July 11, 1961 G. DAHLE 2,991,757

LEAD SHARPENING MACHINE

Filed July 8, 1957 2 Sheets-Sheet 1

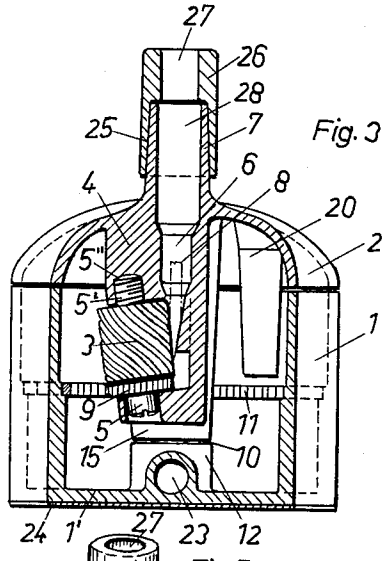



Fig. 3

Fig.2

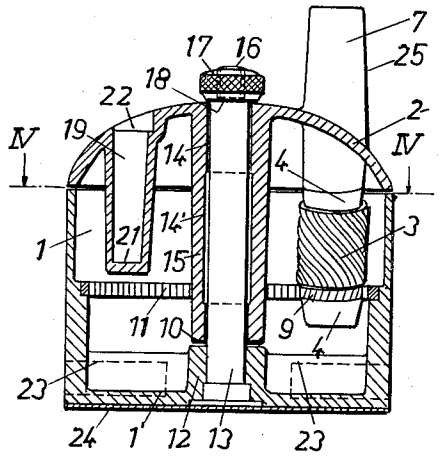



Fig.5

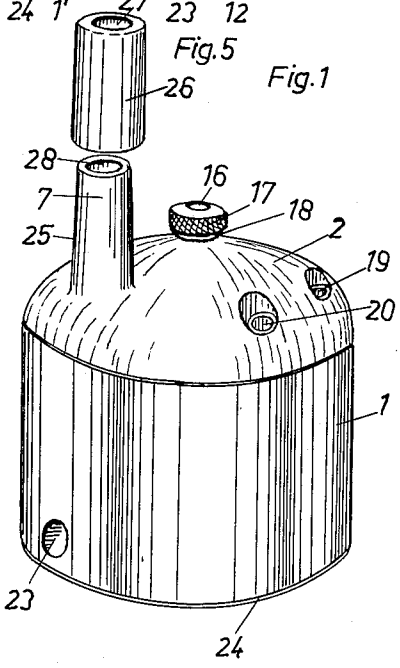
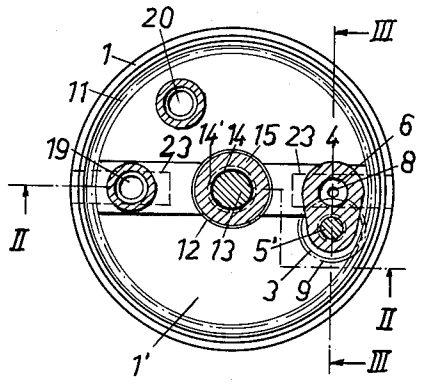



Fig.1

Fig.4




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LEAD SHARPENING MACHINE

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2 Sheets-Sheet 2

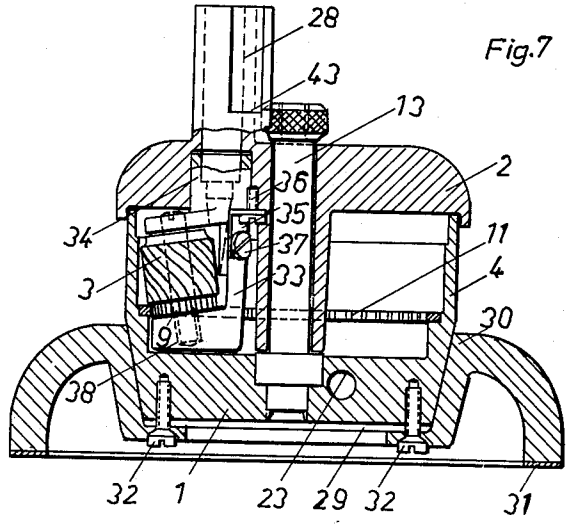



Fig.7

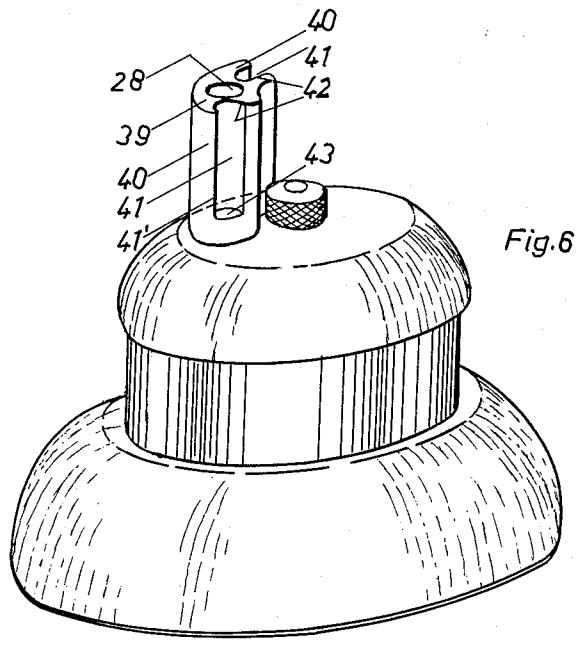



Fig.6

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2,991,757

Patented July 11, 1961



2,991,757

# LEAD SHARPENING MACHINE

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Filed July 8, 1957, Ser. No. 670,402
Claims priority, application Germany July 10, 1956
7 Claims. (Cl. 120—96)

The present invention relates to a machine for sharpening pencil leads in adjustable lead holders.

The simplest, although most time-consuming method of sharpening the leads in such lead holders is by means of an emery board on which the lead is rubbed back and forth until is has the desired point. There have been mechanical devices operating on the same principle as well as such lead sharpeners in which the lead was sharpened by means of cutting blades. All of these prior sharpening means not only had the disadvantage that the sharpening operation was rather complicated and tedious and required considerable time, but also that the lead dust scraped off during such operation easily soiled the draftsman's hands, clothes, or the drawing on which he was working.

The attempt has therefore been made to overcome these disadvantages by providing the abrasive surfaces on which the leads are to be sharpened within a housing which consisted of two parts which were rotatable relative to each other, and to carry out the sharpening operation by passing the leads which were held in one part of the housing along the abrasive surface in the other part when the two parts were rotated relative to each other. Although lead sharpeners of these kinds prevent the lead dust from falling out during the sharpening operation, they have the disadvantage that the leads break off very easily therein and that the abrasive surfaces are quickly clogged which also results in an uneven sharpening of the leads and thus in poor lead points. Furthermore, when the sharpened leads were withdrawn from the sharpener, a considerable amount of lead dust adhered to the lead tip which, in turn, soiled the hands, clothes, or workplace of the draftsmen. Although special wipers were provided on some of these sharpeners, into which the lead after being sharpened was inserted, they were never fully satisfactory and only complicated the proceeding.

It is the object of the present invention to provide a lead sharpening machine which completely overcomes the above-mentioned disadvantages and consists of a housing which has two parts which are rotatable relative to each other. One of these housing parts has an opening disposed eccentrically thereto, into which the lead to be sharpened is inserted. This first part carries a milling cutter. When the first part in which the lead insert opening is provided is rotated, the cutter is also rotated by means of a gearing and engages and sharpens the lead which is held stationary within its adjustable lead holder. Because of the eccentric position of the lead and the lead opening, the cutter will then revolve around the lead and sharpen the point thereof symmetrically. The use of a milling cutter has the advantage over emery and similar abrasives that the adhesion of fine dust particles of lead on the finished lead point will be avoided so that no additional means for wiping off such lead dust are required.

The invention further provides for the use of a planetary gear for driving the cutter. For this purpose, one of two parts of the housing carries a stationary gear rim with its teeth extending inwardly which are in mesh with those of a gear which is secured to the cutter. The rotation of the cutter is therefore produced by the revolving movement of its gear along the inner teeth of the gear rim on the other housing part.

According to another feature of the invention, the milling cutter is rotatably mounted within a support which is secured to or forms an integral portion of the housing part in which the lead-insert opening is provided. The cutter is disposed in this housing part in such a position that the axis of the cutter extends at an inclined angle to the axis of the lead-insert opening. This necessarily requires that the teeth of the gear which is secured to the cutter have to be inclined in accordance with the degree of inclination of the cutter axis.

For guiding the two housing parts so as to be rotatable relative to each other, the invention further provides the inside of the housing part which carries the lead-insert opening with a centering extension. This extension has a central bore therein which serves as a bearing for rotating this housing part on a cylindrical extension on the inside of the other housing part. The two parts of the housing are thus accurately centered relative to each other. The different portions of the two housing parts which extend into each other are preferably balanced relative to each other so as to reduce the frictional resistance between the two parts and to permit an easy operation and manipulation of the machine.

According to another feature of the invention, the cylindrical extension of one part engaging into the centering extension of the other part also serves as a means of supporting these two relatively rotatable parts in their axial direction relative to each other. For this purpose, the cylindrical extension is preferably made of a length so as to extend through and beyond the other housing part carrying the lead-insert opening, and its free end is provided with screw threads for receiving a clamping member, for example, a knurled nut, which engages with the upper surface of the other housing part.

Another feature of the invention consists in the provision of a tubular sleeve which is mounted on the outside of the housing part containing the lead-insert opening and forms an upward extension thereof. This sleeve serves as a support of a lead holder of the type most frequently used and therefore has an inner diameter substantially corresponding to the outer diameter of such lead holder.

Another feature of the invention consists in the provision of one or more adapter sleeves which may be mounted on the outer wall of the last-mentioned tubular sleeve and have a smaller inner diameter than such sleeve. In this event, the opening in the main sleeve on the housing is preferably made of a larger size so as to accommodate the thickest lead holder in use, while the adapter sleeves have a smaller inner diameter to accommodate thinner lead holders. The outer wall of the main sleeve on the housing is preferably of a frusto-conical shape, and the inner wall of each adapter is preferably shaped accordingly so as to fit tightly on the main sleeve.

In order to avoid excessive sharpening of the lead and an unnecessary loss of lead material, the invention further provides at least one socketlike lead-gauging member in or on the housing part carrying the lead-insert opening. This socketlike member is provided with a bottom which serves as a stop for the leads to be sharpened in the machine and is spaced from the outer edge of the member at a distance corresponding to the length of the lead portion which has to be advanced from the forward end of the lead holder in order to insure a fine point on the lead without wasting any lead material. To adjust the lead to its proper length from the forward end of the lead holder, the latter is rested on the outer edge of the socket, whereupon the feed knob or the like of the lead holder is depressed so as to feed the lead forwardly until it engages with the bottom of the socket.

According to another feature of the invention, this socketlike member is preferably made so as to permit an inspection of the lead feeding operation and also an easy

removal of any lead portions which might have broken off within the socket. In a preferred embodiment of the invention, the tubular sleeve member in which the lead holder is guided is provided with one or more lateral extensions in which recesses are provided which preferably extend parallel to the axis of the channel into which the lead holder is to be inserted and which are provided with lateral openings. These openings serve for inspecting that the lead is advanced to its proper length, that is, to the bottom of the recess, and they also permit any broken lead portions to be easily removed from the recess without requiring the entire machine to be tilted.

For insuring an easy operation of the machine, it is further advisable to mount it in a firm position. For this purpose, that part of the housing opposite to the part carrying the lead-insert opening, as well as the cutter, may be provided with suitable means removably clamping the machine upon a table or wall surface. Either alternately of or in addition to such clamping means, the bottom surface of the mentioned housing part may also be provided with a suction or friction member which has the tendency to stick to a table or wall surface to prevent such lower housing part from rotating when the upper part is operated to sharpen a lead. Such suction or friction member may, for example, consist of a layer of very adhesive rubber. According to a preferred embodiment of the invention, the lower part of the housing may for this purpose also be tightly fitted into or secured within a larger heavy base, the bottom of which may be likewise provided with a suction or friction surface as above described. The lower end of the lower housing part is then preferably made of a slightly frusto-conical shape so as to be fitted tightly into a central recess in the base of a corresponding shape. If necessary, the base may be additionally secured to the machine by one or more bolts.

Further objects, features, and advantages of the present invention will appear from the following detailed description thereof, in which—

FIG. 1 shows a perspective view of a lead-sharpening machine according to the invention;

FIG. 2 shows a cross section taken along line II—II of FIG. 4;

FIG. 3 shows a cross section taken along line III—III of FIG. 4;

FIG. 4 shows a cross section taken along line IV—IV of FIG. 2;

FIG. 5 shows a perspective view of an adapter for holding lead holders of smaller diameter;

FIG. 6 shows a perspective view of a modification of a lead sharpener according to the invention; while

FIG. 7 shows the lead sharpener according to FIG. 6 partly in a vertical cross section.

As illustrated in the drawings, and first referring particularly to FIGS. 1 to 4, the housing of the lead sharpening machine consists of a lower part **1** and an upper part or cap member **2** which is rotatable relative to the lower part and carries an inner extension **4** for supporting a milling cuter **3**. Cutter **3** is rotatably mounted on the shaft of a screw **5**, the threaded end portion **5'** of which is screwed into the inner threads **5''** of supporting member **4**. The cap portion **2** is further provided with a socket including a channel **6** which is eccentrically arranged with respect to said cap and is adapted to receive the lead **8** to be sharpened. At the upper end of cap member **2**, bore or channel **6** is extended by a tubular portion **7** which is adapted to guide the lead holder and has a frusto-conical outer wall. For rotating cutter **3** about the shaft or screw **5**, cutter **3** has a gear **9** secured to its lower end which meshes with a gear rim **11** which is secured to the inner wall of housing part **1**. Since the axis of cutter **3** is inclined relative to the vertical axis of the lead channel **6**, gear **9** is also provided with inclined teeth. Thus, when housing part **1** is rotated, such motion is transmitted through gears **11** and **9** to cutter **3**.

The two parts **1** and **2** of the housing are centrally connected to each other by a cylindrical bolt or shaft **13** which is secured to cap member **2**. For this purpose, the cap member **2** has a tubular central extension or web **15** which projects into the lower part **1** and has a bore **14** through which bolt **13** extends and which is relieved at its middle portion **14'**. At its upper end, extending through cap member **2**, bolt **13** has a screw-threaded part **17** on which a knurled nut **17** is screwed to engage at **18** with cap member **2**. Bolt **13** and its knurled nut **17** prevent the relatively rotatable parts **1** and **2** of the housing from shifting in an axial direction and thus insure a permanent meshing engagement of gear **9** with the peripheral gear or gear rim **11**. The bottom portion **1'** of the lower housing part **1** has a central flange **12** which serves as a bearing member of cap member **2**, since the lower surface **10** of the tubular web **15** of member **2** slidably engages with the upper end surface of flange **12**. For adjusting the leads so as to extend the proper distance from the lead holder, cap member **2** further has a pair of recessed portions **19** and **20** of two different diameters formed by suitable webs, the inner bottom **21** of which serves as a stop of the leads. The lead holder is then placed vertically upon the edge surface **22** of the respective recess **19** or **20** and the lead is then fed forwardly therein until its tip engages with the bottom **21**, whereupon the lead holder is tightened on the lead to retain it in such adjusted position. The lower part **1** of the housing also has a pair of opposite recesses **23** which extend transverse to the vertical axis and are adapted to receive suitable means for securing the lead sharpening machine on a table surface or the like. The lower bottom surface **1'** of the lower part **1** is preferably provided with a layer of a material which has a high coefficient of friction so as to prevent the lower part **1** from rotating while the leads are sharpened. An adapter **26** with a central bore **27** may be fitted upon the tubular portion **7** and has an inner diameter smaller than the bore **28** within portion **7**, whereby a lead holder of a smaller diameter may also be properly guided and prevented from assuming an angular position.

The lead sharpening machine illustrated in FIGS. 6 and 7 is substantially similar to that shown in FIGS. 1 to 5. The two parts **1** and **2** of the housing are likewise rotatable relative to each other and connected to each other by a cylindrical bolt **13** and a knurled nut **17**. As shown particularly in FIG. 7, the lower end of housing part **1** is of frusto-conical shape and is fiitted into a corresponding recess **29** of a base **30** which serves as a support of the machine. By means of this base **30**, the machine may be rested on a table surface or the like without being clamped thereon. On its lower side, base **30** is provided with a large friction layer **31** which prevents the base from turning on the table surface when the machine is operated. Screws **32** may be additionally provided to secure housing part **1** to base **30** and prevent its rotation relative thereto. The lead sharpening machine according to FIGS. 6 and 7 may also be used separately from base **30**; and for this purpose the lower housing part **1** also has an aperture **23** for receiving suitable means for clamping the machine upon a table surface.

As further shown in FIG. 7, the cutter support **33** is made as an element separate from cap member **2**, and it is connected to the latter by means of the cylindrical extension **34**. In order to prevent cutter support **33** from rotating relative to cap member **2**, an angular bracket **35** is secured by a screw **36** to cap member **2** and by a screw **37** to cutter support **33**. Cutter **3** is rotatably mounted on cutter support **33** by means of a screw **38** which is screwed from above into the cutter support. The tubular portion **39** extending upwardly from cap member **2** for guiding a lead holder has lateral extensions **40** with recesses **41** therein for adjusting the

lead to the proper length from the tip of the lead holder. For this purpose, the tip of the lead holder is rested upon the upper edge of the respective recess **41**, whereupon the lead is fed forwardly until it engages with the bottom **43** of the recess. Each recess **41** has a lateral longitudinal opening **41'** through which the feeding of the lead can be observed and broken pieces of lead can be easily removed from the respective recess **41** without requiring any tilting of the entire machine. Similarly as shown in FIGS. 1 to 4, the cutter **3** of the machine according to FIGS. 6 and 7 is driven by a gear **9** which is secured thereto and in meshing engagement with a gear rim **11** which is secured to the inner wall of housing part **1**. When the cap member **2** is then rotated relative to the stationary parts **1** and **30**, gear **9** revolves along gear rim **11** and thereby rotates cutter **3**.

Although my invention has been illustrated and described with reference to the preferred embodiments thereof, I wish to have it understood that it is in no way limited to the details of such embodiments, but is capable of numerous modifications within the scope of the appended claims.

Having thus fully disclosed my invention, what I claim is:

1. A lead sharpening machine for mechanical pencils in which the lead is adjustably held in a lead holder, said machine comprising, in combination: a housing having an upper rotatable dome-shaped cover member and a lower stationary body member; a centrally located hollow projection extending downwardly from said cover member into the interior of said housing; bearing means arranged axially opposite the free end of said projection of said cover member and forming a seat for said projection; a central cylindrical guiding and connecting member fitting into said projection and secured in said bearing means for rotatably connecting said cover member to said body member; a socket arranged eccentrically on said cover member and projecting outwardly therefrom, said socket extending through said cover member and ending in the interior of said housing, said socket being formed with an upper insert bore for receiving and guiding the lead holder, an intermediate bore part forming an upper abutment shoulder for the lead holder, a lower conical bore part at the lower end of said socket, said conical bore part being adapted to receive and guide the lead held in the lead holder, and a lateral opening at said lower conical bore part; a supporting member secured to said socket in the interior of said housing; a milling cutter rotatably mounted in said supporting member, the central axis of said cutter being inclined with respect to the longitudinal axis of said housing at an angle corresponding to the taper of the tip of the lead to be sharpened, said milling cutter being supported adjacent to and communicating with said conical bore part through said lateral opening; a gear secured to said cutter; and an internal gear rim with teeth parallel to the rotation axis of said cover member, said gear rim being secured on the inner circumference of and within said body member and engaging said gear on said cutter.

2. A lead sharpening machine according to claim 1, wherein said projection extends downwardly from said upper housing part, and wherein said bearing means comprise another projection extending upwardly from said lower housing part, said latter projection forming at its upper end said seat for said first projection.

3. A lead sharpening machine according to claim 1, wherein said socket has an upwardly directed tubular extension having an inner diameter corresponding to one size of lead holders, and wherein a tubular adapter is provided having a lower part with a recess of a size corresponding to the outer size of said extension, so that said adapter is adapted to be removably attached to said extension, said adapted having in its upper part an opening with a diameter smaller than the inner diameter of said tubular extension, so that lead holders of smaller sizes than said one size corresponding to the inner diameter of said tubular extension can be received and guided when said adapter is assembled.

4. A lead sharpening machine according to claim 3, wherein said tubular extension is exteriorly of frusto-conical shape, and wherein said lower part of said removable adapter has a correspondingly shaped recess.

5. A lead sharpening machine according to claim 1, wherein an additional socket is provided in said upper housing part extending into the interior of said housing at a point spaced from said eccentrically arranged socket in horizontal direction and parallel thereto, said additional socket including an insert bore and an upper annular shoulder for said lead holder and a lower abutment wall in said additional socket for the lead to be sharpened and spaced from said upper annular shoulder a distance corresponding to the proper length of said lead projecting from said lead holder for advancing said lead from said lead holder to the desired length prior to the insertion of said lead holder and lead into said eccentrically arranged socket for sharpening.

6. A lead sharpening machine according to claim 1, wherein a base member is provided with a central, frusto-conically shaped aperture, the bottom of said lower stationary housing part being likewise frusto-conically shaped to fit tightly into said aperture of said base member.

7. A lead sharpening machine according to claim 1, wherein an additional socket is secured to the outwardly projecting portion of said eccentrically arranged socket on said upper housing part, said additional socket being provided with a lateral opening having at its top a semi-annular shoulder for said lead holder and a lower abutment wall for the lead to be sharpened and spaced from said semi-annular shoulder a distance corresponding to the proper length of said lead projecting from said lead holder for advancing said lead from said lead holder to the desired length prior to the insertion of said lead holder and lead into said eccentrically arranged socket for sharpening.

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