

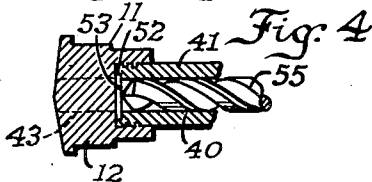
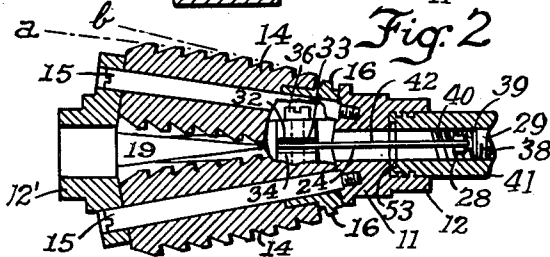
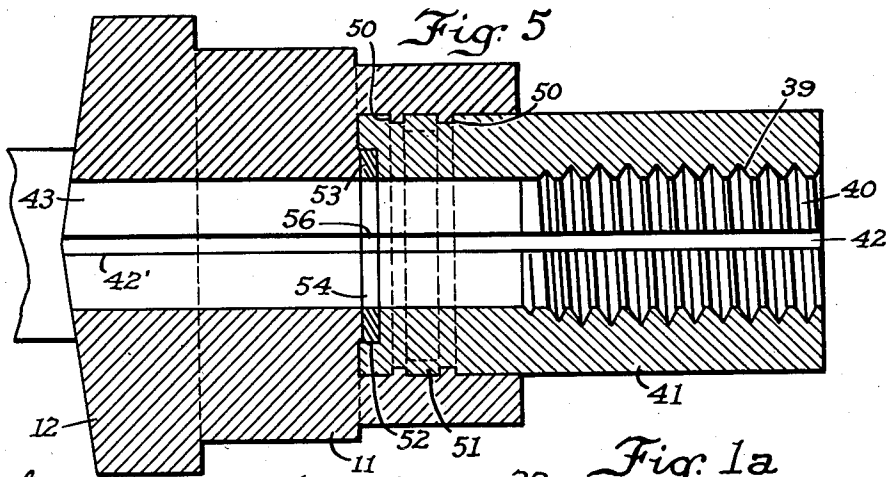
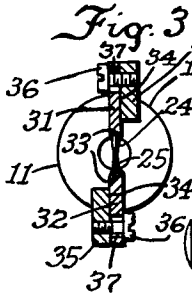
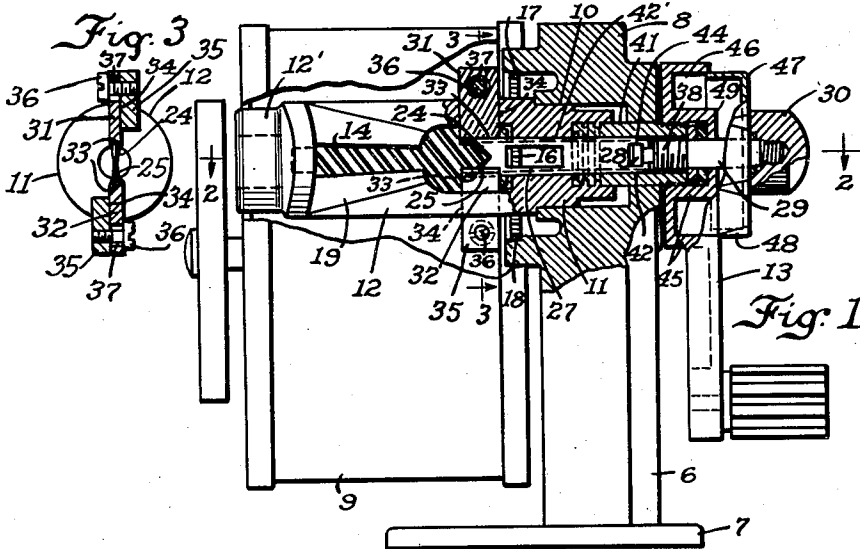
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PENCIL SHARPENER

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PENCIL SHARPENER

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19 Claims. (Cl. 120—96)

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This invention relates to pencil sharpeners and more particularly the well known type incorporating two substantially cylindrical cutters in diametrically opposed converging relationship.

A demand has arisen for a pencil sharpener capable of being adjusted readily to produce different degrees of sharpness of pencil points, so that the user is not confined to a standard sharpness of point, which may not be suited to his or her particular needs or for the particular kind of pencil being used. I am aware that efforts have been made by others in this direction, but their designs of pencil sharpeners have been too complicated and expensive to manufacture or were limited to use of a single cutter, being not at all practical if applied to the conventional two-cutter type sharpener mentioned above. For example, in one of the prior designs (Yerkes Patent No. 2,438,628) the spacing of the converging cutters was increased and the cutters were arranged to cut all but the point portion of the lead, while an auxiliary cutter, functioning as a combination pencil stop and point cutter, was adjustable axially between the converging ends of said cutters into the space therebetween, the auxiliary cutter having a substantially V-shaped cutting edge to sharpen the end portion of the lead to a sharp, blunt, or medium point according to the length of lead left protruding from the wood as predetermined by the adjustment. The converging cutters, being of hardened steel, and the auxiliary cutter being also necessarily of hardened steel, the need for increased spacing of the converging cutters is self evident; any rubbing of the auxiliary cutter on the other cutters would soon render the same too dull for good operation. Moreover, bearing in mind the fact that the auxiliary cutter's V-shaped cutting edges were adapted only to do a scraping operation on the lead, not a true cutting operation, it will be evident that breakage of the lead, especially soft lead, was inevitable unless the auxiliary cutter blade was guided for adjustment in a plane exactly on the center-line of the pencil, with the apex of the V in the blade accurately located coincident with the axis of the pencil and the axis of rotation of the cutter frame to assure evenly balanced application of cutting pressure to the protruding end portion of the lead being pointed, and thus reduce likelihood of the blade gouging the lead and breaking off the point. It is, therefore, one of the principal objects of my invention to provide a pencil sharpener in which:

(1) The two main converging cutters are in a

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normal closely spaced relationship, so as to take care of the entire cutting operation with the exception of tapering the extreme tip portion of the lead, and

(2) The auxiliary cutter blade, which is of rectangular form and has a V-shaped cutting edge on its inner end portion to taper the tip or point portion of the lead, is disposed in a plane between the closely spaced inner ends of the converging cutters, and is cut away intermediate its ends to eliminate any likelihood of any rubbing contact with these cutters or their drive pinions, and is connected on the outer side of the cut-out portion with manually operable adjusting means adjustable axially from the outer end of the crank operated shaft of the sharpener, said blade being slidably guided by its longitudinal edge portions both inwardly and outwardly relative to the converging end portions of said main cutters to keep the blade in the central plane clear of the cutters and also positively insure the accurate positioning thereof coaxially with respect to the pencil being sharpened and the axis of operation of the sharpener, so that the V-shaped cutting edge on the blade trims the point on the pencil lead correctly in every position of axial adjustment of the blade, the blade functioning thereby both for the point dressing or trimming operation and as a stop to limit insertion of the pencil and accordingly predetermine the length of the protruding point portion.

Another object is to provide a pencil sharpener of the kind described above, in which the guides for the innermost portion of the auxiliary cutter blade are provided by grooves in the diametrically opposed inner ends of plates that are radially adjustable in the rotary frame for infinite adjustment and arranged to be clamped frictionally in their finally adjusted positions, whereby to enable accurately locating the apex of the V in the blade coincident with the axis of the pencil and the axis of rotation of the frame and assure such location in any degree of adjustment of the blade.

The invention is illustrated in the accompanying drawing, in which—

Fig. 1 is a vertical section lengthwise through a pencil sharpener embodying my invention;

Figs. 1a and 1b are illustrations of the pointed end of a pencil, showing the points obtainable with the sharpener of Fig. 1 with different settings of the auxiliary cutter blade;

Fig. 2 is a horizontal section on the line 2—2 of Fig. 1, showing only the rotary frame and parts thereon;

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Fig. 3 is a sectional detail on the line 3-3 of Fig. 1, to better illustrate the adjustability of the guide plates and the way in which they are clamped in adjusted positions;

Fig. 4 is a view similar to a portion of Fig. 2, illustrating how the metal slug in the metal sleeve insert is drilled through in the drilling of the axial hole in the die-cast rotary frame, and

Fig. 5 is an enlarged sectional detail of the same end of the rotary frame after the drilling, boring, and broaching operations have been completed.

The same reference numerals are applied to corresponding parts throughout the views.

Referring first to Figs. 1 to 3, the reference numeral 6 designates the standard for the pencil sharpener, which has the usual attaching flange or base portion 7 on one end and a hub portion 8 on the other end adapted to support the usual chip receptacle 9, it being common practice to provide a bayonet lock connection between the hub 8 and receptacle 9, so that the latter may easily be removed from time to time to empty the contents and be as easily replaced. A bearing 10 is provided in the hub 8 for the drive shaft 11, which is formed as an integral part of the rotary frame 12 of the pencil sharpener adapted to be turned by means of the crank 13 to transmit drive to the diametrically opposed, substantially cylindrical, helical milling cutters 14 that are mounted in the frame 12 in converging relation on spindles 15. The frame 12 includes a neck portion 12' on its outer end in concentric relation to the shaft portion 11, through which the end portion of a pencil to be sharpened is entered. The cutters 14 have drive pinions 16 fixed on their inner ends, which mesh with an internal ring gear 17 that is suitably fixed in a recess 18 provided therefor in the hub 8, so that the cutters 14 are caused to turn on their spindles 15 as they are revolved with the frame 12 when the same is turned by means of the crank 13. The diametrically opposed side portions 19 of the frame 12 extend in inwardly converging relation, as indicated in Fig. 1, at a slightly larger angle than the cutters 14, so as to provide lateral support for the tapered end of the pencil as the pencil is sharpened and fed inwardly by hand, or otherwise. It has heretofore been common practice to provide on the frame 12 within the chip receptacle 9 a stop for abutment with the pencil point, working between the inner ends of the cutters in front of the drive pinions, to limit the inward movement of the pencil and provide a given sharpness of pencil point, the stop being usually in the form of a bell-crank member pivoted on the frame with one arm or finger thereof reaching inwardly between the cutters to act as the stop, this bell-crank member being set at the factory in a fixed position by bending the other arm of the bell-crank member at the time of assembling the sharpener. However, a demand has arisen for a pencil sharpener capable of being adjusted readily externally to produce different degrees of sharpness of pencil points, so that the user will not be confined to a standard sharpness of point, which might not happen to be suited to his or her particular need, or might not be best adapted for a particular kind of pencil being used. For that reason efforts have been made to provide a stop readily adjustable from the outside of the pencil sharpener, but, as has been pointed out before, the designs proposed have been too complicated and expensive to manufacture and were not practical as

applied to the conventional two-cutter type sharpeners, such as that herein illustrated and just described. It is important that the close spacing of the converging cutters be left unchanged, so that substantially the entire cutting operation can be performed by the cutters 14, which are best adapted to do this work. For one thing, these cutters are hardened and the cutting edges thereon are accurately ground with a special undercut for durability and knife-like cutting on wood and lead alike. Furthermore, as indicated by the dot and dash lines *a* and *b* in Fig. 2, the inner end portions of the cutters have a slight taper so as to enable making a longer point, as at 20, on the pencil than would be permitted were the point a direct continuation of the taper 21 on the end of the pencil 22, as illustrated in Fig. 1*a*. The sharpness of the pencil point must, therefore, be determined, at least in part, by the closeness of spacing of the inner ends of the cutters 14, and, obviously, that leaves very little room through which to operate any adjustable stop means for abutment with the pencil point to predetermine by the setting thereof the sharpness of the point by predetermining the length of the lead beyond the taper of the wood on the pointed end of the pencil. This limitation upon the design of a pencil sharpener with an outside-operable point sharpener adjustment is what led others, like the patentee Yerkes, mentioned above, to conclude that the pencil sharpener would have to be substantially completely redesigned to the extent of utilizing the cutters 14 to cut all but the point portion of the lead and providing a separate axially adjustable blade with a V-shaped cutting edge on the inner end thereof to cut the point on the lead to whatever sharpness of point was desired and predetermined by the adjustment of this blade. This blade was necessarily a hardened blade and precautions had to be taken to insure against its coming into contact with the revolving cutters, and that explains the change by Yerkes, for example, in the spacing of the revolving cutters to the extent where they were capable of attending to only a part of the cutting operation. However, I have found a much more practical solution to the problem, by providing an auxiliary cutter blade 24 that serves partly as a blade and partly as a stop, the same having a V-shaped cutting edge 25 provided on the inner end thereof to trim only the very end of the pencil lead, as at 26, regardless of the length of the protruding point portion (as should be evident from a comparison of Figs. 1*a* and 1*b*), this blade 24 being cut away intermediate its ends, as at 27, to eliminate any likelihood of any rubbing contact with the cutters 14 or their drive pinions 16, the cutters being as closely spaced as the substantially complete sharpening operation on the pencil requires. The blade 24 is connected on the outer side of the cut-out portion 27, as at 28, with the manually adjustable stem 29 that is adjustable axially from the outer end of the crank-operated shaft 11 by means of a knob 30, and said blade 24 being slidably guided by its longitudinal edge portions both inwardly and outwardly relative to the converging end portions of the cutters 14, so as to keep the blade in the central plane clear of the cutters 14 and also positively insure the accurate positioning thereof coaxially with respect to the pencil being sharpened and the axis of operation of the sharpener, so that the apex of the V 25 is always on the axis of operation regardless of the ex-

tent of axial adjustment of the blade 24. This fine hair accuracy as to location of the apex of the V 25 would be practically impossible of attainment if the blade 24 were guided only behind, that is to say on the crank side of the converging end portions of the cutters 14, but it is relatively easily obtainable when, in accordance with my invention, radially adjustable guide plates 31 and 32 are provided, affording on their diametrically opposed inner ends guide grooves 33 in which the inner end portion of the blade 24 has a close working fit. The plates 31 and 32 are adjustable radially and infinitesimally on the flat faces 34 on lugs 35 provided on diametrically opposite sides of the frame 12. The faces 34 are accurately formed in parallel relation to a plane through the axis of rotation of frame 12 and are so spaced from said plane that the grooves 33 will guide the blade 24 accurately in the aforesaid plane. Screws 36, which are threaded in holes in the lugs 35, extend freely through holes 37 in the radially outer end portions of the plates 31 and 32, and serve, when tightened, to clamp the plates 31 and 32 in their accurately adjusted positions, providing not only for the desired closeness of fit between the parts 24, 31 and 32, but also the close accuracy required so far as the location of the apex of the V 25 is concerned. Consequently there is evenly balanced application of cutting pressure to the protruding end portion of the lead being pointed, as at 26 in Figs. 1a and 1b, and the small amount of scraping done by the V-shaped cutting edge 25 does not involve any likelihood of the blade gouging the lead and breaking off the point.

In operation, when the blade 24 is adjusted to the extreme retracted position, as shown in Fig. 1, the sharpest and longest point illustrated in Fig. 1a is producible, and it is obvious that the cutters 14 perform substantially the entire cutting operation on the wood and lead, the V-shaped cutting edge 25 on the blade 24 serving merely to trim or taper the tip portion, as at 26, so as to give a substantially uniform writing quality regardless of the sharpness or bluntness of the pencil point. The sharpened tip 26 of the pencil point 20 abuts the apex of the V on the blade 24, and in that way the sharpening operation is limited both by engagement of the tapered end portion 21 of the pencil on the converging sides of the portion 19 of the frame 12 and by abutment of the tip 26 of the pencil point 20 at the apex of the V 25. Now, on the other hand, if the blade 24 is adjusted inwardly by means of the stem 29 to any position within the range of axial adjustment of the blade, it should be evident that the pencil point produced will accordingly be shorter and blunter, as illustrated, for example, in Fig. 1b, although even with such a blunt point the tapered tip 26 produced by the V-shaped cutting edge 25 assures good writing qualities, the insertion of the pencil in this instance being again limited both by abutment of the pencil point with the apex of the V 25 and by abutment of the tapered end portion 21 of the pencil shaft with the taper in the portions 19 of the frame 12. The fact that the plates 31 and 32 are so accurately adjusted to keep the apex of the V 25 on the axis of rotation throughout the range of adjustment of the blade 24 assures satisfactory operation of the sharpener in all stages of adjustment for any pencil point the operator may select.

The means for adjusting the blade 24 and indicating the adjustment selected is like that dis-

closed in the copending application Serial No. 77,562, in which I am named as joint inventor with Andrew P. Solem, and it will suffice to state that the stem 29 has an enlarged threaded portion 38, which threads in the internally-threaded outer end portion 39 of the bore 40 of a sleeve 41 that forms an axial extension of the shaft portion 11 of the rotary frame 12, and that there are diametrically opposed grooves 42 extending longitudinally in the bore 40 of the sleeve 41 and the continuation 43 of this bore in the frame 12, and that the opposed longitudinal edge portions of the blade 24 are slidable in these grooves 42 as should be evident from Figs. 1 and 2, whereby to provide, supplementary to the guiding function of the plates 31 and 32, guides for the blade 24 outwardly relative to the converging end portions of the cutters 14, to keep the blade 24 in the central plane clear of the cutters 14, so that the blade 24, which is, of course, hardened, as required, will not dull the inner end portions of the cutters 14 by rubbing contact therewith, despite the fact that the cutters 14 are spaced in the same closely spaced relation as heretofore. The annularly flanged head 28 provided on the inner end of the stem 29 works in a T-slot 44 provided in the outer end of the blade 24 for a swivel operating connection. The hub 45 of the crank 13 is suitably threaded onto the outer end of the sleeve 41 and has an annular recess 46 therein in which the rim portion of cupped indicator dial 47 is slidably and freely rotatable, this dial being secured to the stem 29 by means of the knob 30 and having triangular-shaped indicator markings 48 on the periphery thereof in circumferentially spaced relation, as fully illustrated and described in a copending application, Serial No. 77,562, filed February 21, 1949. With these markings the operator can see in advance of sharpening a pencil the kind of point he will obtain with any given setting, because the farther the stem 29 is adjusted inwardly by means of the knob 30 the more the apex portions of the triangular markings 48 are covered up by the hub portion 45. The washers 49 that are compressed between the end of the sleeve 41 and the socket in the end wall of the hub 45 exert a friction drag on the stem 29 to hold the stem in any position of adjustment, so that it will not be apt to be turned accidentally, or by reason of inertia, in operation of the crank 13.

In conclusion, attention is called in Figs. 4 and 5, to the fact that the sleeve 41, which is of any suitable metal, is preferably in the form of an insert in the die-cast frame 12, the die-cast metal being molded around the inner end portion of the sleeve 41, where annular grooves 50 and a plurality of circumferentially spaced key-projections 51 are provided to insure a good driving connection between the sleeve and body in the finished product. When the sleeve 41 is inserted in the mold of the die-casting machine, the problem of how to close the bore 40 in the tubular part, to prevent molten die-cast metal from entering, is presented, and, with that in mind, a counterbore 52 is provided in the inner end of the sleeve 41 into which a metal slug or disk 53 is pressed to seal the inner end of the bore 40 preliminary to the die-casting operation. Then, after the die-casting operation, a hole is drilled through the slug 53, as at 54, with a drill 55 working in the bore 40 in the sleeve 41 as a guide and drilling the hole 43 as a continuation of the bore 40. The usual finish boring operation trues up the bore 40-43, and grooves 42-42' may be

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broached in one operation, or the previously broached sleeve 41 may be used as a guide in broaching the grooves 42' in the bore 43, cutting through the slug 53 at diametrically opposed points, as indicated at 56. Very little of the original slug 53 is, therefore, left in the final piece, as is indicated in Figs. 2 and 5.

It is believed the foregoing description conveys a good understanding of the objects and advantages of my invention. The appended claims have been drawn to cover all legitimate modifications and adaptations.

I claim:

1. A pencil sharpener comprising a support, a head rotatably mounted on said support, a pair of diametrically opposed substantially cylindrical milling cutters carried by said head with their cutting faces in converging relationship to form a tapered space between said cutters, said cutters being of sufficient length and disposed close enough together to be capable of performing substantially the whole sharpening operation on an elongated pencil, a rectangular blade movable on said head endwise toward and between the converging ends of said cutters and having in its inner end portion a V-shaped cutting edge for tapering only the extreme tip portion of the pencil lead, the endwise adjustment of said blade relative to said cutters predetermining the length of the lead protruding from the pencil when sharpened, guides slidably supporting the opposed longitudinal edge portions of said blade both inwardly and outwardly relative to the converging ends of said cutters whereby positively to prevent rubbing contact of said blade with either of said cutters and also insure accurate location of the apex of the V-shaped cutting edge always on the axis of rotation of said head and disposition of the blade in a plane coincident with said axis in all positions of endwise adjustment of said blade, means for turning said head to operate said cutters, and means for adjusting said blade.

2. A pencil sharpener comprising a support, a head rotatably mounted on said support, a pair of diametrically opposed substantially cylindrical milling cutters carried by said head with their cutting faces in converging relationship to form a tapered space between said cutters, said cutters being of sufficient length and disposed close enough together to be capable of performing substantially the whole sharpening operation on an elongated pencil, a rectangular blade movable on said head endwise toward and between the converging ends of said cutters and having in its inner end portion a V-shaped cutting edge for tapering only the extreme tip portion of the pencil lead, the endwise adjustment of said blade relative to said cutters predetermining the length of the lead protruding from the pencil when sharpened, guides slidably supporting the opposed longitudinal edge portions of said blade inwardly relative to the converging ends of said cutters whereby positively to prevent rubbing contact of said blade with either of said cutters and also insure accurate location of the apex of the V-shaped cutting edge always on the axis of rotation of said head and disposition of the blade in a plane coincident with said axis in all positions of endwise adjustment of said blade, means for turning said head to operate said cutters, and means for adjusting said blade.

3. A pencil sharpener comprising a support, a head rotatably mounted on said support, a pair of diametrically opposed substantially cylindrical

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milling cutters carried by said head with their cutting faces in converging relationship to form a tapered space between said cutters, said cutters being of sufficient length and disposed close enough together to be capable of performing substantially the whole sharpening operation on an elongated pencil, a rectangular blade movable on said head endwise toward and between the converging ends of said cutters and having in its inner end portion a V-shaped cutting edge for tapering only the extreme tip portion of the pencil lead, the endwise adjustment of said blade relative to said cutters predetermining the length of the lead protruding from the pencil when sharpened, means on said head outwardly from the converging ends of said cutters and connected to the outer end portion of said blade to adjust the same endwise, guides on said head between the converging end portions of the cutters disposed in the plane of the blade and adjustable radially relative to said head in said plane into engagement with opposed longitudinal edge portions of said blade for slidably supporting the inner end portion thereof inwardly from the converging ends of said cutters to prevent rubbing contact of said blade with either of said cutters and also insure accurate location of the apex of the V-shaped cutting edge always on the axis of rotation of said head and disposition of the blade in a plane coincident with said axis in all positions of endwise adjustment of said blade, and means for turning said head to operate said cutters.

4. A pencil sharpener comprising a support, a head rotatably mounted on said support, a pair of diametrically opposed substantially cylindrical milling cutters carried by said head with their cutting faces in converging relationship to form a tapered space between said cutters, said cutters being of sufficient length and disposed close enough together to perform the whole sharpening operation on a pencil, the inner end portions of said cutters which cut the lead of the pencil being tapered so that the point produced by the cutters is of smaller angle than the tapered end on the wood of the pencil produced by the cylindrical main portion of the converging cutters, an elongated rectangular blade movable on said head endwise toward and between the converging ends of said cutters and having in its inner end portion a V-shaped cutting edge for tapering only the extreme tip portion of the pencil lead, the endwise adjustment of said blade relative to said cutters predetermining the length of the lead protruding from the pencil when sharpened, guides slidably supporting the opposed longitudinal edge portions of said blade both inwardly and outwardly relative to the converging ends of said cutters whereby positively to prevent rubbing contact of said blade with either of said cutters and also insure accurate location of the apex of the V-shaped cutting edge always on the axis of rotation of said head and disposition of the blade in a plane coincident with said axis in all positions of endwise adjustment of said blade, means for turning said head to operate said cutters, and means for adjusting said blade.

5. A pencil sharpener comprising a support, a head rotatably mounted on said support, a pair of diametrically opposed substantially cylindrical milling cutters carried by said head with their cutting faces in converging relationship to form a tapered space between said cutters, said cutters being of sufficient length and dis-

posed close enough together to perform the whole sharpening operation on a pencil, the inner end portions of said cutters which cut the lead of the pencil being tapered so that the point produced by the cutters is of smaller angle than the tapered end on the wood of the pencil produced by the cylindrical main portion of the converging cutters, an elongated rectangular blade movable on said head endwise toward and between the converging ends of said cutters and having in its inner end portion a V-shaped cutting edge for tapering only the extreme tip portion of the pencil lead, the endwise adjustment of said blade relative to said cutters predetermining the length of the lead protruding from the pencil when sharpened, guides slidably supporting the opposed longitudinal edge portions of said blade inwardly relative to the converging ends of said cutters whereby positively to prevent rubbing contact of said blade with either of said cutters and also insure accurate location of the apex of the V-shaped cutting edge always on the axis of rotation of said head and disposition of the blade in a plane coincident with said axis in all positions of endwise adjustment of said blade, means for turning said head to operate said cutters, and means for adjusting said blade.

6. A pencil sharpener comprising a support, a head rotatably mounted on said support, a pair of diametrically opposed substantially cylindrical milling cutters carried by said head with their cutting faces in converging relationship to form a tapered space between said cutters, said cutters being of sufficient length and disposed close enough together to perform the whole sharpening operation on a pencil, the inner end portions of said cutters which cut the lead of the pencil being tapered so that the point produced by the cutters is of smaller angle than the tapered end on the wood of the pencil produced by the cylindrical main portion of the converging cutters, an elongated rectangular blade movable on said head endwise toward and between the converging ends of said cutters and having in its inner end portion a V-shaped cutting edge for tapering only the extreme tip portion of the pencil lead, the endwise adjustment of said blade relative to said cutters predetermining the length of the lead protruding from the pencil when sharpened, means on said head outwardly from the converging ends of said cutters and connected to the outer end portion of said blade to adjust the same endwise, guides on said head between the converging end portions of the cutters disposed in the plane of the blade and adjustable radially relative to said head in said plane into engagement with opposed longitudinal edge portions of said blade for slidably supporting the inner end portion thereof inwardly from the converging ends of said cutters to prevent rubbing contact of said blade with either of said cutters and also insure accurate location of the apex of the V-shaped cutting edge always on the axis of rotation of said head and disposition of the blade in a plane coincident with said axis in all positions of endwise adjustment of said blade, and means for turning said head to operate said cutters.

7. A pencil sharpener comprising a support, a frame including a hollow driven journal end portion rotatably mounted in and projecting through a bearing on said support, milling cutters carried rotatably in said frame in converging relationship forming between them a space, a gear fixed on the support with which pinions

fixed on the cutters have meshing engagement, whereby to drive said cutters, said frame including longitudinally extending diametrically opposed side portions adjacent the converging end portions of said cutters on which are provided flat surfaces lying in a plane passing midway between said converging ends for adjustably supporting guide plates, guide plates slidably adjustable to an infinitesimal degree radially relative to said frame on said surfaces, means for fastening said plates onto said surfaces in their adjusted position, a blade of rectangular form slidable endwise in said journal for axial adjustment between the converging ends of said cutters, and having its inner end portion closely slidably guided between the radially inner ends of said guide plates for endwise movement solely on the axis of rotation of said frame and journal, said blade having a V-shaped cutting edge on its inner end for tapering only the extreme tip portion of the pencil lead, the endwise adjustment of said blade relative to said cutters predetermining the length of the lead protruding from the pencil when sharpened, a rotatable handle having a hub portion fixed on the outer end portion of said journal for turning said frame, and an adjusting stem threaded axially in the journal and having a swivel operating connection with the outer end of said blade to move the same selectively in either direction a selected distance.

8. A pencil sharpener comprising a support, a frame including a hollow driven journal end portion rotatably mounted in and projecting through a bearing on said support, milling cutters carried rotatably in said frame in converging relationship forming between them a space, a gear fixed on the support with which pinions fixed on the cutters have meshing engagement, whereby to drive said cutters, said frame including longitudinally extending diametrically opposed side portions adjacent the converging end portions of said cutters on which are provided flat surfaces lying in a plane passing midway between said converging ends for adjustably supporting guide plates, guide plates slidably adjustable to an infinitesimal degree radially relative to said frame on said surfaces, means for fastening said plates onto said surfaces in their adjusted positions, a blade of rectangular form slidable endwise in said journal for axial adjustment between the converging ends of said cutters, and having its inner end portion closely slidably guided between the radially inner ends of said guide plates for endwise movement solely on the axis of rotation of said frame and journal, said blade having a V-shaped cutting edge on its inner end for tapering only the extreme tip portion of the pencil lead, the endwise adjustment of said blade relative to said cutters predetermining the length of the lead protruding from the pencil when sharpened, a rotatable handle having a hub portion fixed on the outer end portion of said journal for turning said frame, and an adjusting stem threaded axially in the journal and having a swivel operating connection with the outer end of said blade to move the same selectively in either direction a selected distance, the outer end portion of said stem projecting axially from the outer end of said journal and providing a knob for direct manual adjustment of said blade from outside said sharpener.

9. A pencil sharpener as set forth in claim 7 wherein said plates have grooves provided in their inner ends wherein the opposed longitudi-

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dinal edge portions of said blade are slidably engaged for a close guiding function.

10. A pencil sharpener as set forth in claim 7 wherein said plates have grooves provided in their inner ends wherein the opposed longitudinal edge portions of said blade are slidably engaged for a close guiding function, and wherein said journal has grooves provided therein in coplanar relationship with the grooves in said plates and also slidably receiving the opposed longitudinal edge portions of said blade but with a looser fit.

11. A pencil sharpener comprising a support, a head rotatably mounted on said support, a pair of diametrically opposed substantially cylindrical milling cutters carried by said head with their cutting faces in converging relationship to form a tapered space between said cutters, said cutters being of sufficient length and disposed close enough together to perform substantially the whole sharpening operation on a pencil, said head having an elongated tubular axial drive extension received in and projecting through a bearing provided therefor on said support, there being drive pinions on said cutters meshing with a gear fixed on said support, and a hand crank attached to the outer end of said tubular extension to drive said head, an elongated, rectangular, combination pencil point trimmer and stop blade slidably guided by its longitudinal edge portions in grooves provided inside said extension extending lengthwise thereof, whereby the blade is movable endwise substantially axially relative to the head in a plane between the converging ends of said cutters, the inner end portion of said blade having a V-shaped cutting edge therein for trimming abutment with the tip of a pencil point and as a limiting stop therefor, means adjustable externally of the sharpener axially in the outer end of said extension adapted to transmit endwise adjustment movement to said blade, and radially adjustable guides on said head on the opposite side of the converging ends of said cutters from said drive extension disposed in coplanar relationship with the guide grooves in said extension and slidably engaging with a close fit the longitudinal edge portions of said blade, whereby said guides, when properly adjusted, insure accurate location of the apex of the V-shaped cutting edge on the axis of rotation of said head in all positions of endwise adjustment of said blade.

12. As an article of manufacture, a rotary frame for supporting the milling cutters of a crank operated pencil sharpener, said frame including a main body casting terminating at one end in a tubular driven journal portion of another metal, said journal tube having a counterbore provided in its inner end, and a metal disc inserted tightly in said counterbore to seal the tube during the casting of the body integral with the inner end portion of said tube, said disc having a hole provided therein in register with the bore of the tube and with a bore provided in the cast main body portion of said frame.

13. As an article of manufacture, a rotary frame for supporting the milling cutters of a crank operated pencil sharpener, said frame including a main body casting terminating at one end in a tubular driven journal portion of another metal, and a cover element sealing the inner end of said tube during the casting of the body integral with the inner end portion of said tube, said cover element having a hole provided therein in register with the bore of the tube and

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with a bore provided in the cast main body portion of said frame.

14. As an article of manufacture, a cast body having a tubular extension formed by a tube of other metal as an insert in the casting of said body in a mold, the tube having a counterbore provided in its inner end, and a metal disc fitting tightly in said counterbore to seal the bore of said tube during the casting of said body integral with the inner end portion of said tube, said disc having a hole provided therein in register with the bore of the tube and with a bore provided in the cast body.

15. As an article of manufacture, a cast body having a tubular extension formed by a tube of other metal as an insert in the casting of said body in a mold, and a cover element sealing the inner end of said tube during the casting of said body integral with the inner end portion of said tube, said cover element having a hole provided therein in register with the bore of the tube and with a bore provided in the cast body.

16. A pencil sharpener comprising a support, a head rotatably mounted on said support, a pair of diametrically opposed substantially cylindrical milling cutters carried by said head with their cutting faces in converging relationship to form a tapered space between said cutters, said cutters being of sufficient length and disposed close enough together to be capable of performing substantially the whole sharpening operation on a pencil, an elongated rectangular blade movable on said head endwise toward and between the converging ends of said cutters, the endwise adjustment of said blade relative to said cutters predetermining the length of the lead protruding from the pencil when sharpened, guides slidably supporting the opposed longitudinal edge portions of said blade both inwardly and outwardly relative to the converging ends of said cutters whereby positively to prevent rubbing contact of said blade with either of said cutters and also insure accurate disposition of the blade in a plane coincident with the axis of rotation of said head in all positions of endwise adjustment of said blade, means for turning said head to operate said cutters, and means for adjusting said blade.

17. A pencil sharpener comprising a support, a head rotatably mounted on said support, a pair of diametrically opposed substantially cylindrical milling cutters carried by said head with their cutting faces in converging relationship to form a tapered space between said cutters, said cutters being of sufficient length and disposed close enough together to be capable of performing substantially the whole sharpening operation on a pencil, an elongated rectangular blade movable on said head endwise toward and between the converging ends of said cutters, the endwise adjustment of said blade relative to said cutters predetermining the length of the lead protruding from the pencil when sharpened, guides slidably supporting the opposed longitudinal edge portions of said blade inwardly relative to the converging ends of said cutters whereby positively to prevent rubbing contact of said blade with either of said cutters and also insure accurate disposition of the blade in a plane coincident with the axis of rotation of said head in all positions of endwise adjustment of said blade, means for turning said head to operate said cutters, and means for adjusting said blade.

18. A pencil sharpener comprising a support, a head rotatably mounted on said support, a pair

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of diametrically opposed substantially cylindrical milling cutters carried by said head with their cutting faces in converging relationship to form a tapered space between said cutters, said cutters being of sufficient length and disposed close enough together to be capable of performing substantially the whole sharpening operation on a pencil, an elongated rectangular blade movable on said head endwise toward and between the converging ends of said cutters, the endwise adjustment of said blade relative to said cutters predetermining the length of the lead protruding from the pencil when sharpened, means on said head outwardly from the converging ends of said cutters and connected to the outer end portion of said blade to adjust the same endwise, guides on the head between the converging end portions of the cutters disposed in the plane of the blade and adjustable radially relative to said head in said plane into engagement with opposed longitudinal edge portions of said blade for slidably supporting the inner end portion thereof inwardly from the converging ends of said cutters to prevent rubbing contact of said blade with either of said cutters and also insure accurate disposition of the blade in a plane coincident with the axis of rotation of said head in all positions of endwise adjustment of said blade, and means for turning said head to operate said cutters.

19. A pencil sharpener comprising a support, a frame including a hollow driven journal end portion rotatably mounted in and projecting through a bearing on said support, milling cutters carried rotatably in said frame in converging relationship forming between them a space, a gear fixed on the support with which pinions fixed on the cutters have meshing engagement, whereby to drive said cutters, said frame including longitudinally extending diametrically opposed side portions adjacent the converging end

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portions of said cutters on which are provided flat surfaces lying in a plane passing mid-way between said converging ends for adjustably supporting guide plates, guide plates slidably adjustable to an infinitesimal degree radially relative to said frame on said surfaces, means for fastening said plates onto said surfaces in their adjusted position, a blade of rectangular form slidable endwise in said journal for axial adjustment between the converging ends of said cutters, and having its inner end portion closely slidably guided between the radially inner ends of said guide plates for endwise movement solely on the axis of rotation of said frame and journal, the endwise adjustment of said blade relative to said cutters predetermining the length of the lead protruding from the pencil when sharpened, a rotatable handle having a hub portion fixed on the outer end portion of said journal for turning said frame, and an adjusting stem threaded axially in the journal and having a swivel operating connection with the outer end of said blade to move the same selectively in either direction a selected distance.

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