Sept. 4, 1962 J. BURGESS 3,052,068

KNIFE SHARPENER

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Fig. 1

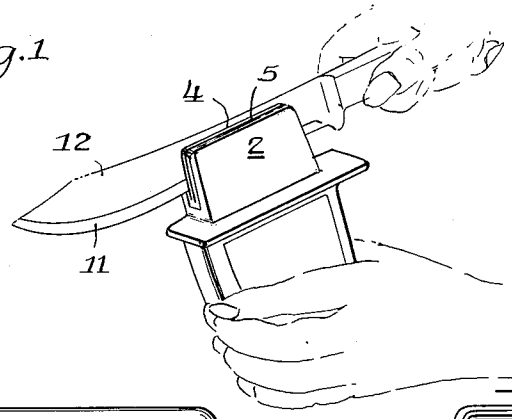


Fig. 2a

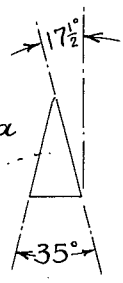
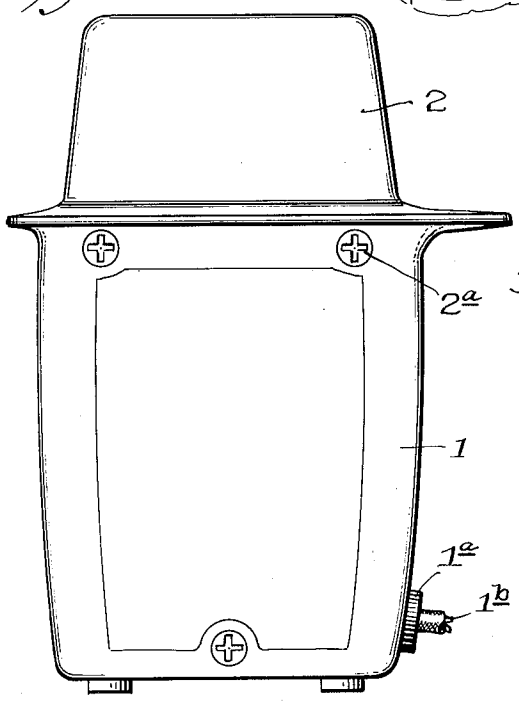


Fig. 2



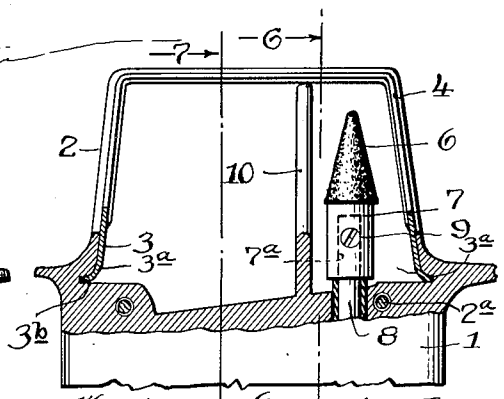


Fig. 4

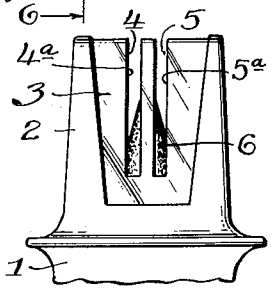


Fig. 5

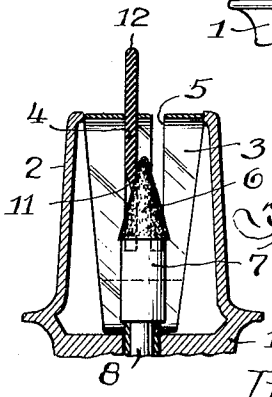


Fig. 6

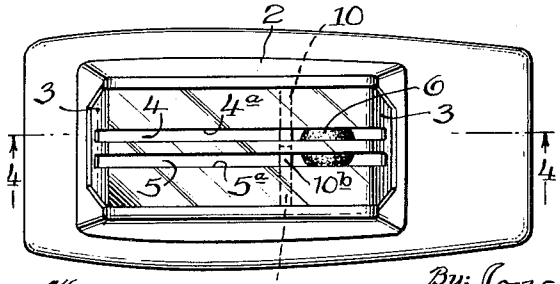


Fig. 3

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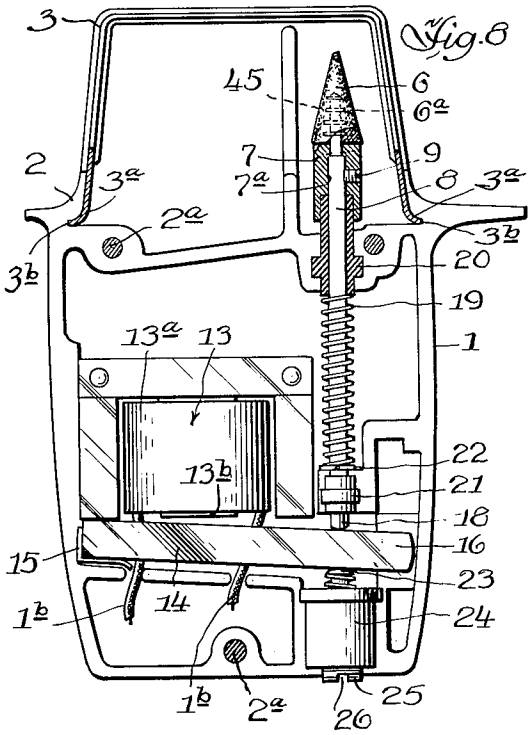


Fig. 8

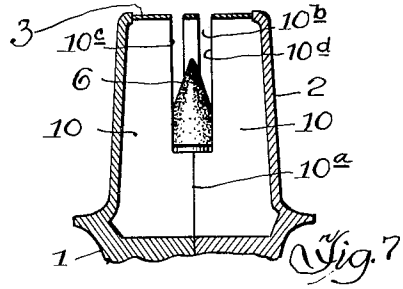


Fig. 7

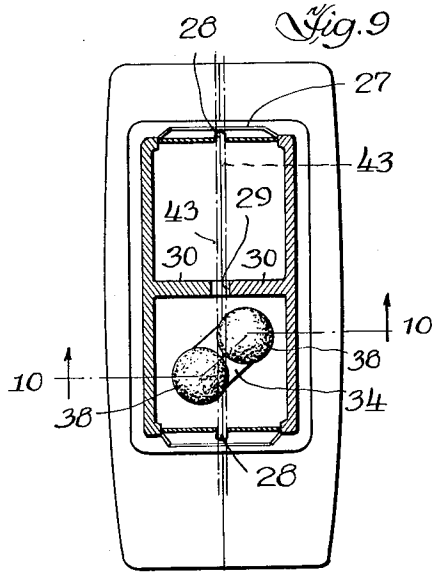


Fig. 9

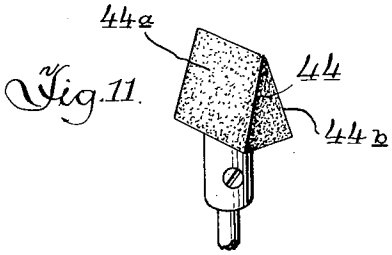


Fig. 11

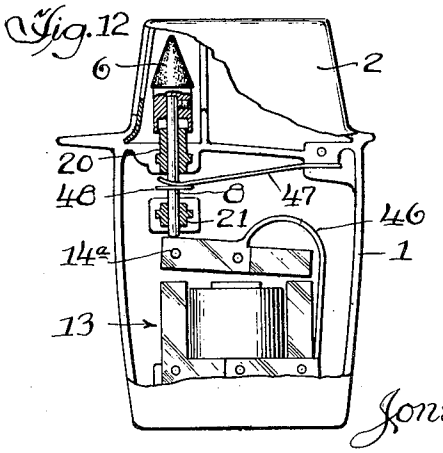


Fig. 12

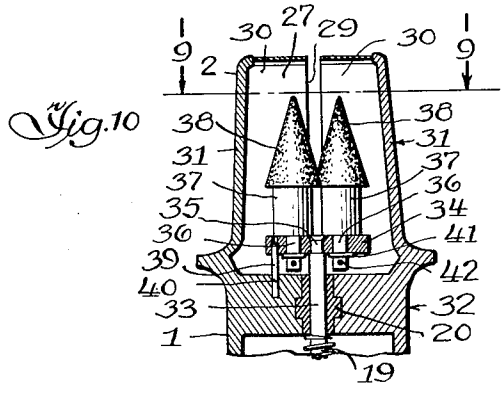


Fig. 10

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Fig. 13

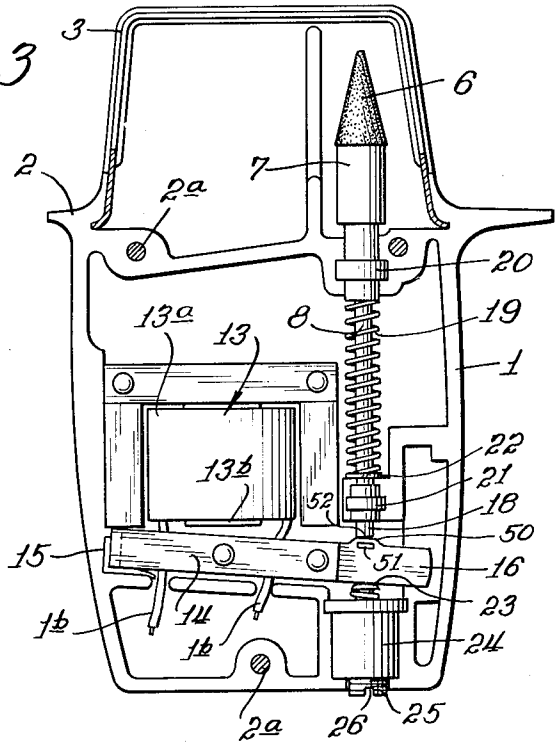


Fig. 15.

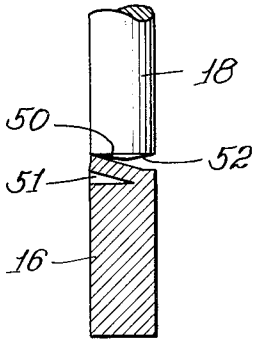


Fig. 14.

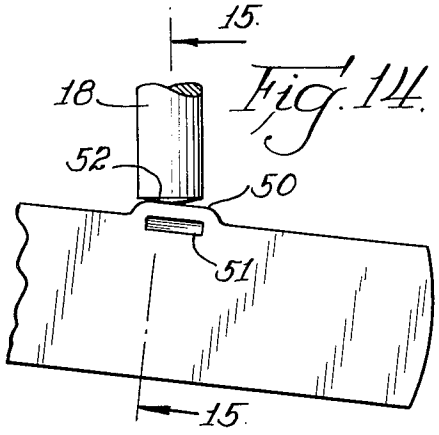
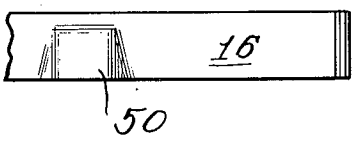


Fig. 16.



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KNIFE SHARPENER

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Filed Nov. 9, 1959, Ser. No. 852,922
12 Claims. (Cl. 51—59)

This invention relates to knife sharpeners, more particularly for household use for sharpening kitchen knives and the like, and aims to provide a simple and efficient device of this class that may be operated partly by manual and partly by electrical means. This application is a continuation in part of Jackson Burgess application Serial Number 771,407, filed November 3, 1958, now abandoned.

The invention contemplates a light, compact article that may be held in one hand while the knife blade is drawn therethrough with the other hand. The abrasive honing member is driven by a self-contained vibrating motor.

A particular object is to provide a knife sharpener having an abrasive body arranged to reciprocate in a direction crosswise of the edge of the knife and wherein the stroke toward the knife is the cutting stroke made under appropriate pressure between abrasive and blade, while the abrasive body is returned without substantial cutting effect. Another object is to provide means for continuously changing the position of the abrasive body so that the portion thereof in contact with the knife blade is continuously changed and wear is thus distributed to all useable surfaces of the abrasive.

The foregoing and other objects and advantages will be apparent from the following description, taken together with the accompanying drawings showing illustrative embodiments of the invention, in which drawings—

FIGURE 1 is a perspective view showing the use of the device;

FIGURE 2 is an enlarged side elevational view thereof;

FIGURE 2*a* is a diagrammatic view of an abrasive cone;

FIGURE 3 is a plan view;

FIGURE 4 is a fragmentary side elevational view, partly in section on the line 4—4 of FIG. 3;

FIGURE 5 is a fragmentary end elevational view;

FIGURE 6 is a cross-section taken on the line 6—6 of FIG. 4;

FIGURE 7 is another cross-section taken on the line 7—7 of FIG. 4;

FIGURE 8 is a more complete sectional view similar to FIG. 4 showing the operating vibratory motor;

FIGURES 9 and 10 show a modification; FIG. 9 being a plan section taken on the line 9—9 of FIG. 10; and FIG. 10 being a fragmentary vertical section taken on the staggered line 10—10 of FIG. 9, the cones, however, being shown in elevation;

FIGURE 11 shows a further modification;

FIGURE 12 is a side elevational view, partly broken away and in section, showing an alternative arrangement of the knife sharpener;

FIGURE 13 is a cross-sectional view similar to that of FIG. 8 and showing a further modification of the invention, and

FIGURES 14, 15 and 16 are detailed views of the sharpener-driving mechanism, FIG. 15 being taken at line 15—15 of FIG. 14.

Referring in detail to the illustrative constructions shown in the drawings and turning first to that of FIGS. 1 to 8 inclusive, in accordance with the present invention the numeral 1 indicates a casing having a bifurcated top 2, the casing being advantageously made of molded complementary halves of a light-weight non-metallic initially plastic material secured together as by screws 2*a* and having an outlet 1*a* for an electric cord 1*b*. The space between the bifurcations 2 of the casing is partly closed by an inverted U-shaped metallic guard member 3 that has out-turned ends 3*a* that may be snapped into the recesses 3*b* in the ends of the case adjacent the bifurcations 2 to hold the guard 3 in position by its own resilience. The guard 3 conforms to the profile of the casing top 2 and has therein closely adjacent slots 4 and 5 that are in parallel planes parallel to the axis of a honing member 6. In this instance the honing member 6 is conical and is mounted on a stud 6*a* (FIG. 8) of a thimble 7 that in turn is carried on the upper end of a rotatable spindle 8. The thimble 7 has an axial recess 7*a* to receive the upper end of the spindle 8 to which it is non-rotatively secured as by a set screw 9.

Each casing bifurcation 2 has an interior integral partition 10 molded therewith, these partitions extending toward each other and abutting at their lower ends as at 10*a* but at their upper ends spaced apart as at 10*b* (FIG. 7) so as to provide a slot of a width corresponding to the overall width of the slots 4 and 5 in the guard 3. The proximate edges 10*c* and 10*d* of the slot 10*b* are flush with the edges 4*a* and 5*a* respectively (FIG. 5) of the slots 4 and 5 in the guard 3 and all of these edges are in parallel planes that intersect the cone 6 on opposite sides thereof. That is to say, edges 4*a* and 10*c* are in one plane and edges 5*a* and 10*d* are in another plane. The included angle defined by the cone 6 is preferably thirty-five degrees so that the angle of incidence of the plane of a slot edge 4*a* and 10*c*, and correspondingly of a slot edge 5*a* and 10*d*, is seventeen and one-half degrees with respect to the surface of the cone. An angle of seventeen and one-half degrees is substantially that of the knife edge 11 of a kitchen knife 12 illustrated in FIG. 1.

When the knife blade 12 is inserted in one of the slots 4 or 5 of the guard 3, say first in the slot 4 as shown in FIGS. 1 and 6, it can be pushed down into contact with the cone 6, the slot 4 being wide enough to receive the blade 12. Partitions 10 and outer edges 4*a* and 5*a* of the slots act as guides to hold the blades at the proper angle against the cone. If desired, only a single slot having side edges 4*a* and 5*a* may be provided, since the necessary guiding surfaces would thus be present. Electrical means here represented by the vibrating motor 13 are provided for reciprocating the cone 6 across the knife blade edge 11 while the knife is so held and while at the same time the knife is manually drawn longitudinally through the slot 4, thus honing the blade edge along its length. After sharpening one side, the blade is inserted on the other side of the cone, as in slot 5, and the action repeated to sharpen its other side.

The vibrating motor 13 is shown in FIG. 8 and as there illustrated embodies a coil 13*a* and core 13*b* and an armature 14 held at one end by a clip 15 and free to vibrate at its other end 16 toward and away from the magnetizable core 13*b* under the influence of an alternating electric current led to the motor by the electric cord 1*b*. The spindle 8 at its lower end 18 is preferably dome shaped and abuts against the free end 16 of the armature 14. At each half cycle of the excitation of the motor coil 13*a*, the core 13*b* is magnetized and attracts to it the armature 14, which thereupon pushes the spindle 8 in a direction outwardly of the casing 1 and axially of the spindle. As the current dies between half cycles, the spindle 8 and with it the free end of the armature is moved in the opposite direction by a compression coil spring 19 encircling the spindle 8 between a pair of spaced-apart bearing members 20 and 21 on the spindle. Since with a sixty cycle current, for example, there will be one hundred and twenty pulsations, the latter number of cycles of reciprocation of the spindle 8 will occur, and a very rapid honing action is accomplished. At one end

the spring 19 bears against the bearing 20 and at its other end against a collar 22 fixed on the spindle 8. Bearings 20 and 21 are desirably of a lubricous material such as molded nylon.

Further, in accordance with the present invention the spindle 8 not only reciprocates in the bearings but is also free to rotate therein with the cone 6 under the influence of the knife blade as the latter is drawn longitudinally through the slot 4. The dome-shaped end 18 of the spindle 8 where it bears against the armature permits rotation of the spindle with a minimum of friction. Thus, continually different surface areas of the cone 6 are presented in honing action to the knife blade edge 11. The guides 10 assist in holding the knife blade against the cone to give a rotative action to the cone while it is being reciprocated by the motor 13.

The amplitude of stroke of the motor armature 14, and consequently of the spindle 8, is adjustable by a spring abutment 23 that is mounted in a cylinder 24 carried within the casing 1. A screw 25 in cylinder 24 is provided for compressing or relaxing the spring 23 and has a kerfed head 26, for a screw driver or the like, accessible on the exterior of the casing 1. Through a mating opening therein, the spring abutment 23 also provides a cushion for the armature in its movement under the influence of the spring 19.

In the form of the invention shown in FIGS. 9 and 10, the guard 27, otherwise similar to the guard 3, has only a single central slot 28 therein which registers with a central slot 29 formed between the guide partitions 30 in the bifurcated head 31 of the casing 32. Here, the spindle 33 has affixed to its outer end an obliquely disposed cross yoke 34 rigidly secured thereto at 35. At each end of the cross yoke 34 there is a perforation for receiving the shank 36 with a thimble 37 that carries a conical honing member 38. Rotation of the spindle and cross yoke must be prevented by suitable means, as by providing a square spindle and bearing or, as here shown, by a stud 39 that depends from the cross yoke and enters a recess 40 in the adjacent face of the casing 32. The shanks 36 are held in position on the cross yoke by washers 41 and set screws 42, respectively. Each honing member or cone 38 may rotate on its shank 36.

In the use of the form of the device shown in FIGS. 9 and 10, the knife blade, which is indicated schematically at 43 (FIG. 9) need be inserted only once, that is, into the slot 28 of the guard 27, and it is then pushed down between and into contact with both of the cones 38 simultaneously, the staggered arrangement of the cones permitting the knife blade to intersect the surfaces of both cones at the same time while the knife blade edge itself is sharpened on both sides at one time by the reciprocating action of the spindle 33 under the influence of the motor 13, which causes a honing action of both cones 38 across the knife simultaneously. At the same time, the cones 38 may rotate independently on the cross yoke 34, as the knife blade is drawn longitudinally through the slot 28 to hone the blade edge along its length and to present fresh surfaces of the honing material to the knife blade edge.

In another modification shown in FIG. 11, the honing member is in the form of a wedge-shaped block 4 of inverted V-shape. This form of honing member might be used in place of the honing member 6 of FIGS. 1 to 8, and in such case the knife blade is inserted alternately in the slots 4 and 5 to contact successively with the opposite tapered surfaces 44*a* and 44*b* of the wedge 44. Here again, the edges 4*a* and 10*c*, and 5*a* and 10*d*, intersect the sides of the V-shaped block 44 respectively. In this instance the wedge shaped block 44 cannot rotate as the knife blade is drawn therealong, because of the parallelism therebetween, the longer faces of the wedge engaging the blade.

An example of the knife sharpener wherein means are provided for positively rotating the honing member 6 during operation of the device is shown in FIGS. 13 through 16, the structure being otherwise similar to that above described. To effect rotation of the conical honing member 6, a mechanical expedient that may aptly be termed a friction pawl and rachet is provided at the juncture of the extremity of lower end 18 of spindle 8 with the end portion 16 of armature 14. The essential relationship of the armature and spindle driven thereby is that contact between the two members is made at or near the periphery of the spindle so that longitudinal movement of the armature as it pivots about its left end (as seen in FIG. 13), being retained by clip 15, results in the turning of spindle 8 about its axis to rotate the honing member 6. To effect this result, a contact button or lip 50 is formed in the top edge of armature element 16 by staking the metal at 51. The inclined surface (FIG. 15) thus provided engages the end 52 of the spindle at or near the periphery thereof. Because the pressure between engagement surfaces of lip 50 and spindle 18 is different for the power and return strokes of the armature, the spindle is rotated during the power stroke, only, with the result that the honing member is rotated in one direction to continuously change the grinding surface which is in engagement with the knife blade being sharpened.

In the several examples of the sharpener of the invention above described, the upward stroke of the spindle and abrasive member is the power stroke of the motor and is, also, the cutting stroke. An alternative arrangement of the working parts is shown in the further example of the invention illustrated in FIG. 12. In this form of the sharpener, the vibratory motor 13 is mounted with its armature 14*a* at the top of the motor, as contrasted with the arrangement shown in FIG. 8 wherein the armature is located underneath the motor. The power stroke of the motor of the device of FIG. 12 is, accordingly, downward, a relatively strong spring 46 being provided to return the armature to its position spaced from the field magnet structure of the motor preparatory for the succeeding power stroke. The spindle 8 is mounted for reciprocation in suitable bushings 20 and 21 which are, in turn, supported in sockets molded in body 1 of the sharpener. The abrasive or honing member 6 is affixed at the top end of spindle 8 in the manner above described.

Spring means, such as leaf spring 47 is provided to bias the spindle and abrasive assembly downwardly sufficiently to hold the spindle in contact with the armature at all times. A suitable collar or other stop member 48 is fastened to the spindle to receive the spring pressure for this purpose. Alternatively, a coil compression spring may be inserted between the collar 48 and the body structure above it. Regardless of what form of spring means are employed, the spindle and honing member assembly is floated, in effect, between springs 47 and 46.

In the arrangement of the mechanism shown in FIG. 12, the cutting stroke is the motor return stroke rather than the power stroke. Otherwise, the operation of this form of the invention is similar to that above described with reference to other examples in that the knife is sharpened by reciprocation of the conical or otherwise tapered abrasive head member.

By using a very stiff spring 46, it is possible to limit the movement of the armature on the power stroke to prevent striking of the field magnet structure, thereby minimizing the noise created by operation of the motor. Forms other than that shown by way of example of spring 46 may be employed.

The honing members 6, 38 and 44 are advantageously molded of an abrasive material such as "Carborundum," emery or the like, suitable interlocking means being provided between the abrasive material and its supporting thimble, such as a roughening of the stud 6*a* indicated at 45 (FIG. 8).

It will be understood from the foregoing description

of the several examples of the invention that since the direction of reciprocation of the abrasive body is parallel with the width of the knife blade, and the cutting surface is inclined at an angle to the blade, upward movement of the abrasive body drives the abrasive surface against and along the knife blade at the edge thereof, providing the necessary pressure and movement for the abrasive cutting action. Correspondingly, downward movement of the abrasive member tends to draw the abrasive surface away from the knife blade, with the result that very light cutting, if any, takes place in the direction away from the knife. Very little manually applied pressure is needed to hold the knife in proper position for the sharpening operation.

When a conical abrasive or honing member is employed, the sharpened knife edge is slightly serrated. Far from being undesirable, such an edge is more effective for cutting than the usual straight edge.

The invention having been described, such changes may be made, including further modifications or additions as fall within the scope of the appended claims, without departing therefrom.

Invention is claimed as follows:

1. A knife sharpener comprising a casing having a guide slot in the top thereof in approximately the principal vertical median plane of said casing, a spindle mounted for vertical reciprocation along its axis in approximately said median plane, a cross yoke carried by said spindle, and a pair of vertical conical honing members mounted upon said cross yoke for free rotation about their respective conical axes, said conical axes being parallel to said spindle axis, and means for preventing rotation of said spindle about its axis, said honing member being staggered whereby to present overlapping inclined surfaces intersecting said plane of said guide slot.

2. A sharpener for a knife having a blade and a cutting edge said sharpener comprising: a casing; a member journaled in said frame for reciprocation along a line; a cutting device attached to said reciprocating member, said device having a cutting surface positioned at an acute angle with respect to said line, whereby said surface reciprocates in a first plane parallel to said line; power means operatively connected to said member to reciprocate it; and positioning means attached to said case to position said blade in a second plane parallel to said line with said edge intersecting said surface, and said first plane and said second plane at approximately right angles to each other.

3. The sharpener of claim 2 wherein, said angularly disposed surface and said line define an included angle of approximately 17½°.

4. A sharpener of claim 2 wherein, the cutting device is conical.

5. The sharpener of claim 4 wherein, the conical device is mounted for free rotation about its conical axis.

6. The sharpener of claim 4 wherein, said sharpener includes means for rotating the conical device about its conical axis.

7. The sharpener of claim 4 wherein, said reciprocating member is a spindle mounted for rotation about said line and having an end spaced from said cutting device; said power means includes a vibratory motor having an armature, said armature being positioned to abut said end of said spindle near the periphery of said spnidle to provide a frictional pawl and rachet arrangement for rotating said spindle and said cutting device as said cutting device is reciprocated.

8. The sharpener of claim 2 wherein, said cutting device is a V-wedge shape.

9. The sharpener of claim 2 wherein, there are a plurality of cutting devices positioned at opposite sides of said plane.

10. The sharpener of claim 2 including a second positioning means, parallel to and in juxtaposition with the first positioning means and at the opposite side of said cutting device from said first positioning means.

11. A knife sharpener for a knife having a planar blade and a cutting edge, said sharpener comprising: a casing having means at the top thereof to position said blade horizontally with the plane of the blade generally vertical and the edge downward and inside said casing; a cutting device in said case and having a cutting surface below said edge and extending upwardly an angle with respect to the plane of the blade; and power means mounted within said case and operatively connected to said device to move said device vertically with said surface contacting a side of said blade along said edge.

12. The sharpener of claim 11 wherein, said power means includes: a spindle journaled in said frame for vertical movement and connected at its upper end to said device; a vibratory motor having a movable armature positioned to contact the lower end of the spindle and urge the spindle up as the armature moves up; and resilient means between the spindle and the casing to urge the spindle downwardly.

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