May 26, 1964 TAKEO HORI 3,134,365

ELECTRIC PENCIL SHARPENER

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FIG. 1

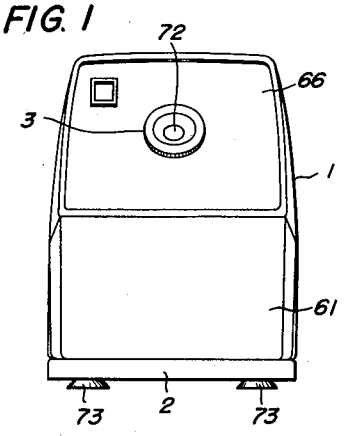


FIG. 17

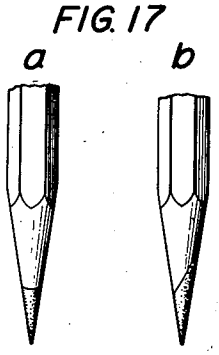


FIG. 2

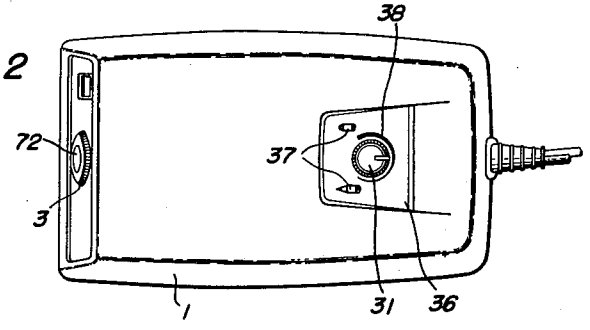
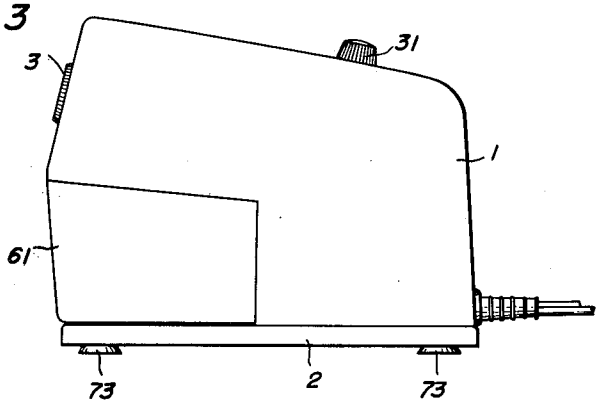


FIG. 3



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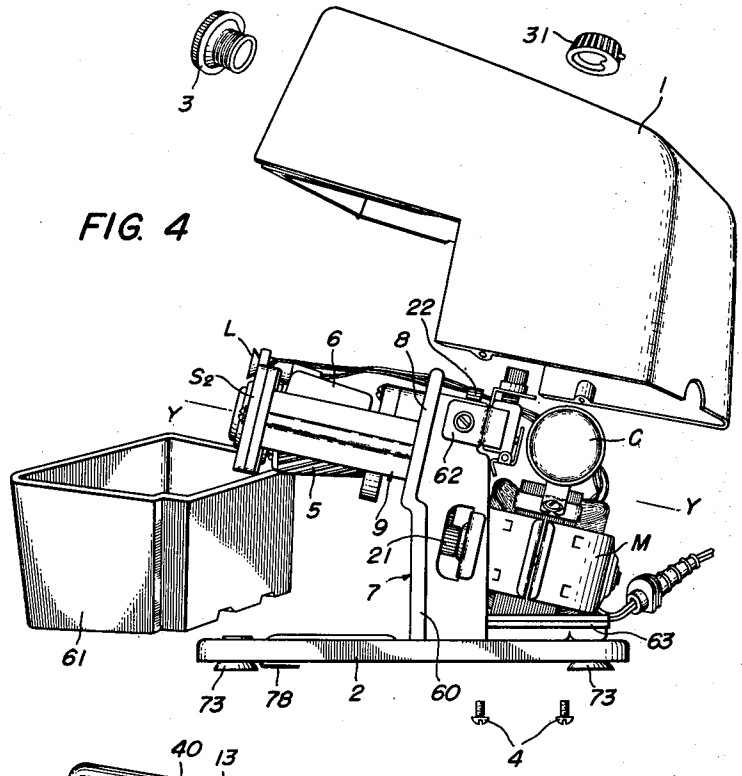


FIG. 4

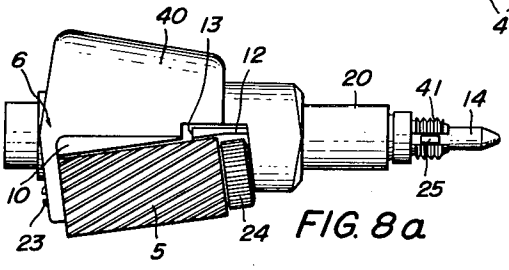


FIG. 8a

FIG. 8c

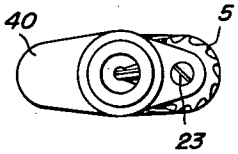


FIG. 8b

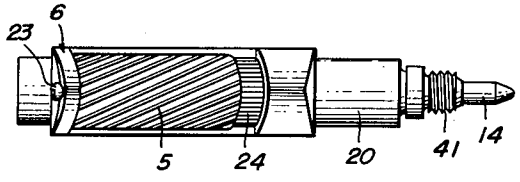


FIG. 5

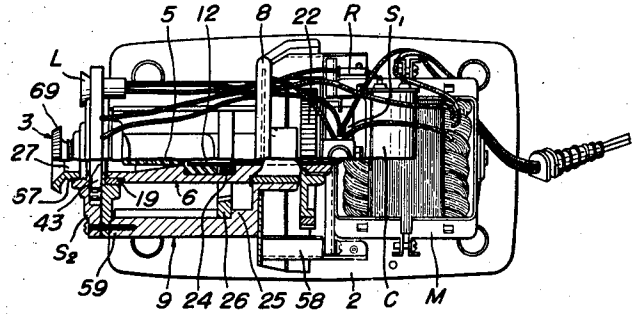


FIG. 6

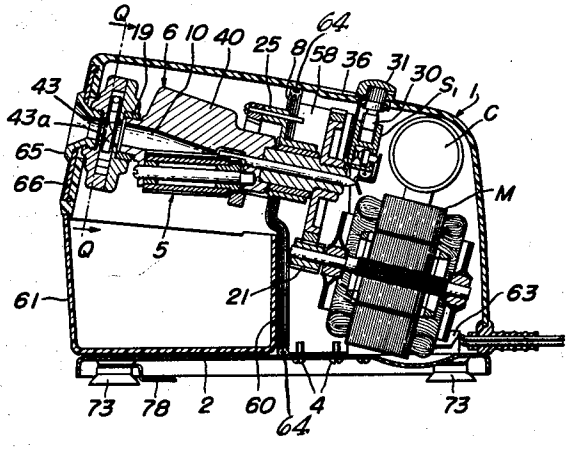


FIG. 10a

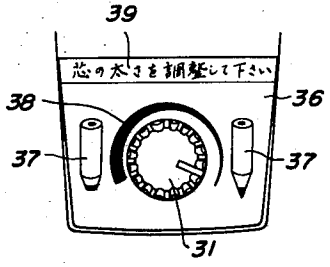
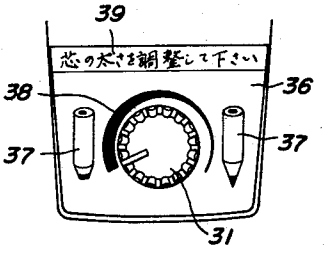


FIG. 10b



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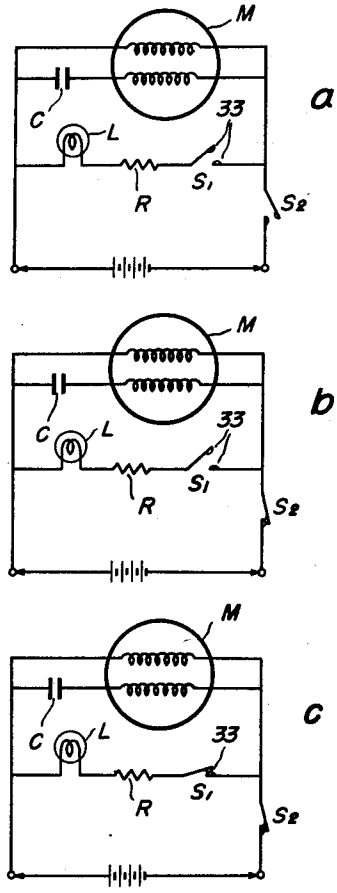
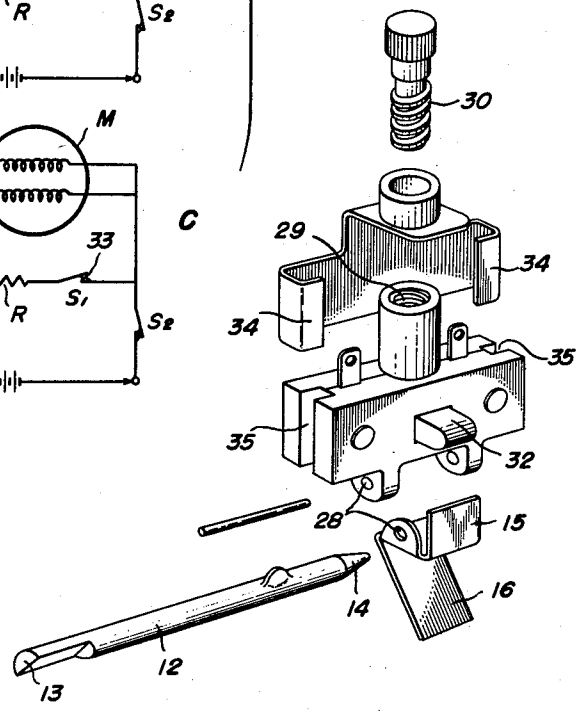


FIG. 7

FIG. 13



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FIG. 9a

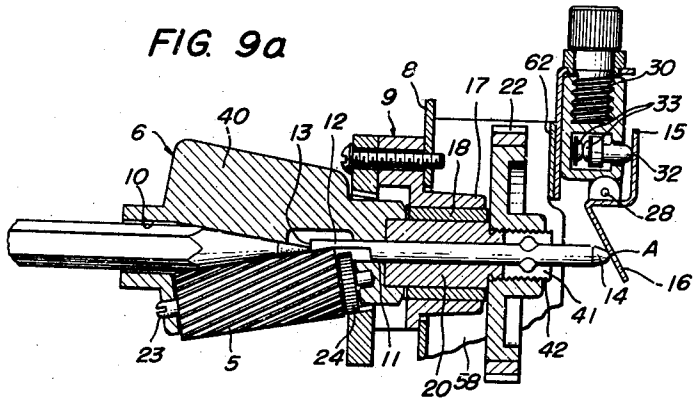


FIG. 9b

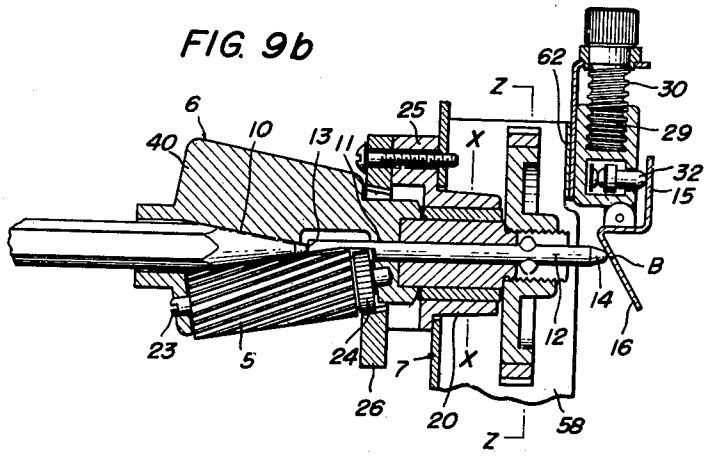


FIG. 12

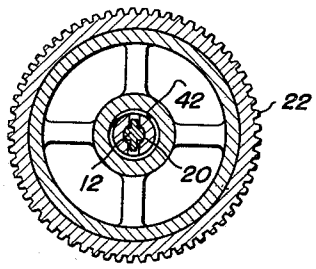
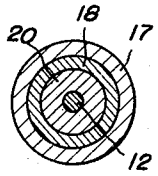


FIG. 11



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FIG. 14

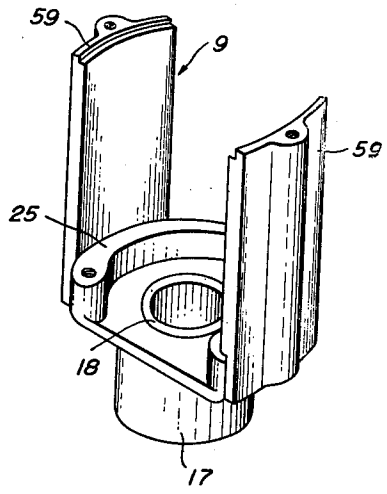


FIG. 16

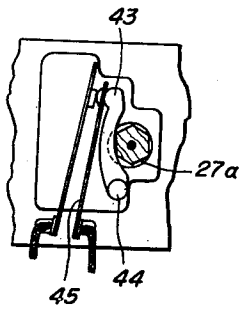


FIG. 15a

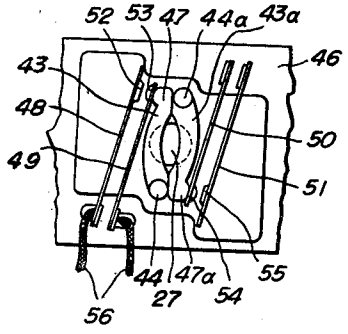
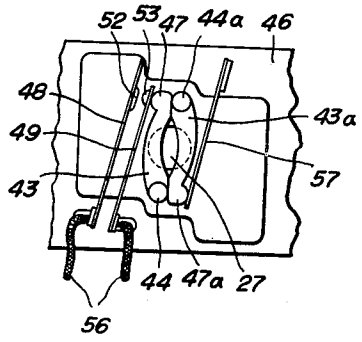


FIG. 15b



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FIG. 18

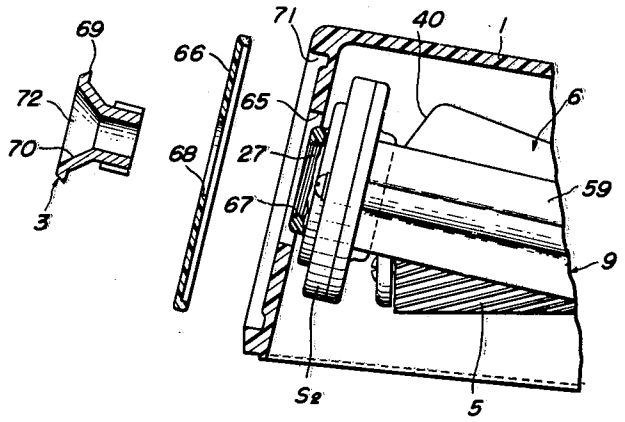


FIG. 19b

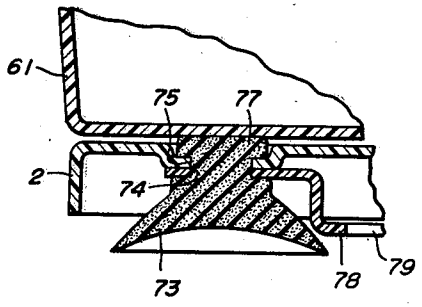


FIG. 19a

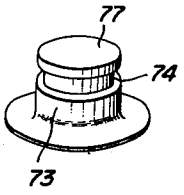
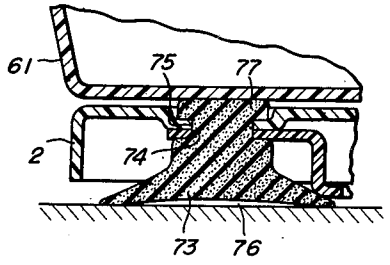


FIG. 19c



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FIG. 20

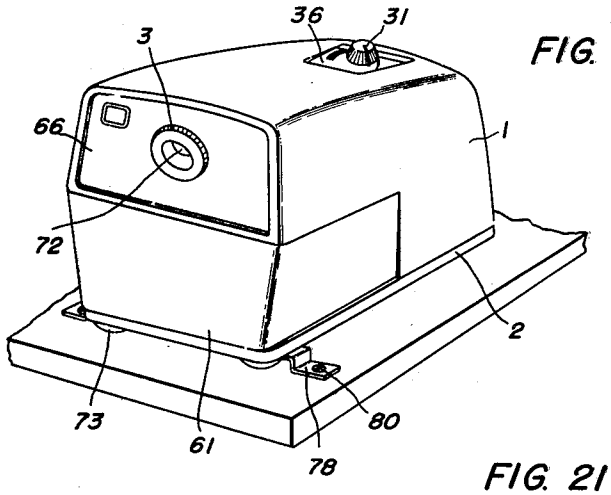


FIG. 21

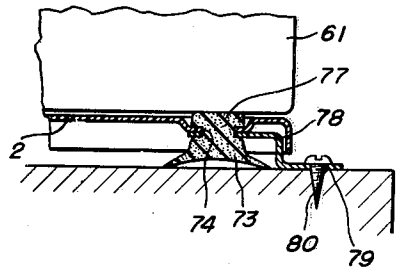
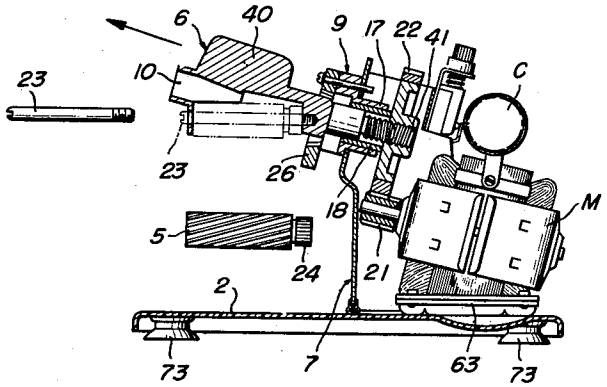


FIG. 22



United States Patent Office 3,134,365 Patented May 26, 1964

3,134,365

ELECTRIC PENCIL SHARPENER

Takeo Hori, Fukuoka-shi, Japan, assignor to Matsushita Electric Industrial Co., Ltd., Osaka, Japan, a corporation of Japan

Filed July 13, 1961, Ser. No. 123,789
Claims priority, application Japan July 16, 1960
7 Claims. (Cl. 120—96)

The present invention relates to an improved electric pencil sharpener and is intended to provide an electric pencil sharpener comprising indicating means such as an electric lamp, buzzer, or bell for informing the operator when the sharpening operation has been completed, and designed to finish the pencil point being worked to any desired size or thickness in accordance with the hardness of the pencil lead, the kind and particular use of the pencil being worked which may be a carbon pencil, color pencil, drawing or other pencil.

The present invention has for its object to provide an electric pencil sharpener designed to sharpen a pencil to give a properly shaped point which is neither flat nor eccentric.

Another object of the present invention is to provide an electric pencil sharpener designed to cut and shape the lead point of a pencil to any desired size or thickness by an extremely simple procedure and with accuracy.

A further object of the present invention is to provide an electric pencil sharpener designed as described above which is simple in construction, inexpensive to manufacture and easy to use.

The present invention will now be described in further detail with reference to the accompanying drawings which illustrate a preferred embodiment of the invention.

In the drawings:

FIG. 1 is a front view of an electric pencil sharpener embodying the present invention;

FIG. 2 is a plan view of the electric pencil sharpener shown in FIG. 1;

FIG. 3 is a side elevation of the unit shown in FIGS. 1 and 2;

FIG. 4 is a perspective view of the unit with its casing disassembled to show the interior mechanism;

FIG. 5 is a view partly in plan and partly in section taken along the line Y—Y of the interior mechanism shown in FIG. 4;

FIG. 6 is a vertical cross section of the mechanism;

FIGS. 7*a*, 7*b* and 7*c* are wiring diagrams of the electric pencil sharpener shown in FIGS. 1 to 6, respectively corresponding to the inoperative or rest position, the operative or cutting position, and the position which the unit assumes when it has just completed the sharpening operation;

FIG. 8*a* is a front view of the cutter holder with a cutter attached thereto;

FIG. 8*b* is a bottom view of the cutter holder shown in FIG. 8*a*;

FIG. 8*c* is a left-hand side elevation of same;

FIGS. 9*a* and 9*b* are fragmentary vertical cross sections showing the cutting mechanism of the sharpener with parts adjusted to the respective extreme positions for the minimum and maximum finished sizes of the pencil point;

FIGS. 10*a* and 10*b* are top plan views of the device mounted on the sharpener casing for indicating the degree of cut, corresponding to FIGS. 9*a* and 9*b*, respectively;

FIG. 11 is a transverse cross section, taken along the line X—X in FIG. 9*b*, of the bearing portion of the cutter holder;

FIG. 12 is a transverse cross section taken along the line Z—Z in FIG. 9*b* and showing the fitting relation of the operating rod;

FIG. 13 is an exploded perspective view showing a switch mechanism of the indicator means for indicating completion of the pencil sharpening as associated with major parts for adjusting the point size to which the pencil is to be sharpened;

FIG. 14 is a perspective view of the frame to be fixed to the base plate and adapted to carry the cutting mechanism;

FIGS. 15*a* and 15*b* illustrate two forms of power switch as viewed in the direction of the arrows Q—Q in FIG. 6;

FIG. 16 is a front view of a conventional power switch;

FIG. 17*a* shows a pencil point obtained by use of the power switch shown in FIG. 15*a* or 15*b*;

FIG. 17*b* shows a pencil point obtained by use of the conventional power switch shown in FIG. 16;

FIG. 18 is a partly exploded fragmentary cross sectional view showing the casing, the mechanism and the indicia plate;

FIGS. 19*a* to 19*c* illustrate one of the pad structures on the base of the sharpener;

FIG. 19*a* is a perspective view of a rubber cushion or pad to be mounted on the base;

FIG. 19*b* is a fragmentary cross section of the sharpener base with a rubber pad mounted thereon;

FIG. 19*c* is a fragmentary cross section of the sharpener base shown in FIG. 19*b* when the sharpener is placed on a desk top;

FIG. 20 is a perspective view of the electric pencil sharpener as placed on and firmly secured to the desk top or on a suitable support plate;

FIG. 21 is a fragmentary cross section of the electric pencil sharpener shown in FIG. 20, showing one of the anchor legs; and

FIG. 22 is a partly exploded side elevation of the interior mechanism of the unit showing the manner in which the cutter is replaced.

Referring to the drawings, there is shown a sharpener comprising a casing **1** formed of polystyrol resin and enclosing the cutting mechanism mounted on a sharpener base **2**. The casing **1** is fixed at the front by a socket member **3** threadably secured to the internal operating mechanism and at the bottom to the sharpener base **2** by screws **4**. The base **2** is made of sheet metal by pressing or like procedure. The socket member **3** also serves as a guide for a pencil when it is inserted and then operated.

Numeral **5** designates a cylindrical cutter having helical cutting edges. Numeral **6** designates a cutter holder for rotatably supporting the cutter **5** at a desired inclination to the axis of the holder and is rotatably supported on a frame **9** which is secured to the upper inclined wall portion of a partition plate **7**, which in turn is secured to the sharpener base **2**. Formed in the cutter holder **6** in a pencil receiving bore **10** comprising a front or outer bore portion having a cylindrical wall parallel to the holder axis and an inner bore portion having a conical wall of the same inclination as that of the cutter **5**. Formed in the rear portion of the cutter holder **6** is an axial bore **11** which fittingly receives an operating rod **12** for axial sliding movement. The operating rod **12** is recessed flat at one end so as to form a slight clearance along the periphery of the cutter **5** mounted thereon. The end of the operating rod **12** forms a flat abutment surface **13** while the other end or the outer end **14** of the rod is disposed so as to abut against the inclined portion **16** of an operating lever **15** for a switch S_1 for an indicator lamp L.

A structure for supporting a cutter holder **6** includes

a lower bearing 18 force-fitted in the bottom housing portion 17 of the frame 9 as shown in FIG. 14 which supports the lower portion of the cutter holder, while the upper portion thereof is supported by an upper bearing 19 provided in a power switch S_2 which is secured to the frame 9. The lower portion of the cutter holder 6 forms a holder shaft 20 about which the cutter holder 6 is rotatable by way of transmission gears 21 and 22 with the rotation of a motor M.

The cutter 5 is supported on a cutter shaft 23 so as to be inclined in parallel with the conical portion of the pencil receiving bore 10 formed in the cutter holder 6 and carries at one end a pinion gear 24, which is in mesh with an internal gear 26 fixed to a mounting bracket 25 formed on the frame 9 so that with the rotation of the cutter holder 6 the cutter 5 effects rotaton about its own axis as well as around the axis of the cutter holder 6.

The power switch S_2 is operated to close a power circuit as a pencil to be sharpened is inserted through a pencil receiving opening 27 into the sharpener unit. Thus, to sharpen a pencil, a pencil is first inserted through the pencil opening 27 into the pencil receiving bore 10 thereby to close the power switch S_2 to complete the power circuit. This starts the motor M to rotate the cutter holder 6 so that the cutter 5 effects rotation about its own axis while revolving around the pencil. Consequently, the pencil point is conically cut in a progressive manner, the pencil lead growing increasingly sharp until its abuts against the surface 13 of the operating rod 12 to cause the latter to slide axially. This causes the outer end 14 of the operating rod 12 to push the inclined portion 16 of the operating lever 15 for the switch S_1 for the indicator lamp L thereby to close the switch S_1 for automatic lighting of the indicator lamp L, which informs the operator of the electric pencil sharpener when the pencil sharpening operation has been completed.

Referring now to the wiring diagrams of FIGS. 7*a*, 7*b* and 7*c*, there is connected across the power source and in parallel with the circuit including the drive motor M an indicator lamp L which is turned on and off by a switch S_1. A capacitor C and a resistor R are also included in the circuitry as shown.

The circuitry shown in FIG. 7*a* corresponds to the rest state of the drive motor M, with both the power switch S_2 and the indicator lamp switch S_1 opened. In this case, when a pencil is loaded the motor circuit is closed as shown in FIG. 7*b* to energize the motor M to start sharpening a pencil. Upon completion of the sharpening operation the switch S_1 for the indicator lamp L is closed to light the latter to inform the operator of the pencil sharpener when the sharpening operation of the pencil has been completed.

As apparent from the foregoing description, the electric pencil sharpener of the present invention is capable of automatically informing the operator of the completion of the pencil sharpening operation and thus overcomes the deficiencies of conventional electric pencil sharpeners by eliminating the inaccuracy and inconvenience involved in their operation which needs hold the pencil being cut with the lead point bearing against a stationary abutment to know the completion of the sharpening operation by the hand feeling or needs frequent withdrawal of the pencil out of the sharpener unit to inspect the pencil point being worked. Further, in previous electric pencil sharpeners, in which a pencil is held with its lead point bearing against a stationary abutment, the pencil point is usually cut to an irregular shape and the pencil may be sharpened freely and indefinitely if it is pushed forward under substantial pressure. Thus, conventional pencil sharpeners generally afford poor finish to the pencil point and which makes the use of such sharpeners uneconomical. Free from these deficiencies is the electric pencil sharpener of the present invention as will readily be appreciated from the foregoing description.

In this connection, some of previous electric pencil sharpeners have a drive motor adapted to automatically stop when the pencil loaded has been properly sharpened. With this type of sharpeners, the drive motor comes to stop with the cutter blades caught in the pencil producing a rough and irregular finished surface. On the other hand, with the electric pencil sharpener of the present invention, only a means is provided for indicating when the pencil point has been properly shaped, the cutter continuing to rotate until the pencil has been withdrawn to give a beautiful finish to the sharpened pencil point.

It will thus be appreciated that according to one aspect of the present invention there is provided an electric pencil sharpener which includes a simple mechanism and operation thereof enabling the operator to accurately feel or sense the completion of pencil sharpening thereby to enable economical pencil sharpening and give a very beautiful finish to the sharpened pencil point.

According to a further aspect of the present invention, there is provided an electric pencil sharpener having means for adjusting the size or thickness of the lead point as formed by the sharpening operation of the unit.

Specifically, the switch device S_1 for the indicator in the form of a neon lamp, a common incandescent lamp or a buzzer, includes a means for controlling or adjusting the size or thickness of the lead point as formed by the electric pencil sharpener. The switch S_1 includes the operating lever 15 as described above, which lever comprises an inclined portion 16 disposed at an angle of approximately 60 degrees to the axis of the operating rod 12 and fulcrumed as at 28 to the indicator switch S_1.

The indicator switch S_1 includes a casing having a threaded portion 29, which threadably receives an adjusting screw 30 carrying at the top a dialing knob 31. With the rotation of the dial 31, the inclined portion 16 of the operating lever 15 effects vertical movement substantially at right angles to the axis of the operating rod 12 actuating the indicator switch S_1.

The indicator switch S_1 operates as follows: As the outer end 14 of the operating rod 12 pushes the inclined portion 16 of the operating lever 15 to pivot the latter about its fulcrum 28 to press the push 32, which acts to close the switch contacts 33 to light the indicator lamp L. The indicator switch S_1 is supported at opposite ends by a rail member 34 formed of sheet metal as by pressing and slide grooves 35 formed in the indicator switch casing and thus is free to effect vertical displacement. As a consequence, the indicator switch S_1 may move vertically with rotation of the adjusting screw 30.

When it is desired to sharpen a pencil point to the minimum size or thickness, the dial 31 is rotated so as to upwardly move the indicator switch S_1 and with it the operating lever 15 to the position shown in FIG. 9*a*. As seen in the figure, the outer end 14 now bears against inclined portion 16 at a point adjacent to the bottom thereof. It will be noted that in this position of the dial 31 and the operating lever 15 the contacts 33 of the indicator switch S_1 is not closed until the lead point of the pencil being worked has been sharpened to an extreme extent.

To the contrary, as the indicator switch S_1 is lowered to a position as shown in FIG. 9*b*, the outer end of the operating rod 12 comes to bear against the inclined lever portion 16 at a point B adjacent to the top thereof. As a conequence, the indicator switch S_1 will be closed before the pencil loaded has been pushed deeply into the sharpener as shown in FIG. 9*a* or before the lead point has been cut very sharply. It will be appreciated therefore that the size or thickness of the lead point may be adjusted as desired in accordance with the kind of pencil to be worked or the use of such pencil.

To indicate the size of thickness of the lead point for which the above adjusting device has been set, the following means is recommendable.

Referring to FIGS. 10*a* and 10*b*, numeral 36 designates an indicia plate associated with the dial 31 and is adhesively mounted in a slight recess formed in the top

surface of the casing 1. On the surface of the indicia plate 36 around the dial 31, as shown in these two figures, are provided an arcuate line 38 having a varying width, and extending between the two extreme angular positions of the dial 31 and two sketches of a pencil point respectively indicating the maximum and minimum thicknesses thereof and arranged at the opposite extremes of the angular range of dial adjustment, the width of the arcuate line 38 approximately corresponding to the size or thickness of the pencil point to be obtained, preferably, the indicia plate also carries a series of characters, for example, such as "Adjust the Thickness of the Lead Point," formed on a readable area thereof by printing or other convenient process.

By constructing and arranging the pencil point controlling means as described hereinbefore, the operator may readily obtain a pencil point of any size or thickness suited to the kind and use of the particular pencil and he may also sense the completion of sharpening work by means of an indicator when the pencil point has been completely cut to the desired size or thickness.

Description will now be made upon the advantageous features of the cutter holder 6. Attached to the cutter holder 6 is a cutter 5 as described above which is balanced by a balance weight 40 molded integrally with the cutter holder 6 by casting simultaneously with the manufacture thereof.

Conventional pencil sharpeners generally operate to sharpen a pencil by rotating the cutter about its own axis while revolving it around and alongside the pencil at any desired angle of inclination to the axis of the pencil irrespective of whether the sharpener is motor-driven or manually operated. In a conventional electric pencil sharpener based upon such operational principle, two cutters have generally been mounted on a holder therefor in symmetrical positions with respect to the axis of the pencil in order to prevent vibration due to unbalance caused by the cutter rotation about the axis of the pencil.

Meanwhile, with this type of electric pencil sharpener employing two cutters, there has been a deficiency that the pencil point obtainable by such sharpener is flattened and practically unusable due to the fact that the pencil is always in contact with the two cutters in two respective areas. Moreover, with such type of sharpener, it is required that the cutter holder has two recesses for retaining respective cutters and that the peripheral wall of the conical bore formed in the cutter holder for receiving and guiding a pencil to be sharpened has two openings. This always causes some instability to the pencil being cut offsetting the latter toward either of the two cutters and thus the pencil is unavoidably cut in an eccentric manner. In addition, since the two cutters are required to be disposed in symmetrical positions with respect to the pencil axis at any desired angle thereto, the cutting edges of the two cutters must be more or less spaced from each other. Moreover, an abutment member for enabling the operator to feel the completion of cut by hand (which corresponds to the abutment surface 13 for the operating rod 12 of the illustrated embodiment of the present invention must always be disposed between the two cutters, and the spacing therefor is required between the lower end portions of the two cutters. These requirements preclude the sharpener from cutting the pencil point to a desired size or sharpness.

To contrast, according to the present invention in which not two but only one cutter 5 is mounted on the cutter holder 6 together with a balance weight 40 as described hereinbefore, the holder assembly when rotated is in complete balance and not subject to any vibration. Additionally, the pencil is always cut over a single area thereon by a cutter revolving around the pencil while rotating about the axis of the cutter itself so that there is no danger that the pencil point be flattened as with the conventional sharpener. Further, with the inventive sharpener having a single cutter, the pencil being cut is supported in the generally conical pencil-receiving bore 10 to be cut at all times in a stable state thus eliminating any danger of eccentric cut as often met with previous pencil sharpeners. It will be recognized that in the inventive sharpener which employs a single cutter the cutter may be arranged with the bottom of its cutting edge disposed close to the axis of the pencil as loaded and this enables the pencil point to be cut as sharply as desired.

As a further advantage of the electric pencil sharpener of the present invention, the cutter 5 may be removed and replaced by a simple procedure.

Specifically, the cutter holder shaft 20 is screw-threaded at the rear end as indicated at 41. Threadably fitted over the threaded portion 41 is the transmission gear 22 by way of an axial threaded bore 42. The cutter holder shaft 20 is supported by a lower bearing 18 force-fitted into the bottom housing portion 17 of the frame 9, the cutter 5 being rotatably mounted on said cutter holder by means of a cutter shaft 23, as described hereinbefore. Therefore, in order to replace the cutter 5, the cutter is first rotated in a direction such as to loosen the transmission gear 22 to cause the cutter holder shaft 20 to move gradually in the direction of the arrow as shown in FIG. 22. This moves the pinion gear 24 on the cutter 5 clear of the internal gear 26 allowing the cutter shaft 23 to be withdrawn without necessitating the withdrawal of the cutter holder shaft 20 and then the cutter is removed. A new cutter may now be pivotally mounted on the cutter holder 6 by means of the cutter shaft 23 and the transmission gear 22 tightly fitted to the threaded end 41 of the cutter holder shaft 20 to finish the cutter replacement. Incidentally, the transmission gear 22 and the internal gear 26 are preferably made of nylon to avoid noise.

In conventional pencil sharpeners of this kind, the transmission gear has been mounted on the cutter holder shaft by use of a key, nut, screw and washer or other fastening means and thus the cutter replacement has required disassembling the internal mechanism, which in turn has necessitated insertion of a screw driver, a spanner and other hand tools into limited spaces between parts.

To the contrary, the electric pencil sharpener according to the present invention does not necessitate insertion of any tools for cutter replacement as apparent from the description made hereinbefore, since the transmission gear 22 in mesh with the gear 21 on the drive motor M is threadably fitted over the threaded end 41 of the cutter holder shaft 20 making cutter replacement extremely easy. The threads 41 on the cutter holder shaft end are cut in a sense such that the rotation of the transmission gear 22 fitted thereon causes no loosening therebetween.

One preferred embodiment of the power switch for use in the electric pencil sharpener of the present invention will now be described.

In the past, the power switch for an electric pencil sharpener is usually mounted adjacent to the pencil receiving opening 27 as shown in FIG. 16. Upon insertion of a pencil, a lever 43 is forced by the pencil to the left as viewed in FIG. 16 to rotate about the fulcrum 44, pushing the resilient contacting plate 45 to close the power switch thereby to start the motor for sharpening the pencil. In this case, since such lever 43 is provided on one side alone of the pencil receiving opening 27, the pencil may not be disposed centrally of the opening 27 when inserted but is biased under the action of the resilient contacting plate 45 to be cut eccentrically as shown in FIG. 17*b*.

On the other hand, the electric pencil sharpener according to the present invention is provided for sharpening a pencil to a correct shape which is not eccentric, as will be described below.

The power switch S_2 in the illustrated embodiment includes a casing 46 preferably formed of phenol formalin resin and two levers 43—43 are disposed symmetrically with respect to the axis of the pencil receiving opening 27 for pivotal movement about respective fulcrum points 44—44*a*.

In the switch form shown in FIG. 15*a*, the insertion of a pencil into the opening 27 actuates two levers 43—43 carrying adjacent to the free extremity respective arcuate lugs 47—47*a*, which lugs in turn actuate respective pairs of switch contacts 52—53, 54—55, mounted on pairs of resilient contacting plates 48—49, 50—51, respectively. The pair of resilient contacting plates 48—49 are connected with lead wires 56 whereas the other pair of resilient plates 50—51 only has a resilient action. Namely, upon insertion of a pencil into the pencil inlet opening 27, the resilient contacting plate 49 is urged to the left as viewed in FIG. 15*a* by way of the lever 43 fulcrumed at 44, the contact 53 on the plate 49 being brought into contact with the contact 52 on the cooperating resilient contacting plate 48 to energize the drive motor M. At the same time, the lever 43*a* on the opposite side of the pencil axis with respect to the lever 43 is pivotally moved about the fulcrum 44*a* to the right as viewed in FIG. 15*a* to cause the arcuate lug 47*a* to push the resilient plate 50 to the right. It is to be understood that the resilient plates 50, 51 have an identical resilience with the contacting plates 49 and 48, respectively.

In FIG. 15*b*, there is shown another form of power switch in which a single relatively thick resilient plate 57 is substituted for the pair of resilient plates as used in the form shown in FIG. 15*a*, the single resilient plate 57 having a resilience substantially the same as that of the pair of conducting resilient plates 48—49 operable to open and close the power circuit. It will be appreciated that the form shown in FIG. 15*b* has the same functional effect with that shown in FIG. 15*a*.

In case a pencil is cut with an electric pencil sharpener provided with a power switch S_2 constructed and arranged as described above, the pencil is pressed uniformly on both sides by the levers 43—43*a*, which are arranged symmetrically, and thus retained centrally of the pencil inlet opening 27 to be cut accurately and with no eccentricity as illustrated in FIG. 17*a*.

The construction and arrangement of various component parts forming the electric pencil sharpener of the present invention will now be described.

Secured to the base 2 by screws 4 are frame plates 58—58 to which is integrally secured a partition plate 7 including the upper inclined wall 8. Mounted on the inclined wall 8 is a cutting mechanism including a frame 9 which comprises the bottom housing portion 17 adapted to support the cutter holder shaft 20, which drives the cutting part consisting of a cutter 5 and a cutter holder 6, a mounting bracket 25 adapted to carry an internal gear 26, and a holder 59 for the power switch S_2.

Detachably secured to the front of the lower vertical wall portion 60 of the partition 7 is a box 61 for collecting pencil shavings while to the rear of said partition 7 are arranged the transmission gear 22 and a support plate 62 bridging the frame plates 58—58 and carrying a switch S_1 with means for controlling the thickness of the pencil point. Arranged further to the rear of the switch S_1 are a capacitor C and a drive motor M supported on a support 63.

It will be appreciated, therefore, that the casing 1 carries no components having any susbtantial weight and thus need not be formed of material having very high strength. The partition 7 effectively prevents pencil shavings and particularly finely divided particles of pencil lead formed in the cutting part from penetrating into the indicator switch S_1 and the drive motor M, thereby preventing deterioration of such components. Further, the drive motor M, being protected by the partition from any penetration of shavings, may be of the open type which has an advantage of being free from burning due to excessive temperature rise. Provision of a resilient ring 64 fitted all around the periphery of the partition 7 is effective to further prevent the shavings from penetrating into the motor area.

Being constructed and arranged as described above, the electric pencil sharpener of the present invention may be assembled with ease and manufactured at a high rate of production. In assembling, the cutting mechanism, constructed as a unit, is mounted on the partition plate 7 and the switch S_1 is similarly mounted on the frame plates 57—57 of the partition 7 by way of a support plate 62. The drive motor M is then placed on the base 2 to the rear of the partition 7 together with the support 63 placing the motor gear 21 in meshing engagement with the transmission gear 22. The frame plates 58—58 of the partition 7 are then secured to the base by means of screws 4. Finally, the casing 1 and the shavings box 61 are fitted to complete assembling.

Description will now be made on simplified means for securing the casing 1 to the sharpener body.

Provided in the casing 1 in a position opposite to the pencil inlet opening 27 formed in the power switch casing 46 of the sharpener is a through opening 65. Numeral 66 designates a decorative plate secured to the front of the casing 1 and including a transparent region opposite to to the indicator lamp L mounted on the shoulder portion of the casing 46 of the power switch S_2. The remaining portion of the decorative plate 66 is colored for decorative appearance.

The socket member 3 is adapted to secure the casing 1 and the decorative plate 66 simultaneously to the machine body and is interfitted with the threads 67 formed on the wall of the pencil inlet opening 27 in the power switch S_2 (FIG. 18). Formed on the top of the socket member 3 is an annular flange 69 having an outside diameter larger than the diameters of the openings 65 and 68 formed in the casing wall 1 and the decorative plate 68, respectively. Formed inside of said socket member 3 is a tapered wall surface 70. This construction, in which the casing 1 and the decorative plate 66 are clamped to the power switch casing 46 secured to the machine body, no separate fixture is needed to secure the decorative plate 66 to the casing 1. The decorative plate 66 may be secured to the casing 1 without being rotated with the rotation of the socket member 3 simply by forming a recess 71 in the front face of the casing 1 to fittingly receive the decorative plate 66. The axis of the pencil receiving and guiding bore 72 in the socket member 3, which is threadably fitted with the threaded wall 67 of the pencil inlet opening 27 in the power switch S_2, is in perfect coincidence with the axis of the pencil inlet opening 27 in the power switch S_2. As a result, when a pencil is inserted through the socket member 3, it is inserted into the pencil receiving opening 27 without any eccentricity and thus may be cut at all times to a correct, symmetrical shape.

Description will now be made in connection with improved pad or support structures of the electric pencil sharpener of the present invention which are useful when the unit is placed for use on the desk top or the like.

The electric pencil sharpener of the present invention may be used for pencil sharpening simply by placing the unit on a desk or other suitable support. However, in this case, there is a danger that the machine be gradually shifted over the desk surface because of vibration caused by the operation of the drive motor M, and that the unit may fall off the desk when it is inadvertently touched by hand.

To avoid such danger, it is desirable to attach sucker-like rubber cushions 73 to the sharpener base 2 as shown in FIGS. 19*a* to 19*c*. The rubber cushions or pads 73 are each formed with a peripheral groove 74 as clearly seen in FIG. 19*a*, and firmly fitted to the base 2 with the peripheral groove 74 in firm engagement with the peripheral edge of associated one of through apertures 75 formed in the base 2, as clearly shown in FIGS. 19*b* and 19*c*. When the electric pencil sharpener of the invention is held free, the pad structures each take its free configuration as shown in FIG. 19*b*. Meanwhile, when the unit is placed on the desk, the space 76 defined by the bottom of the rubber pad 73 and the desk surface is re-

duced by the weight of the unit per se and manual pressure, if any, upon the unit to produce suction effective to make the unit stable on the desk.

The head **77** of each of the rubber cushions **73** preferably extends upwardly beyond the top surface of the base **2** whereby the shavings box **61** has its bottom held in pressure contact with the cushion head **77**. The friction thus caused between the rubber pads and the bottom of the shavings box **61** acts to prevent the latter from being dislocated by itself off the base **2**.

Referring now to FIGS. 20 and 21, anchor legs **78** may preferably be engaged to the peripheral groove **74** of the rubber cushions **73**. Each of the anchor legs **78** has formed therein a through opening **79** through which a threaded screw **80** is threaded into the desk top to secure the leg thereto. Where the desk top is substantially horizontal or only slightly inclined to the horizontal, the suction effect of the rubber cushions **73** is sufficient to make stable the frame of the pencil sharpener on the desk. However, if the desk top is substantially inclined it is recommendable to use the anchor legs **78** for fastening the sharpener unit to the desk. In cases where the anchor legs **78** are not necessary, they may be moved to their inoperative position under the base **2** by rotating each of them around the annular groove **74** in the associated rubber cushion **73**.

While a particular embodiment of the present invention has been shown and described, it is apparent that changes and modifications may be made without departing from the invention in its broader aspects. The aim of the appended claims, therefore, is to cover all such changes and modifications as fall within the scope of the invention.

What is claimed is:

1. An electric pencil sharpener comprising a motor switch adapted to be closed by a pencil being inserted and to be opened by the withdrawal of the pencil therefrom, an insulating casing accommodating said motor switch, a frame having two projecting ends to which said switch casing is threadably secured, an internal gear secured to the base portion of said frame, a pinion gear adapted to mesh with said internal gear, a cutter carrying said pinion gear, a cutter holder having said cutter mounted thereon in inclined position, a rotatable shaft carrying said cutter holder and rotatably journaled in the base portion of said frame, a through bore formed centrally of said cutter holder and the rotatable shaft therefor, an operating rod inserted in said through bore for sliding movement, one end of said operating rod extending to the pencil receiving bore in said cutter holder while the other end of said operating rod projects, rearwardly beyond the rotating shaft of the cutter holder to abut against a lever for actuating an indicator switch, a dial knob rotatable to vertically move said indicator switch, a transmission gear threadably fitted over the rear end of the cutter holder shaft and held in mesh with the motor gear, a partition plate upstanding from the base, said base portion of said frame being secured to the upper front portion of said partition plate, a shavings box mounted on the base under the cutter with the motor arranged to the rear of said partition plate, and a casing covering the above mentioned components.

2. An electric pencil sharpener comprising a casing, a base, a partition extending upwardly from said base into said casing to divide the space therein into a front and a rear chamber, a box for collecting pencil shavings being located on said base forwardly of said partition, a mechanism within said casing and including: a drive motor arranged in said casing rearwardly of said partition, a frame secured to said partition, an internal gear, a cutter overlying the shavings box, a pinion gear integral with the cutter meshing with internal gear, a cutter holder having a pencil receiving bore formed therein and carrying said cutter in a position adjacent said pencil receiving bore at an angle to the direction in which a pencil to be sharpened is inserted, a holder shaft rotatably mounted in said frame and carrying said cutter holder, an insulating switch casing interposed between the inner surface of the front wall of said sharpener casing and the forward end portion of said cutter holder, a motor switch encased in said switch casing and operable to close upon insertion of a pencil into the sharpener and to open upon removal of the pencil therefrom, indicator means for indicating the completion of each pencil sharpening operation arranged in the sharpener casing and observable exteriorly thereof, said holder shaft being an axial one extending therethrough, an operating rod slidably fitted in said axial bore with one end of said operating rod being presently to the inner bottom of said pencil receiving bore in said cutter holder and the other end of said operating rod extending rearwardly from said holder shaft, switch means engageable by the rear end of said operating rod to operate said indicator means, a threaded formation on the rear end of said holder shaft, and a transmission gear threaded on said threaded formation by rotation thereon in a direction opposite that of rotation of said motor and held in meshing relation with the drive gear on the motor shaft.

3. An electric pencil sharpener as claimed in claim 2 further comprising a balance weight disposed on said cutter holder in a position diametrally opposite to said cutter.

4. An electric pencil sharpener as claimed in claim 2 in which said indicator switch means includes a lever having an abutment portion inclined at an angle to the direction in which said operating rod is slidable and held in abutment against said operating rod so as to open and close said indicator switch upon sliding movement of said operating rod, said lever with said abutment portion being capable of being translated in a direction substantially at right angles to the direction of sliding movement of said operating rod so as to shift the operating point of said indicator switch.

5. An electric pencil sharpener as claimed in claim 2 in which said motor switch includes two levers arranged symmetrically with respect to the pencil receiving bore so as to be pivotally moved by the contacting pressure of a pencil being inserted, two resilient contact plates adapted to be moved into and out of contact with each other by pivotal movement of one of said levers and a resilient plate arranged in engagement with the other lever and resiliently movable by the other lever in the same manner as said resilient contact plates.

6. An electric pencil sharpener comprising a motor switch adapted to be closed by a pencil inserted and to be opened by the withdrawal of the pencil therefrom, an insulating casing accommodating said motor switch, a frame having two projecting ends to which said switch casing is threadably secured, an internal gear secured to a base portion of said frame, a pinion gear adapted to mesh with said internal gear, a cutter carrying said pinion gear, a cutter holder having said cutter mounted thereon in inclined position, a rotatable shaft carrying said cutter holder and rotatably journaled in the base portion of said frame, said cutter holder including a through bore formed centrally thereof, an operating rod inserted in said through bore for sliding movement, an indicator switch, a lever for actuating the switch, one end of said operating rod extending to the pencil receiving bore in said cutter holder while the other end of said operating rod projects rearwardly beyond the rotating shaft of the cutter holder to abut against said lever for actuating the indicator switch, a dial knob rotatable to vertically move said indicator switch, a transmission gear threadably fitted over the rear end of the cutter holder shaft, a motor, a motor gear in mesh with the transmission gear, a partition plate upstanding from the base portion, said base portion of said frame being secured to the upper front portion of said partition plate, a shavings box mounted on the base portion under the cutter with the motor arranged to the rear of said partition plate, and a casing covering the above-mentioned components.

7. An electric pencil sharpener comprising a pencil cutting mechanism including: a frame, a drive motor, supported by the frame, a switch for controlling said motor and operable to close upon insertion of a pencil into the sharpener and to open upon removal of the pencil therefrom, a cutter holder rotatably mounted on the frame, speed reduction gearing between the motor and holder for driving the latter, an internal gear secured to said frame, and a cutter including a pinion gear held in meshing engagement with said internal gear and carried on said cutter holder at an angle to the axis of rotation thereof, whereby upon energization of said drive motor said cutter rotates about its own axis while revolving bodily about the axis of the pencil inserted in said cutter holder; and a device for indicating the completion of the pencil sharpening operation including: an indicator for indicating the completion of the pencil sharpening operation, and an indicator switch for operating said indicator and including an operating rod slidably fitted in an axial bore extending through the shaft portion of said cutter holder and operable for axial sliding movement by the pencil point being finished.

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