May 21, 1963 R. S. CONDON 3,090,358

SHARPENING DEVICE FOR PENCIL LEADS

Filed July 27, 1961 4 Sheets-Sheet 1

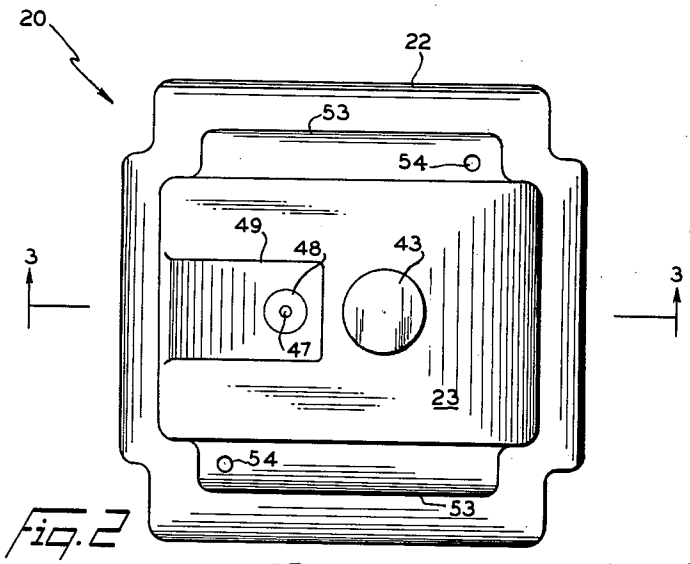


Fig. 2

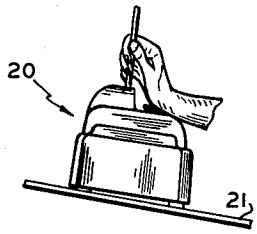


Fig. 1

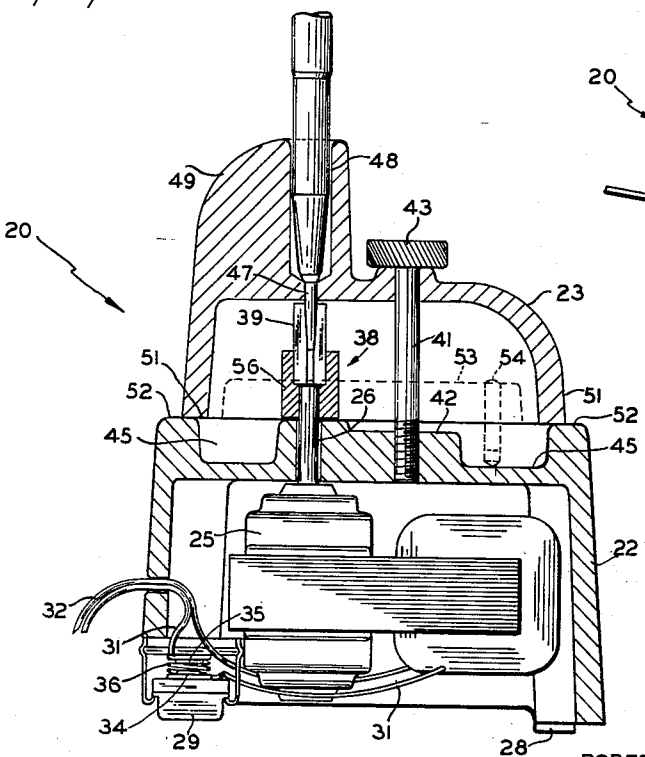


Fig. 3

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SHARPENING DEVICE FOR PENCIL LEADS

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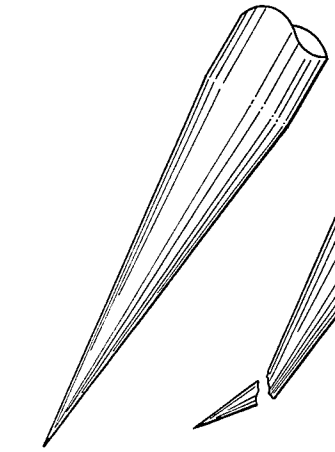


Fig. 9

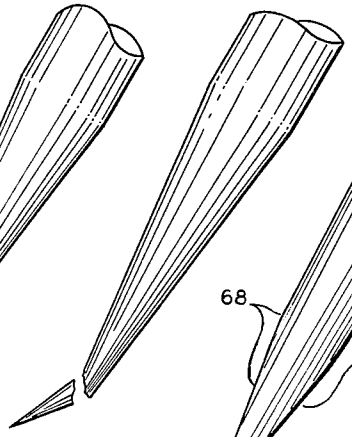


Fig. 10

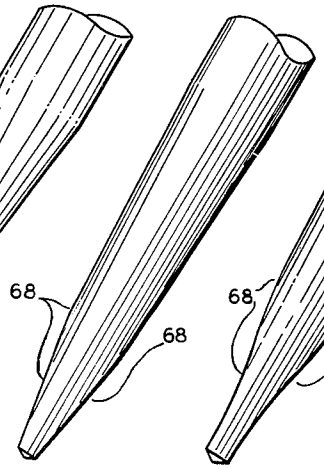


Fig. 11

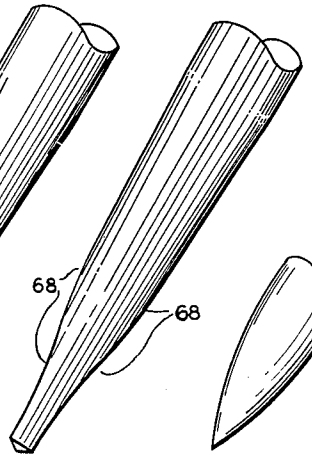


Fig. 12

Fig. 13

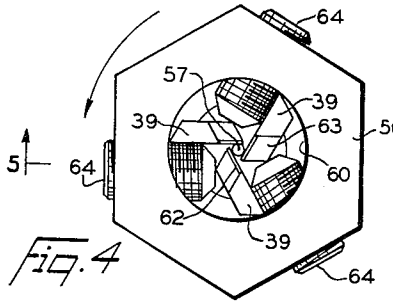


Fig. 4

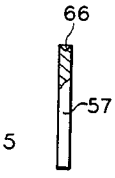


Fig. 6

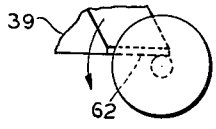


Fig. 14

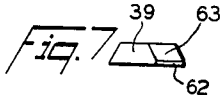


Fig. 7

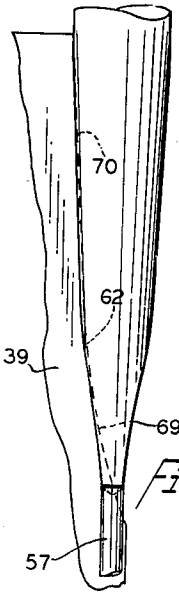


Fig. 15

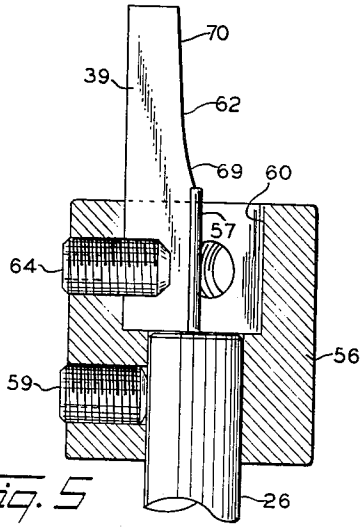


Fig. 5

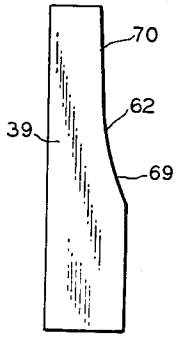


Fig. 8

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SHARPENING DEVICE FOR PENCIL LEADS

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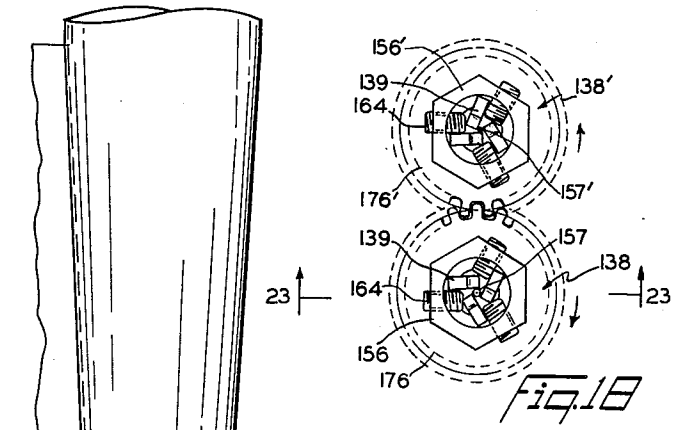


Fig. 18

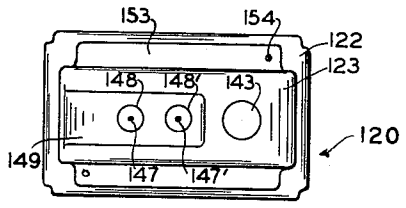


Fig. 17

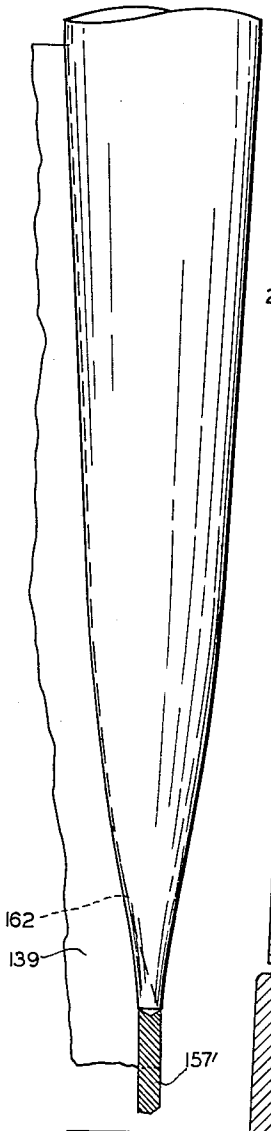


Fig. 19

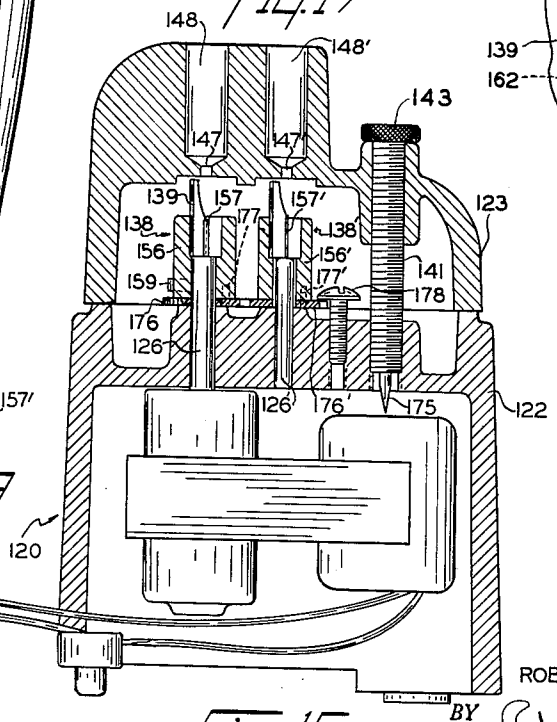


Fig. 16

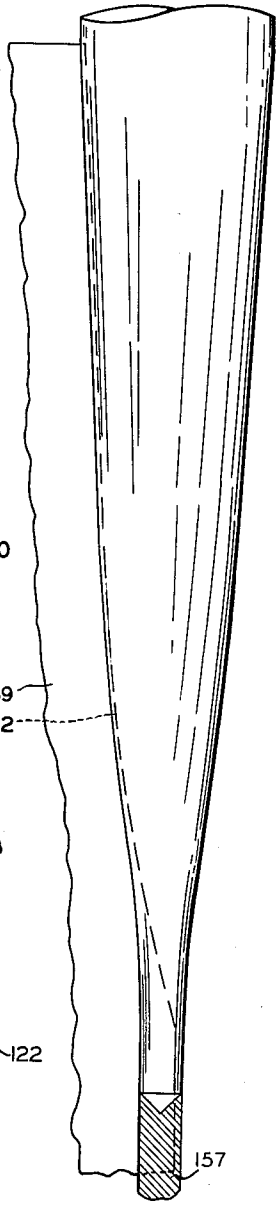


Fig. 20

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SHARPENING DEVICE FOR PENCIL LEADS

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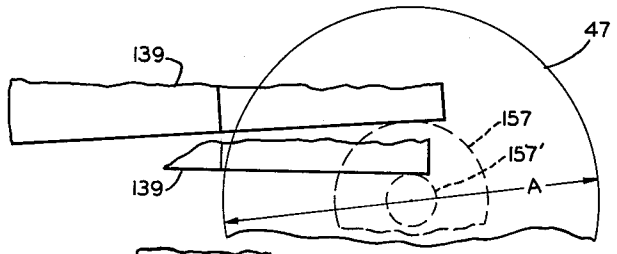


Fig. 21

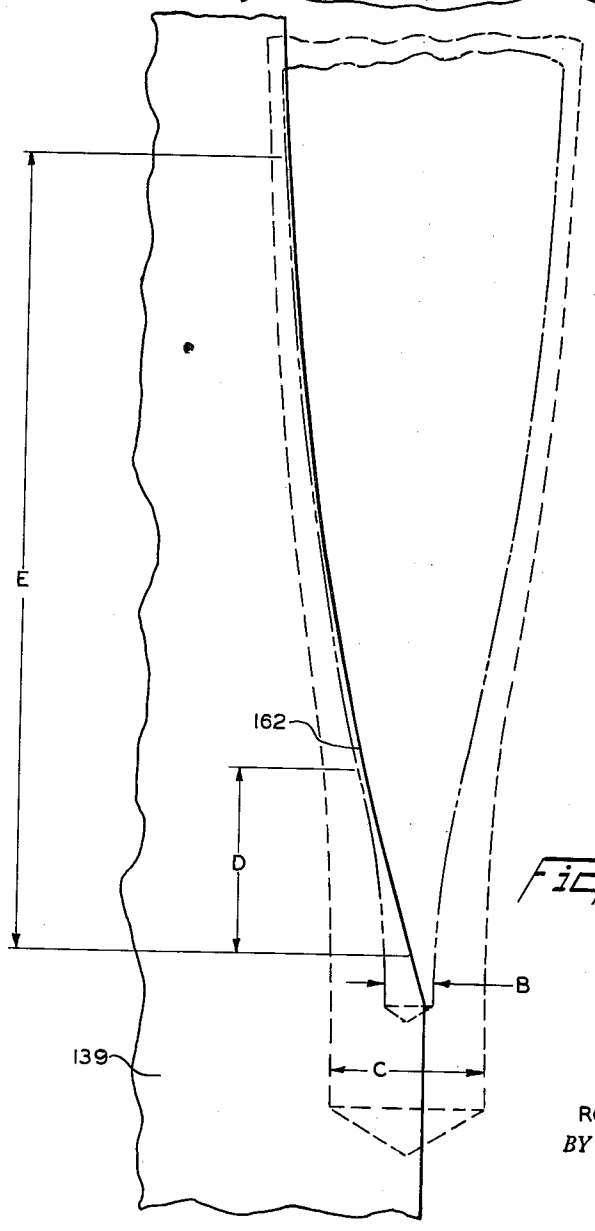


Fig. 22

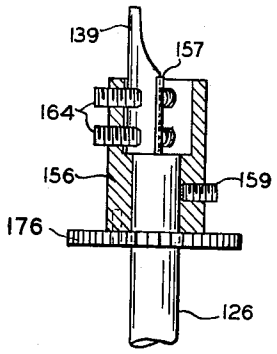


Fig. 23

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United States Patent Office 3,090,358
Patented May 21, 1963

3,090,358

SHARPENING DEVICE FOR PENCIL LEADS

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Filed July 27, 1961, Ser. No. 128,635
8 Claims. (Cl. 120—96)

This invention is a continuation-in-part of copending application Ser. No. 819,843, filed June 12, 1959, by applicant. The invention relates generally to sharpening devices for lead pencils, and has particular reference to an automatic device for sharpening the leads of refillable drafting pencils.

While both manually operated and automatic devices have been developed previously for the specific purpose of sharpening the leads of refillable drafting pencils, most of these devices are designed to sharpen the leads to a fine conical point by means of abrasive discs or cones. Unfortunately, leads having sharp conical points are easily broken, and the applicant has found that the likelihood of breakage is further increased by the use of an abrasive sharpening means because the latter leaves minute surface scratches that provide a starting point for cracks when the lead is stressed during use. Accordingly, the present invention contemplates and has as its principal objective the provision of a greatly improved sharpening device which forms a specially contoured and very much stronger pencil point by means of a novel cutter blade assembly to be described. Thus, in accordance with the invention, the contour that is produced results in a reinforced area in back of the tip of the point where breakage usually occurs and at the same time enables the point to make a fine line throughout a reasonable period of wear.

Another important object of the invention is to provide an automatic sharpening device for drafting pencil leads which performs the sharpening operation instantly and is very easy to use, the device being operable with one hand without the draftsman having to change his body position or release triangles or the like being held in the other hand. In this connection, it will be seen from the description of the drawings to follow that operation can be accomplished with either hand with equal ease.

A further important object of the invention is to provide a sharpening device of the character described which is economical to use since the construction of the cutter assembly enables the draftsman to "feel" exactly when sharpening has been completed, and therefore no more lead is removed than is necessary to form the desired point.

A still further important object of the invention is to provide a sharpening device of the character described which is constructed so that the lead to be sharpened is guided into exact centered engagement with the cutter blades whereby the round point that is formed is centered on the lead.

It is another important object of the invention to provide a sharpening device of the character described wherein the cutter assembly is constructed so that the point that is formed thereby is clean and has a smooth surface that is free of scratches tending to weaken the point.

Still another important object of the invention is to provide a sharpening device of the character described which is actuated when a slight pressure is applied to the upper part of the sharpener housing, the pressure normally being applied by the hand which inserts the pencil in the device for sharpening.

A further important object of the invention is to provide a sharpening device of the character described which can be quickly opened to empty accumulated graphite dust or remove pieces of broken lead.

A more specific object of the invention is to provide

a sharpening device of the character described having a plurality of independent cutter blades formed with specially contoured cutting edges to produce a point of the desired shape.

Another specific object of the invention is to provide a sharpening device of the character described wherein the cutter assembly includes a stop pin which aids in properly positioning the cutter blades and also serves to indicate when the sharpening has been completed.

A further specific object of the invention is to provide a sharpening device of the character described wherein the cutter assembly employs a balanced cutter blade arrangement.

It is another specific object of the invention to provide a sharpening device of the character described wherein the cutter assembly is constructed so that the cutting edges of the cutter blades are positioned above the blade support to permit the free escape of graphite dust or pieces of broken lead therefrom.

Still another specific object of the invention is to provide a sharpening device of the character described wherein the cutting blades are designed with two flat, parallel sides to facilitate stacking so that the contoured cutting edges of all of the blades of a set can be ground together to ensure a perfectly matched set.

Still another important object is to provide a sharpening device of the character described for alternatively and selectively forming a stronger pencil point with a very small tip for drawing fine lines or a stronger, longer-lasting point for drawing heavier lines and for lettering.

Other objects and advantages of the invention will become apparent from the following detailed description thereof read in conjunction with the accompanying drawings which illustrate a representative embodiment of the invention for the purpose of disclosure.

In the drawings:

FIGURE 1 is a diminutive side elevation of an automatic sharpening device embodying the invention, in use on a drawing board;

FIGURE 2 is a top plan view of the sharpening device;

FIGURE 3 is a vertical section through the device taken substantially along line 3—3 of FIGURE 2;

FIGURE 4 is an enlarged top plan view of the cutter assembly;

FIGURE 5 is an enlarged vertical section through the cutter blade support member, showing one cutter blade and the stop pin positioned therein;

FIGURE 6 is an enlarged side elevation, partly in section, of the stop pin;

FIGURES 7 and 8 are respectively a top plan view and a side elevation of the cutter blade shown in FIGURE 5;

FIGURE 9 is a greatly enlarged side elevation of a conventional sharp, conical point on a drafting pencil lead;

FIGURE 10 is an elevation corresponding to FIGURE 9 showing the usual point of fracture of a pencil lead sharpened in this manner;

FIGURES 11 and 12 are greatly enlarged side elevations of pencil points formed by the sharpening device of the invention;

FIGURE 13 is a greatly enlarged side elevation of another conventionally shaped point;

FIGURES 14 and 15 are greatly enlarged top plan and side elevational views respectively, showing the relative positions of the pencil lead and one of the cutter blades during sharpening.

FIGURE 16 is a sectional view similar to FIGURE 3 showing a pencil lead sharpener with two cutter assemblies constructed in accordance with the invention;

FIGURE 17 is a top plan view thereof on a smaller scale;

FIGURE 18 is an enlarged top plan view of the cutter assemblies thereof;

FIGURES 19 and 20 are greatly enlarged side elevational views showing the relative positions, during sharpening, of the pencil leads and one of the cutter blades of each of the cutter assemblies respectively;

FIGURES 21 and 22 are greatly enlarged top plan and side elevational views respectively, showing the superimposed relative positions, during sharpening, of the pencil leads and one of the cutter blades of each of the cutter assemblies; and

FIGURE 23 is an enlarged vertical section through one of the cutter blade support members, showing one cutter blade and the stop pin positioned therein.

Referring now to the drawings, wherein like reference numbers designate the same part in each of the views, **20** generally indicates the sharpening device which is adapted to rest on a drawing board **21** within each reach of the draftsman, FIGURE 1, although it can be positioned on any horizontal or slightly inclined surface. The sharpener **20** is essentially comprised of a lower housing **22** which forms the motor chamber and an upper housing **23** which forms the cutter chamber. In this connection, it should be pointed out that the terms "upper" and "lower," "above" and "below," etc., as used in the specification and claims, have reference to the normal position of the sharpener on a drawing board and are not intended to be used in a restrictive sense since the device is operable in any position.

A motor **25** is mounted by an suitable means in the lower housing **22** and is arranged so that its drive shaft **26** extends upwardly through the top wall of the housing into the cutter chamber as shown in FIGURE 3. The motor housing is provided with supporting feet **28** and **29**, the front feet **28** preferably being made of rubber or the like to prevent the sharpener from slipping on an inclined board. The housing is also constructed so that the front feet extend downwardly farther than the back foot **29** to compensate somewhat for the inclination of the drawing board.

The back foot **29** is a vertically movable plunger or push button which is adapted to close a normally open motor switch upon the application of a slight downward pressure to either of the housings. To this end, one of the lead wires **31** of the motor line cord **32** is broken, and one side of this wire is connected to a contact **34** on plunger foot **29** while the other side is connected to a contact **35** mounted on an insulator secured to the housing. The contacts **34**, **35** are normally maintained in spaced relation by a small compression spring **36** bearing against the foot **29**, but when pressure is applied to the housing the contacts are moved into engagement whereby the switch is closed and the motor actuated.

The upper housing **23** forms with the top wall of the lower or motor housing an enclosed chamber in which the cutter assembly or head generally indicated at **38**, is located. The cutter assembly is fixed on the upper end of the motor drive shaft **26** for rotation therewith and includes a plurality of vertically disposed cutter blades **39** which extend upwardly in the chamber to a point adjacent the top wall thereof, as shown. The upper housing is secured to the lower housing by a single manually removable screw **41** which threads into a boss **42** on the top wall of the lower housing. The boss **42** is bored to clear the motor drive shaft **26** and forms a thrust bearing against the lower part of the cutter assembly that seals graphite dust away from the motor. By simply unthreading screw **41** by means of its enlarged knurled head **43**, the upper housing can be removed from the lower housing to permit graphite particles to be emptied from a dust collecting well **45** formed in the top wall of the lower housing, or to permit access to the cutter assembly as when a broken piece of lead has become lodged in the cutter blades.

The lead to be sharpened enters the cutting chamber through an opening **47** in the top wall thereof and, in order to ensure centered engagement of the lead with the cutter blades, the upper housing is provided with a vertically disposed guide passage **48** above the opening, which passage is formed in an upstanding projection or boss **49** on the housing. The guide passage **48** is adapted to receive a portion of the pencil body with a free fit, and the lead itself is received with a close sliding fit in the opening **47**. Since the axes of the passage **48** and opening **47** are colinear with the axes of the motor drive shaft and cutter assembly, and since the pencil cannot be canted, there is always proper alignment of the lead with the cutter assembly. In this connection, it should be mentioned that engaging portions of the upper and lower housing, i.e., the abutting edges **51** and **52**, are finished or otherwise formed with smooth plane surfaces so that when the sharpener is initially assembled during manufacture the upper housing can be slidably adjusted on the lower housing to bring the axis of guide passage **48** into exact alignment with the axis of the motor drive shaft. When this adjustment has been made, holes are drilled through the upper housing flanges **53** into the lower housing, the dowel pins **54** are fixed in the flange holes to maintain proper alignment thereafter.

Having reference now to FIGURES 1 and 4–8, the cutter assembly **38** comprises a blade support or collar member **56**, a plurality of elongated cutter blades **39**, previously referred to, and a stop pin **57** about which the blades are arranged in a manner to be described. The collar member **56** is fixed to the upper end of the motor drive shaft **26** as by a set screw **59**, FIGURE 5, and above the end of the shaft the collar is provided with a counterbore **60** in which the cutter blades are received. The blades extend axially outwardly from the counterbore so that the cutting edges **62** thereof are located above the collar member, the edges being bevelled as shown at **63** in FIGURES 4 and 7.

In the embodiment of the invention shown, there are preferably three cutter blades and these are arranged in angularly spaced relation about the stop pin **57** which is centrally positioned in the counterbore. The lower portions of the blades abut against and overlap the pin as shown in FIGURE 4 so that the pin contacting surface of each blade **39** which terminates in the cutting edge **62** lies tangent to the pin **57** and the cutting edges of the blades are slightly offset radially from the center of the pin. The blades are held in this position by three set screws **64**, each blade being engaged by the side of one screw and the end of the next adjacent screw so that it is wedged against the pin and side wall of the counterbore.

Since the cutter blades and stop pin are secured in fixed relation in the collar member, as above described, all of these parts rotate in unison with the motor drive shaft to perform the sharpening operation, and the offset arrangement of the blades result in a scraping action on the lead which produces a smooth, scratch free surface on the point. Moreover, because the stop pin is located in the center of the blades, and its upper end terminates just above the lower extremities of the blade cutting edges (see FIGURES 5 and 15), the tip of the point that is formed is slightly blunted or rounded as indicated in the greatly enlarged views of FIGURES 11 and 12, rather than being pin-point sharp as shown in FIGURE 9. With a point as sharp as that illustrated in FIGURE 9, the tip tends to dig into the paper with the result that the point usually breaks in back of the tip as indicated in FIGURE 10. In order to obtain a slightly rounded tip as shown in FIGURES 11 and 12, the upper end of the stop pin **57** can be made concave as shown at **66** in FIGURE 6.

Since extensive tests have shown that a newly sharpened point usually breaks back of the tip as indicated in

FIGURE 10, the cutting edges 62 of the blades 39 are specially contoured so that the points formed by the sharpener of the invention are reinforced or buttressed in this area as is shown at 68 in FIGURES 11 and 12. In order to obtain this desired point shape, the cutting edge of each blade is formed with a curved lower portion 69 adjacent the stop pin 57 and the upper portion can be straight and outwardly inclined as at 70, FIGURES 5, 8 and 15. The lower curved portion of the cutter blade gives the desired buttressed shape to the lead point. The manner in which the contoured cutting blades act upon the pencil lead to produce the desired point shape is illustrated in FIGURES 14 and 15, the latter also indicating the relationship of the stop pin to the blades whereby the upper end of the pin defines the cut-off point for the cutting or scraping action of the blades below which the blade edges have no effect on the lead.

With the point shape shown in FIGURE 11, breakage is substantially reduced and yet the portion of the point between the tip and reinforced area 68 enables the point to make a fine line which does not thicken materially as the point wears towards the reinforced area (remembering, of course, that the points shown in FIGURES 9–13 are many times actual size). The point shown in FIGURE 12 is a slight modification of the shape shown in FIGURE 11 and can be formed by altering the curved portions of the blade cutting edges. This point is not quite as strong as the point of FIGURE 11 but continues to make a fine line for a somewhat longer period of wear. In contrast, the point shown in FIGURE 13, having a shape produced by one type of presently available sharpener, is relatively strong but makes a thick line almost immediately after it begins to wear.

Referring again to the cutter blades, and in particular to FIGURE 7, it will be seen that the blades can be formed with two flat sides, two bevelled sides and squared ends. This enables the blades to be stacked and the cutting edges simultaneously ground so that each set of blades is perfectly matched. In this connection, these blades are preferably made of tungsten carbide for the greatest possible durability. By grinding the edge square only the minimum amount of material is removed from the previously bevelled edge.

To use the sharpener, the draftsman simply inserts his pencil in the guide passage 48 and, while holding the pencil with his thumb and first fingers, exerts a slight pressure on the top of the upper housing 23 with the third and fourth fingers. This closes the motor switch by means of the inverted push button 29 and starts the cutter assembly rotating. It is the rotation of the cutters past the pencil lead that does the sharpening. By gently pushing the pencil downwardly, the draftsman can feel the sharpening taking place and, more important, can feel when the end of the lead engages the stop pin 57 so that he knows when the sharpening has been completed and need not waste lead by removing more than is necessary to obtain the desired point shape. During this process, the graphite dust that is scraped from the lead falls through the cutter blades into the well 45 since the cutting edges of the blades are positioned above the supporting collar 56 and there is no surrounding structure to prevent free elimination of the dust. When the draftsman withdraws the pencil, he at the same time relieves the pressure on the top of the housing and the motor stops automatically due to the action of the push button spring 36.

In the embodiment shown in FIGURES 16 and 17, the lead sharpener 120 is provided with two cutter assemblies or heads 138 and 138', as hereinafter described, one for a fine tip or point and the other for a coarser point. The upper housing 123 is provided with two anti-canting guide passages 148 and 148' opening into the cutting chamber through smaller lead-centering openings 147 and 147' respectively, which are axially aligned with the

cutter assemblies. The upper housing 123 is secured to the lower housing 122 by means of a pointed end 175 which may be used to clear broken lead point tips from between the blades of the cutter assemblies.

Cutter head 138 is secured to the motor shaft 126 by a set-screw 159 carried by the blade support 156. Head 138' is rotatably mounted on a parallel stub shaft 126' secured in the top wall of housing 122 as by a drive fit, the blade support 156' of head 138' being provided with an "oilite" bearing pressed therein.

Intermeshing gears 176 and 176' are secured to the bottom of the blade supports as by the spring wire pins 177 and 177'. A shouldered or self-threading screw 178 in the top wall of housing 122 is provided as shown for keeping the cutter head 138' from falling from shaft 126' when housing 123 is removed and the sharpener is inverted. In other respects, aside from necessary changes in size, sharpener 120 is in all respects essentially of the same construction as the sharpener 20.

The cutter heads 138 and 138' are constructed like the cutter head 38 except that it has been found advantageous to provide upper and lower set screws 164 in pairs for more firmly securing the blades 139 in the supports, as clearly shown in FIGURE 23.

The head 138 is provided with a larger stop pin 157 than the pin 157' of head 138', which latter pin is about one-third the diameter of the first and of the order of ten one thousandths of an inch. For reasons which will appear, the stop pin 157 is shorter than pin 157'. Also, the blades 139 may be formed without the bevel 63 of blades 39, and they are oppositely disposed in the support 156' because of the reversal of the direction of rotation of the two cutter heads occasioned by the interaction of gears 176 and 176', as shown in FIGURE 18.

In use, the draftsman may insert his pencil in either one of the guide passages according to whether a finer or a coarser point is desired. The cutter head 138' produces the finer point because the pin 157' thereof is of a diameter of less than one fifth the standard diameter of a pencil lead, seventy-four thousandths of an inch, and the pin 157 is only slightly less than half the diameter of the lead.

As seen in FIGURES 19 and 20 and in the superimposed views of FIGURES 21 and 22, the diameter of the stop pin is necessarily the diameter of the ground point of the pencil lead due to the arrangement of the blades with their cutting edges tangent to and commencing at the top of the stop pin.

The radius of curvature of the cutter blades is of the order of five-eighths of an inch at the lower end of the curve, and at a point slightly less than one quarter of an inch above the start of the curved edge the curve merges tangently into a straight cutting edge diverting from the axis of the head at about a three degree angle. It will be apparent from an examination of FIGURES 21 and 22 that the shape of the point is determined by an intersection of the curved cutting edge of the blades with the round pencil lead as determined by the diameter of the stop pin.

It will also be apparent that, the pin 157 being longer than the pin 157', a point produced by the head 138 will be more tapered and less curved than a point produced by head 138'. The result is that the latter point, though having a finer tip, is buttressed by a more sharply-flaring point than the thicker and stronger point of head 138. Since the thicker point is stronger, a stop pin 157 is shorter for producing a longer tip on the point which is substantially cylindrical so that the point will last longer for producing heavy lines or for use in lettering.

The fine point of FIGURE 22 has a diameter B at the tip which is about one third the diameter C of the coarser point, the finer point being for dimension and shade lines

where less pressure is exerted on it by the draftsman. The finer point doubles in size at a distance D above the tip, and the coarser point at a distance E, about three times as great as D, above the cylindrical tip of the point. The finer point, therefore, is more closely reinforced than the coarser, stronger point.

It will be noted that both points taper outwardly to the original diameter of the lead at a distance slightly above that portion shown at the top of FIGURE 22.

As will be apparent to those familiar with the art, the invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The embodiments disclosed are therefore to be considered in all respects as illustrative rather than restrictive, the scope of the invention being indicated by the appended claims.

What is claimed is:

1. In a sharpening device of the character described: a lower housing adapted to rest upon a drawing board, a motor mounted in said housing with its shaft extending substantially vertically through the top wall thereof, an upper housing positioned on the top wall of said lower housing and forming therewith an enclosed cutter chamber, manually releasable means normally securing said upper to said lower housing, dowel means in said housings for the accurately aligned interengagement of said housings, and a cutter assembly located in said enclosed cutter chamber, said cutter assembly including a blade support secured directly to the upper end of said motor shaft and a plurality of independent cutter blades each secured at one end in fixed relation to said support, each of said cutter blades being formed with a concave cutting edge extending in a generally axial direction relative to said shaft, and said upper housing having an elongated cant-preventing guide passage in the top wall thereof axially aligned with said shaft for receiving and supporting the body of a drafting pencil, said guide passage terminating in a smaller axially aligned pencil-lead centering passage opening into said cutter chamber, whereby said upper housing is removable for cleaning and clearing broken leads from said blades.

2. In a sharpening device of the character described: a motor having a drive shaft, a blade support member operably connected to said shaft for rotation therewith, a stop pin positioned centrally in said blade support axially of said shaft, a plurality of flat cutter blades arranged in angularly spaced relation about said pin with the cutting edge portions thereof projecting outwardly from said blade support, each blade having a surface which terminates in said cutting edge secured in tangential relation to said pin, and a plurality of set screws in said support coacting with said pin to hold the cutter blades in position, the cutting edge portion of each blade being concavely curved along its pin-contacting surface and radially spaced from the axis extended of said pin, said curved cutting edge portions terminating adjacent the outer end of said stop pin, whereby the tip of the sharpened end of each lead is equal in diameter to the diameter of said stop pin.

3. In a device for sharpening the lead of a refillable drafting pencil: a lower housing adapted to rest upon a drawing board and having a top and side walls, a motor mounted in said housing with its shaft extending substantially vertically through a clearance hole in the top wall thereof, means on said top wall forming a dust collecting well, a cutter assembly including a blade support secured to the upper end of said motor shaft and three independent cutter blades secured in fixed relation to said support, said blade support having a flat bottom contacting said housing top wall to form a thrust bearing and seal said motor from dust, each of said cutter blades being formed with a concave cutting edge, a stop pin centrally secured in said support and axially aligned with said shaft, each of said cutter blades being secured in said support in tangential relation to said pin and having the lower end of its cutting edge radially spaced from the top end of said stop pin, an upper housing positioned on the top wall of said lower housing and forming therewith an enclosed chamber for said cutter assembly and dust collecting well, manually releasable means normally connecting said upper to said lower housing, and an upstanding boss formed on the top wall of said upper housing, said boss having an elongated, substantially vertical guide passage dimensioned to receive the body of the drafting pencil with a close sliding fit for guiding the pencil lead downwardly into centered engagement with said blade cutting edges.

4. A device for sharpening the lead of a refillable drafting pencil comprising in combination a lower housing having a top and side walls, a motor mounted in said housing with its shaft extending substantially vertically through the top wall thereof, said housing top wall being formed on its upper side with a recessed dust collecting portion substantially encircling said motor shaft in spaced relation thereto, a collar member secured at its lower end to the upper end of said motor shaft for rotation therewith, a stop pin positioned coaxially in said collar member with its upper end terminating adjacent the upper end of the member, three elongated cutter blades positioned longitudinally in said collar member in angularly spaced relation about said pin, each of said blades extending upwardly from said collar member and having its cutting edge located above the upper end of the member, the cutting edge of each blade having a curved portion terminating adjacent the upper end of said stop pin, a plurality of set screws on said collar member to hold the portions of said cutter blades within the member in engagement with the longitudinal surface of said stop pin in radially offset relation to the longitudinal axis thereof, an upper housing positioned on the top wall of said lower housing and forming therewith an enclosed chamber for said cutter blades and said recessed dust collecting portion, a single releasable thumbscrew normally connecting said upper to said lower housing, an upstanding boss formed on the top wall of said upper housing, said boss having an elongated, substantially vertical guide passage dimensioned to receive the body of the drafting pencil with a close sliding fit for guiding the pencil lead downwardly into centered engagement with said blade cutting edges, a normally open motor switch in said lower housing, a plurality of supporting feet for said lower housing one of which is movable, said movable foot being operable when pressure is applied to the top of said upper housing to close said switch and actuate the motor, and spring means coacting with said movable foot and operable to open said switch when the pressure on the upper housing is released.

5. In a device for sharpening the lead of a refillable drafting pencil having a housing, a motor mounted in said housing, a shaft projecting into a cutter chamber therein, and means for guiding the lead of a pencil into said chamber axially of said shaft, the improvement comprising a counterbored blade support secured in said chamber on said shaft, a plurality of blades secured in the bore of said support and projecting therefrom, a stop pin in said bore axially aligned with said shaft, said blades being arranged tangentially about said stop pin, each blade having a curved cutting edge at one side of its pin-contacting surface extending outwardly from a point adjacent the end of said stop pin, all of said cutting edges being equally radially spaced from the axis extended of said pin, and a plurality of set-screws radially arranged in said support for securing and centering said pin and blades in said support, each blade having its pin contacting surface secured against said pin and a first set-screw by the radial adjustment of a second set-screw.

6. In a device for sharpening the lead of a refillable drafting pencil: a motor housing, a motor mounted in said housing with its shaft extending through the wall

thereof, a rotary cutter mounted on the end of said shaft, said cutter having independent blades radially disposed and angularly spaced therein, each blade being secured at one end in said cutter and having the other end projecting therefrom, a cutter housing mounted on said motor housing and forming a closed chamber about said cutter blades, an elongated pencil guiding and supporting passage in the wall of said cutter chamber axially aligned with said motor shaft and cutter, said pencil guiding passage terminating in a smaller axially aligned pencil-lead centering passage opening into said cutter chamber, separable locating means on said housings for the accurately aligned interengagement of said housings, and a single releasable thumbscrew normally securing said housings in interengagement, whereby said cutter housing may be easily removed for cleaning said cutter chamber and for freeing said cutter of broken lead.

7. In a device for sharpening the lead of a refillable drafting pencil: a first motor driven shaft, a second parallel shaft, a first cutter head secured to said first shaft, a second cutter head rotatably mounted on said second shaft, intermeshing gears secured respectively to said heads, each of said heads having a counterbored blade holder, a plurality of blades secured in the bore of each holder and projecting upwardly therefrom, and a stop pin in said bore axially aligned in the head, said blades being angularly spaced in said holder and tangentially arranged about said stop pin, each blade having a concavely curved cutting edge extending upwardly and outwardly from said stop pin, one of said heads having a stop pin of less diameter than the other, said smaller diametered stop pin extending up to the lower end of said curved edges, and the larger stop pin extending to a point below the lower end of said curved edges, whereby pencil leads are ground to a fine buttressed point by one of said heads and leads are ground to a thicker tapered point by the other of said heads.

8. In a drafting-pencil-lead sharpener having a lower housing adapted to rest upon a drawing board, a motor mounted in said housing with its shaft extending through the top wall thereof, an upper housing positioned on said top wall and forming therewith an enclosed cutter chamber, and manually releasable means normally securing said upper to said lower housing; the improvement comprising a first cutter head secured directly to the upper end of said motor shaft in said cutter chamber; a second cutter head rotatably mounted on a stud shaft projecting parallel to said motor shaft in said cutter chamber, intermeshing gears secured respectively to said cutter heads; and a pencil guiding passage in said upper housing terminating in a pencil centering passage opening into said cutter chamber axially aligned with each of said heads; each of said heads comprising a counterbored blade holder, a plurality of blades secured in the bore of each holder and projecting upwardly therefrom, and a stop pin in said bore axially aligned with said shaft, said blades being arranged, angularly spaced and tangentially disposed about said stop pin, each blade having a concavely curved cutting edge extending upwardly and outwardly from said stop pin; one of said heads having a stop pin of less than one fifth the diameter of said pencil lead extending up at least to the lower end of the curved edge of said blades; and the other of said heads having a stop pin of two to three times the diameter of said other stop pin extending up to a point below the lower end of the curved edge of said blades; whereby pencil leads are ground to a fine buttressed point by one of said heads, and leads are ground to a thicker tapered point by the other of said heads.

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