vertical position, in alignment with the vertical indicator 137. The pivoted support is then pressed downwardly, bringing the needle into contact with the grinding wheel 74, as shown in Figs. 6 and 7. This will grind a flat arc on the end portion of the needle, as shown in Figs. 9 and 10. The needle is then withdrawn, as indicated in dotted lines in Fig. 6, until the plate 142 snaps into gripping relation with the body of the needle, as shown in Fig. 14, the tapered end of the needle then being in the position shown in the upper dotted lines in Fig. 10. The needle is then rotated until stopped in one direction by one of the stops 138, and pressed against the grinding wheel. It is then rotated in the other direction to a stop and again pressed against the grinding wheel. This completes the grinding of the edges of the initial arc, and forms a sharp point on the needle, as indicated by the dotted lines in Figs. 9 and 11. The needles may be of various diameters and lengths, since the carrier 118 may easily be moved forwardly until the needle tip contacts the stop 112, irrespective of its length; and since the gripping member 94 is automatically adaptable to a wide range of needle diameters.

For convenience, a handle 160 may be formed or otherwise secured on carrier plate 120, to aid in depressing the end of the support 76. Also a tapered entrance 162 may be formed at the rear end of the slot 100 of the holder 92, to facilitate the insertion of a needle through the slot.

Three features of manual adjustment are provided in this machine, one being the vertical adjustment of the grinding wheel toward and from the hypodermic needle. To effect such adjustment, assuming that the needle has previously been ground to a tapered end, and with a needle in the holder 92, the forward end of the support 76 is depressed until it contacts the lower fixed stop 90. Then through thumb nuts 42 and 44, the grinding wheel 74 is moved upwardly on the pintles 30 until the periphery of the wheel firmly contacts the needle. Then, to grind the initial arc in the end of the needle, it is necessary only to start the wheel in rotation and press each needle lightly against the wheel. The needle, after being initially ground and pointed, as heretofore described, can then be finished on the polishing wheel 58 and circular brush 60.

To form a shorter tapered end, the stop 112 is adjusted outwardly from the casing 14, as heretofore described. This will cause the grinding wheel to form a shorter tapered or pointed portion, as indicated by the lower dotted lines in Fig. 10.

When the grinding surface of the wheel 74 becomes worn in one plane, the set-screw 84 is released from contact with the sleeve 78 and the support 76 is laterally moved either toward or from the wheel to bring the needles in alignment with an unworn portion of the wheel.

With the arrangement of parts illustrated and described, all needles, irrespective of diameter or length, can be uniformly ground to the precise form of taper and point for which the machine has been adjusted. The necessary adjustments can be made by a person familiar with the requirements and the grinding of large numbers of needles performed by operators having little or no previous experience or skill. Such a machine is of particular value in hospital centers where an accumulation of dull needles of various sizes and lengths can be re-sharpened in a short period of time.

For convenience of removing any article which may fall into the casing 14, a cover plate 164 is removably attached thereto by a screw 166. Also a drainage valve 168 is connected to the interior of the casing.

Obviously, various changes in the details of construction of my improved grinding machine may be made without departing from the spirit and scope of my invention. Therefore, it should be understood that the construction shown and described is intended to be illustrative, only, and not limited to such specific construction.

I claim:

1. A machine for grinding hypodermic needles comprising, in combination, a stationary base, a grinding wheel journaled on said base, means for rotating said wheel, a vertically movable support mounted on said base in approximate tangential relation with the periphery of said wheel, spring means urging said support radially away from said wheel, a needle holder carried by said support, a stop on said base for abutting the tip of a hypodermic needle inserted in said holder, a gripping member slidably mounted in said holder, an angular shoulder in said holder, an inclined surface on said gripping member arranged to face toward said shoulder, spring means urging said inclined surface into contact with one side of a needle resting against said shoulder, and manually operable means for releasing said gripping member from contact with said needle.

2. A machine for grinding hypodermic needles comprising, in combination, a stationary base, a grinding wheel journaled on said base, means for rotating said wheel, a vertically movable support mounted on said base in approximate tangential relation with the periphery of said wheel, spring means urging said support radially away from said wheel, a needle holder carried by said support, a stop on said base for abutting the tip of a hypodermic needle inserted in said holder, a slot in said holder extending perpendicularly to said support and wheel periphery, an angular shoulder in said holder intersecting said slot and having a corner on each side of said slot, a needle gripping member slidably mounted in said slot, an inclined surface on said gripping member arranged to face toward said shoulder, spring means urging said inclined surface into contact with a needle resting in the corners of said shoulder, and manually operable means for releasing said gripping member from contact with said needle.

3. A machine for grinding hypodermic needles comprising, in combination, a stationary base, a grinding wheel journaled on said base, means for rotating said wheel, a vertically movable support mounted on said base in approximate tangential relation with the periphery of said wheel, spring means urging said support radially away from said wheel, a needle holder carried by said support, a stop on said base for abutting the tip of a

hypodermic needle inserted in said holder, a slot in said holder extending perpendicularly to said support and wheel periphery, an angular shoulder intersecting said slot at a distance from one end thereof and forming a corner on each side of said slot, a needle gripping member slidably mounted in said slot, said member having a vertically widened end portion outwardly from said shoulder and a handle portion at its other end, an inclined surface on the inner end of said widened portion arranged to face toward said shoulder, and spring means cooperative with said handle urging said inclined surface into contact with a needle resting in the corners of said shoulder.

4. A machine for grinding hypodermic needles comprising, in combination, a stationary base, a grinding wheel journaled on said base, means for rotating said wheel, a vertically movable support pivotally mounted at its rearward portion in approximate tangential relation with the periphery of said wheel, a needle holder carried by the forward end of said support, a stop on said base for abutting the tip of a hypodermic needle inserted in said holder, means carried by said holder automatically adaptable to grip needles of various diameters in point grinding relation with said wheel, a needle carrier including a plate slidably mounted on said support forwardly of the pivotal mounting of and in perpendicular relation with said support, a through, centrally arranged, needle receiving opening in said plate, a rotatable member, having a central needle receiving opening, carried by said plate, said member also having means for gripping the outer handle portion of a hypodermic needle, a slidable member carried by said plate and having means for alternately abutting the inner handle portion and the body portion of the needle, for centering said needle in forwardly extended and withdrawn positions, respectively, in said carrier and in substantial alignment with the gripping means in said holder, and means carried by said plate for limiting rotative movement of said rotatable member and needle carried thereby in each direction.

5. A machine for grinding hypodermic needles comprising, in combination, a stationary base, a grinding wheel journaled on said base, means for rotating said wheel, a vertically movable support pivotally mounted at its rearward portion in approximate tangential relation with the periphery of said wheel, a needle holder carried by the forward end of said support, a stop on said base for abutting the tip of a hypodermic needle inserted in said holder, means carried by said holder automatically adaptable to grip needles of various diameters in point grinding relation with said wheel, a needle carrier including a plate slidably mounted on said support forwardly of the pivotal mounting of and in perpendicular relation with said support, a through, centrally arranged, needle receiving open-

ing in said plate, a rotatable member, having a central needle receiving opening, carried by said plate, said member also having means for gripping the outer handle portion of a hypodermic needle, a slidable member carried by said plate and having means for alternately and laterally abutting the inner handle portion and the body portion of a needle, for centering said needle in forwardly extended and withdrawn positions, respectively, in said carrier and in substantial alignment with the aforesaid gripping means in said holder, spring means urging said carrier rearwardly on said support, releasable means carried by said carrier plate and engageable with said support for fixing said carrier plate to said support, and cooperative means carried by said plate and said rotatable member for limiting rotative movement of said rotatable member and needle carried by said member in each direction.

6. A machine for grinding hypodermic needles as claimed in claim 4 and including means cooperative with the pivotal mounting of said pivoted support for laterally adjusting said pivoted support on said base toward and from said grinding wheel.

7. A machine for grinding hypodermic needles as claimed in claim 4 in which said carrier plate is provided with a pair of stops equidistantly spaced on each side of the central opening in said carrier plate, and in which said rotatable member is provided with a radially extending handle arranged between and adapted for alternate engagement with said stops to limit rotative movement of said rotatable member and needle carried thereby.

8. A machine for grinding hypodermic needles as claimed in claim 4 in which the needle handle gripping means of said rotatable member consists of a pair of spring fingers adapted to receive and grip the outer handle portion of a hypodermic needle inserted axially from the rear of said needle carrier.

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