United States Patent

Dahle

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[54] LEAD SHARPENER

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[51] **Int. Cl.** **B43l 23/00**

[58] **Field of Search** 144/28.1, 28.11, 28.2, 28.8, 144/28.9, 28.3, 28.6, 28

[56] **References Cited**

UNITED STATES PATENTS

3,398,773 8/1968 Dahle 144/28.1

FOREIGN PATENTS OR APPLICATIONS

1,107,126 5/1961 Germany 144/28.6

1,114,725 10/1961 Germany 144/28.1

Primary Examiner—Andrew R. Juhasz

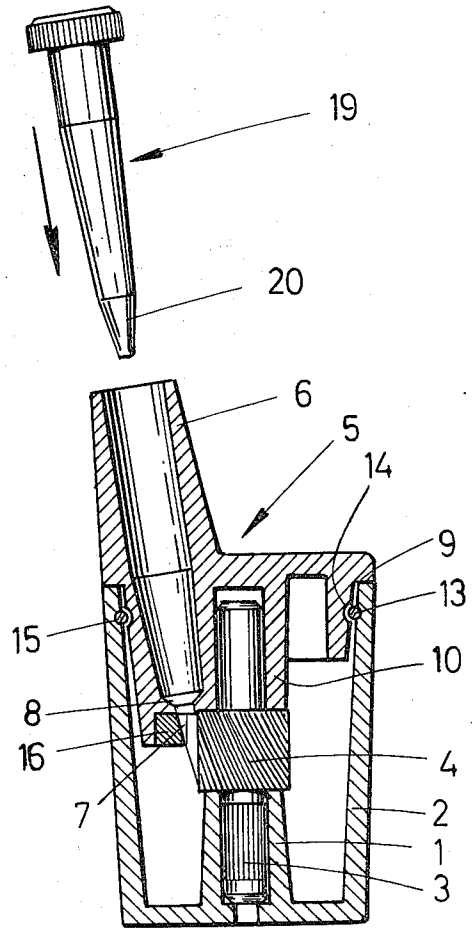
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[57] **ABSTRACT**

A lead sharpener which may be carried in the pocket of a coat and comprises a head with an inclined lead-holder channel which is partly inserted in and rotatable relative to a housing and about a fixed milling cutter in the housing so that the tip of the lead to be sharpened revolves about the cutter. The main weight of this head is located within the housing so as to attain a flywheel effect as closely as possible to the milling cutter when the head is turned to sharpen the tip of a lead.

3 Claims, 2 Drawing Figures



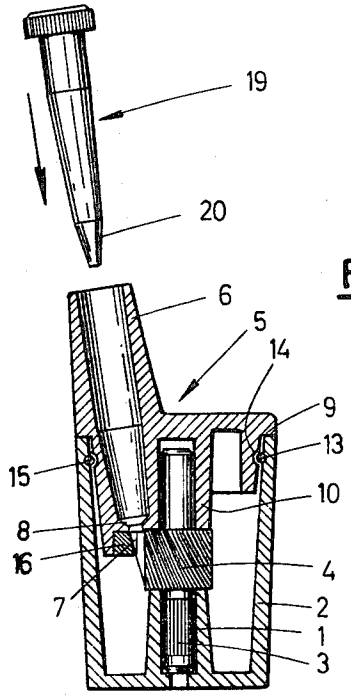


FIG. 1

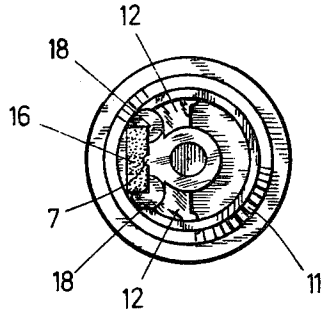


FIG. 2

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LEAD SHARPENER

The present invention relates to improvements in lead sharpeners of the type as disclosed, for example, in the U.S. Pat. No. 3,398,773. This apparatus comprises a cylindrical milling cutter of steel which is nonrotatably mounted in a housing on a stationary shaft, and a head part which is rotatable on the shaft carrying the milling cutter and is provided with a guide channel into which the lead holder is inserted and which is inclined to the axis of the milling cutter. For sharpening a lead in an apparatus of this type, the lead holder from which the lead projects for a certain distance is inserted into the lead-holder channel and held by hand and then moved in a circle together with the entire head around the axis of the milling cutter. In the operation of these lead sharpeners it has been found to be very advisable to design the rotatable head so as to function like a flywheel in order to overcome more easily the small resistances which occur during the revolving milling operation. The rotatable head of such a lead sharpener is usually provided with an annular flange which forms a sealing surface for closing the head relative to the sharpener housing, and the flywheel mass of this head is located above this annular sealing surface.

While the previous lead sharpeners of this type including the one disclosed by the above-mentioned patent are made of a relatively large size since the housing of such a sharpener is intended to be placed upon a solid supporting surface and is either to be pressed by hand against this surface or to be permanently secured thereto, a market analysis has shown that many users of such sharpeners and especially professional draftsmen who need them very frequently would prefer them to be of the smallest size so as to keep them easily in a pocket or in a desk drawer when not needed.

It is an object of the present invention to improve a lead sharpener of the known type as previously described in a manner so as to facilitate its operation, and it is a further object of the invention to provide such a lead sharpener so as to have such a small size as to permit it to be easily carried in a pocket, for example, of a coat.

These objects are attained according to the invention by providing the flywheel masses in such positions on the head part of the lead sharpener that they are located underneath the annular sealing surface formed by the flange of this head part. The main flywheel mass preferably consists of a relatively thick and heavy substantially cylindrical annular part which projects from the sealing flange of the head downwardly into the housing and coaxially to the stationary shaft which carries the milling cutter and on which the head is rotatable. The main flywheel mass of the head is therefore no longer located above the sealing flange but at the inside of the housing and as closely as possible to the milling cutter.

For purpose of making the flywheel mass of the head of the lead sharpener at the inside of the housing as heavy and effective as possible, it is another feature of the invention to design the casting forming the head so that aside from the thick annular projection underneath the annular flange, additional solid masses are provided at both sides of an integrally with the walls of the lead channel and therefore eccentrically to the axis of rotation of the head.

While in the known lead sharpeners of this type the head part is rotatably mounted on the fixed shaft of the milling cutter by means of a small spring ring which is inserted into the rotatable head part and engages into an annular groove in the cutter shaft, the lead sharpener according to the invention which is designed as previously described permits a valuable improvement of these connecting means by providing the outer peripheral surface of the annular projection on the head part which serves as a flywheel with an annular groove into which a large spring ring is inserted and by providing a corresponding groove in the inner wall surface of the housing into which the spring ring snaps when the parts of the head underneath the annular flange are inserted into the housing.

The provision of the spring ring in corresponding grooves in the annular projection on the head part and in the wall of the

housing has several additional advantages. While the relatively large housing of one of the known lead sharpeners as previously described was intended to rest on a supporting surface or to be secured thereto, the graphite powder which was ground off the lead was collected in the housing and could not pass to the outside at least unless the entire lead sharpener was turned over. Different conditions prevail, however, in a small lead sharpener which may be carried in a clothes pocket. Unless special sealing means are provided, the fine graphite powder may in this case penetrate between the annular surface of the rotatable head part and the adjacent upper edge of the housing and then soil the pocket from which it can hardly be removed again. Thus, while in one of the previous lead sharpeners with a more or less stationary housing no special sealing means had to be provided, such means are absolutely required in a pocket sharpener. In this case the invention provides the spring ring also to serve as a sealing ring by designing it so as to engage with such a spring pressure into the annular groove in the housing wall that it will be in a fixed position therein when the head part is rotated. The head part therefore rotates about the fixed spring ring which thus produces a very good sealing effect. When the head part is inserted and the spring ring is snapped into the groove in the housing, the gap between the ends of the spring ring is so small that, even when intentionally tried, it would be very difficult to shake any graphite powder through this gap and out of the housing.

In a small lead sharpener of the type as described another phenomenon occurs which will occur only to a small extent in a larger apparatus, namely, a very high friction between the lead guiding channel and the lead. Since when sharpening a lead the outwardly projecting part of the lead holder is gripped by the hand while rotating the head part of the sharpener, the lead rotates relative to the wall of the lead channel. Since the rotatable head part usually consists of die-cast zinc, the friction occurring between the lead and the zinc lead channel of the small sharpener according to the invention is so high that it is difficult to carry out a continuous rotary movement and a kind of chattering movement will easily occur. This disadvantage may be overcome by another feature of the invention, namely, by providing the sharpener with an insert which contains the lead channel and consists of a highly wear-resistant material and by reinforcing the parts of the head in which this insert is mounted so as also to form flywheel masses which are integral with but eccentrical to the main flywheel mass of of the annular projection underneath the flange of the head. Since the coefficient of friction of the highly wear-resistant material of the lead-channel insert which preferably consists of a sintered metal is only a small fraction of the coefficient of the die-cast zinc of the head itself, the rotation of the head during the sharpening operation will be smooth and uniform. This is further insured by the inertia of the flywheel action of the head including that of the eccentrical reinforcements of the parts in which the lead-channel insert is mounted.

While previously the importance of the good sealing effect between the head and the housing has been mentioned which is attained by the spring ring, there is still another point where the fine graphite powder may fall out of the sharpener, namely, from the outer end of the lead-holder guide. In order to prevent this, it is another feature of the invention to provide a removable plug which is adapted to be inserted into the lead-holder guide. However, instead of employing a plug which merely closes the outer end of the lead-holder guide in a manner similar to that in which a bottle or tube may be closed by a conventional plug, the plug according to the invention is designed so as to seal primarily the inner end of the lead-holder guide so that, when carrying the lead sharpener in a pocket, the graphite powder cannot even enter the guide channel and therefore also cannot fall out of its outer end. The plug according to the invention therefore has such a length that when fully inserted, its inner end extends up to the mentioned insert in which the conical lead channel is provided and thus seals the point where otherwise the graphite powder might enter the lead-holder channel.

While in the previous description the invention was considered primarily in view of attaining a lead sharpener of such a small size that the user may carry it in his pocket, it should be pointed out that the feature of the invention of transferring the main flywheel mass of the rotatable head part of the lead sharpener to the inside of the housing below the sealing element between the head part and the housing may also be applied to other lead sharpeners of the previously known type. Also in these sharpeners it would be of advantage to transfer the flywheel mass of the head part to the inside of the housing at least for the reason that this would considerably reduce the height of the entire sharpener.

The features and advantages of the present invention will become more clearly apparent from the following detailed description thereof which is to be read with reference to the accompanying drawings, in which

FIG. 1 shows a vertical section of a lead sharpener according to the invention, while

FIG. 2 shows a bottom view of the rotatable head part of this sharpener.

As illustrated in FIG. 1 of the drawings, the lead sharpener according to the invention comprises a small housing 2 of plastic which has on its bottom a projection 1 in which the lower end of a shaft 3 is nonrotatably mounted, for example, by being provided with a knurling which is forced into a bore in the projection 1. Above the projection 1 shaft 3 carries a cylindrical milling cutter 4 of steel, which may be either rigidly secured to or integral with this shaft. On the cylindrical upper part of shaft 3 a metallic head 5 is rotatably mounted which is preferably die-cast of zinc. For guiding a lead holder (not shown) from the front end of which the lead to be sharpened projects for a predetermined distance, head 5 is provided with a guide channel 6 which extends eccentrically and at a small inclination to the axis of shaft 3 and the nonrotatable cutter 4 thereon. Near its inner end, guide channel 6 is provided with a stop surface 8 against which the front end of the lead holder is adapted to abut when the sharpening operation is completed. The part of the casting containg the guide channel 6 projects for a certain distance beyond the stop surface 8 and in this projecting part an insert 16 is rigidly secured one side of which facing the cutter 4 is provided with a tapering recess 7 which serves as a channel for guiding the tip of the lead which projects from the front end of the lead holder. For the sharpening operation, the lead holder is inserted into guide channel 6 until the projecting tip of the lead engages upon the cutter 4. The entire head 5 is then turned by means of the hand-held lead holder about the shaft 3, whereby the tip of the lead revolves about the cutter 4. Since during this movement the tip of the lead also rotates relative to the surface of the lead channel 7 in the insert 16, this surface is subject to considerable friction. The insert 16 is therefore made of a highly wear-resistant material.

For determining the depth to which the lower part of the head 5 may be inserted into the housing 2, the head is provided with an annular flange the lower surface 9 of which is slidable along the upper end surface of housing 2 and also acts as a sealing surface for substantially closing the housing 2.

In accordance with the invention, the part of the head 5 which is located underneath the annular flange surface 9 and therefore within the housing 2 consists of a substantially cylindrical projection 11 of a considerable thickness and length which extends concentrically to the shaft 3 and forms a relatively heavy flywheel mass 10 which is further increased by heavy eccentrical parts 12, as shown in FIG. 2, which integrally connect the hub or bushing of the head for the shaft 3 with the cylindrical projection 11 at the side of the axis of rotation of the head which faces the guide channel 6. The flywheel mass 10 of the head 5 which is located at the inside of the housing 2 and thus as closely as possible to the cutter 4 is further increased by lateral projections 18 on the part of the head casting containing the lower part of the guide channel 6 and the insert 16. When the head 5 is rotated by the lead holder, the entire flywheel mass 10 consisting of the cylindrical part 11, the parts 12 and the projections 18 produces a steady inertia and thus a uniform revolution of the lead tip around the cutter 4 and a uniform grinding action of the latter upon the lead tip.

For rotatably mounting the head 5 in a fixed axial position relative to the housing 2 and shaft 3, the substantially cylindrical part 11 of the head is provided with an annular groove 14 and the inner wall of housing 2 in a corresponding position with an annular groove 15. Into the groove 14 of the head a spring ring 13 is inserted so as to be freely rotatable relative thereto even when it is so far compressed that the two ends of this ring abut against each other. When head 5 is inserted so far into the housing 2 that the flange surface 9 substantially engages with the end surface of the housing, the part of spring ring 13 which projects outwardly from groove 14 snaps into groove 15 and presses tightly against the surface thereof. Therefore, when the head 5 is rotated, ring 13 remains stationary relative to the housing 2 and seals the inside thereof tightly so that the graphite powder which has collected in the housing will not penetrate to the outside and soil, for example, the pocket of a coat in which the user might carry the lead sharpener when not in use.

In order to prevent the graphite powder from passing to the outside through the lead-holder channel 6, the invention further provides a plug 19 which has a conical end 20 and such a length that, when fully inserted into guide channel 6, its conical end 20 completely closes the front end of this channel and thus prevents any graphite powder from entering the latter.

Although my invention has been illustrated and described with reference to the preferred embodiment thereof, I wish to have it understood that it is in no way limited to the details of such embodiment 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 sharpener comprising a housing having an upper open end, a shaft nonrotatably mounted in said housing, a cylindrical steel milling cutter rigidly secured to said shaft, a head member consisting of a heavy metal and forming a flywheel, said head member having a heavy substantially cylindrical part mounted in the upper end of said housing and rotatably mounted on said shaft, an annular flange on said head member above said cylindrical part and adapted to slide along the upper end surface of said housing and to substantially seal said housing, said cylindrical part having an annular groove in its peripheral surface at a distance from said flange, the inner wall surface of said housing also having an annular groove located in a position corresponding to that of said groove in the cylindrical part, and a spring ring located in both grooves for rotatably connecting said head to said housing, said head member having a lead-holder guide channel inclined to the axis of said shaft and extending into said housing to a point near said cutter.

2. A lead sharpener as defined in claim 1, in which said spring ring loosely engages into said groove in said cylindrical part and presses tightly against the wall of said groove in said housing so as to be stationary relative thereto when said head is rotated, said ring serving in addition to said flange as a sealing member to prevent the powder ground off said leads from falling out of said housing when said sharpener is held in a position in which the bottom of said housing is not horizontal.

3. A lead sharpener as defined in claim 1, further comprising a separate plug member adapted to be inserted into said guide channel when said sharpener is not in use, said plug member having a length substantially equal to the length of said channel and such a shape that, when inserted in said channel, it closes off its inner end completely.

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