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Laszlo

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[54] **SHARPENER DEVICE**

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[52] **U.S. Cl.** ..... **51/170 PT,** 51/102

[51] **Int. Cl.**..... **B24b 23/00,** B24b 7/00, B24b 9/00

[58] **Field of Search**..... 51/170 PT, 170 R, 170 EB, 51/173, 102, 241 G, 241 S, 228; 76/83

[56] **References Cited**

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[57] **ABSTRACT**

A mechanically operated portable sharpener for ice skate blades. The device has a cylindrical abrading stone internally mounted within a contoured sharpener head. The sharpener head is provided with a blade registration slot for positioning a blade in frictional contact with the abrading stone. A floating bearing assembly is incorporated to relieve excessive contact pressure on the abrading stone and to thereby prevent blade damage. An alternate embodiment includes multiple blade registration slots of different widths.

10 Claims, 8 Drawing Figures

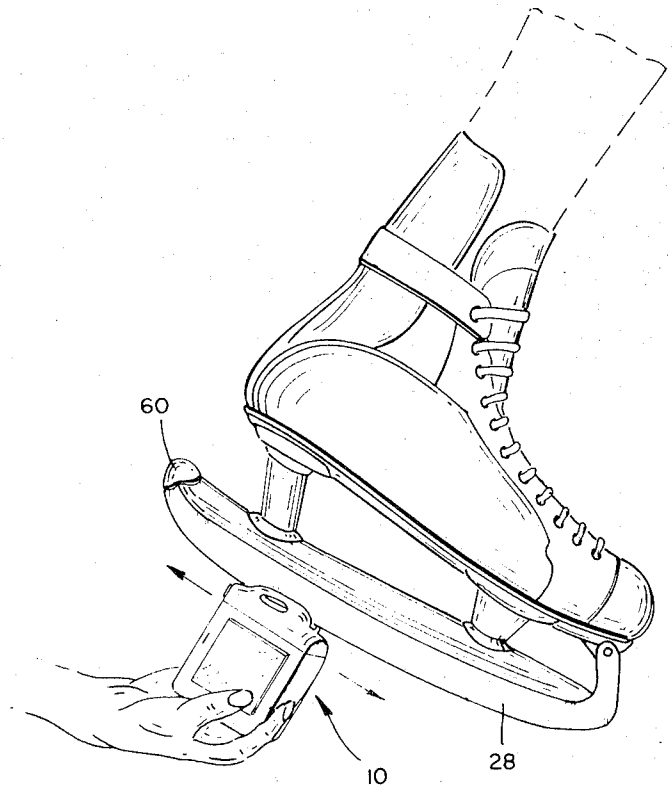


FIG. 1

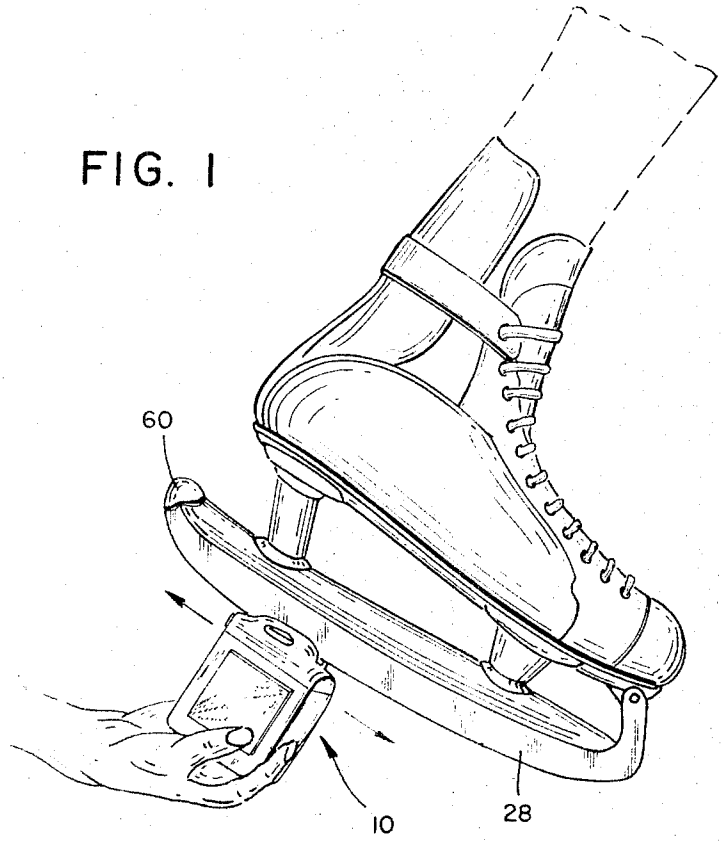


FIG. 3

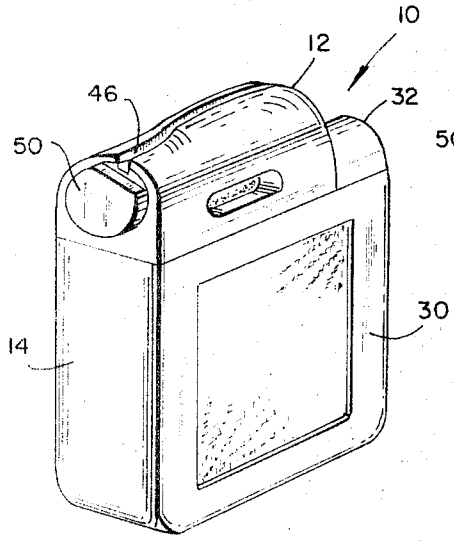
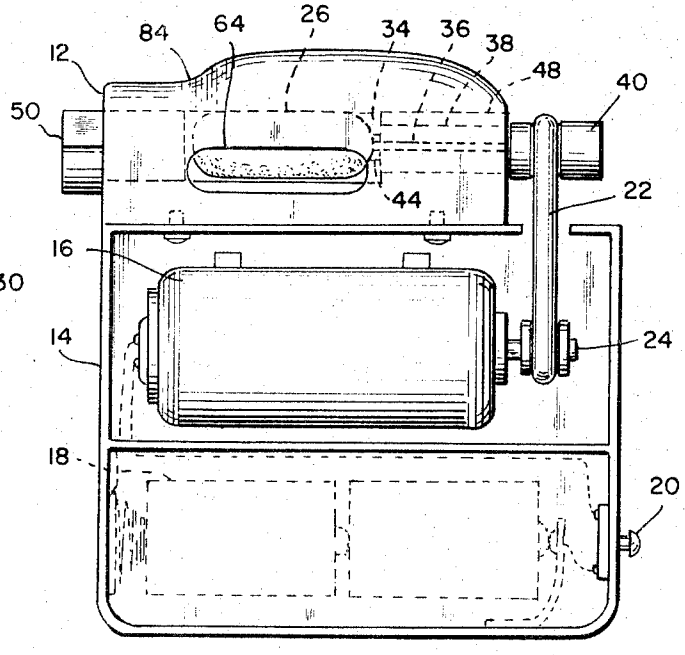


FIG. 2



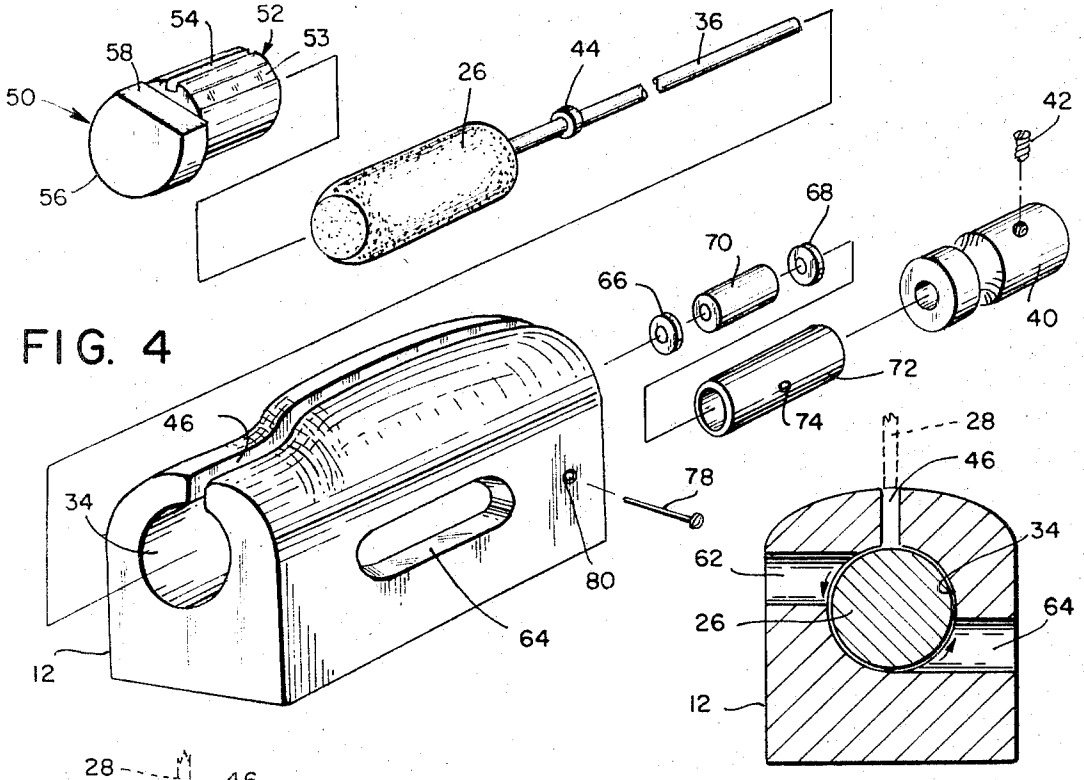


FIG. 4

FIG. 6

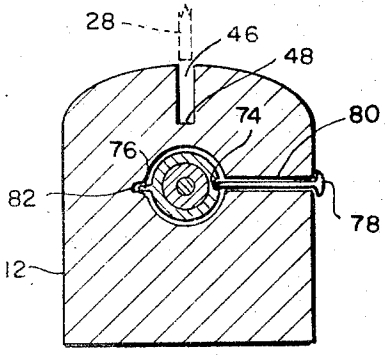


FIG. 7

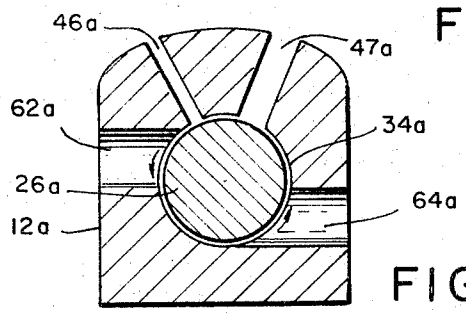


FIG. 8

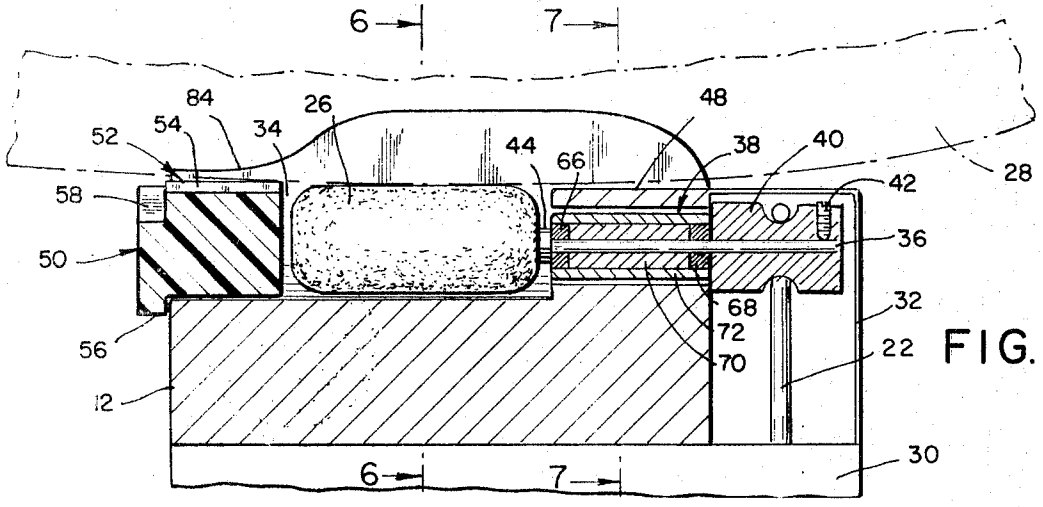


FIG. 5

SHARPENER DEVICE

BACKGROUND OF THE INVENTION

1. Field of Invention

This invention relates to grinding apparatus and especially to a sharpener device for ice skate blades.

In particular, this device is concerned with a mechanically operated portable ice skate blade sharpener. The sharpener of this invention is especially adapted for use with hockey skates, however it can also be suitably modified for sharpening figure skates.

The sharpener device has an abrading stone designed to provide a smooth hollow ground blade edge and additionally incorporates other structural features to facilitate the sharpening operation, to provide safety for the user, and to reduce the possibility of damage to the blade during the sharpening operation.

2. Description of the Prior Art

Most of the presently used mechanical ice skate sharpening devices, as found in skate shops, generally include rather elaborate and cumbersome stationary machines typically floor mounted or attached to a table or bench and requiring a jig or clamp arrangement for holding a skate blade in proper alignment during the sharpening operation. The blade is generally guided along and held in contact with a power driven grinding wheel in a plane parallel to the wheel. This procedure requires some degree of skill on the part of the operator and is frequently used commercially and for professional skate sharpening.

Alternatively, various hand sharpening tools have been developed for use by non-professional ice skaters. These devices are generally "pocket size" and contain an abrading stone, steel file, or other abrasive material, in the form of a cutter insert or wheel; in use, the device is manually held in contact with the blade edge and moved back and forth along the edge. A "cutting" pressure must be exerted on the tool urging same towards the edge in order for the abrasive action to be effective, and in many instances repetitive passes over the blade are needed to achieve adequate sharpening. A disadvantage of these devices is that frequently the stone or cutting insert becomes worn or flat on one side after repeated use and consequently there is no uniformity or consistency in the finished blade edge. A further disadvantage is that these devices do not provide for accurate control of the depth of cut.

The device of this invention, in contrast, is portable and adapted for battery-powered operation. Furthermore, the blade can be sharpened without removing the boot from the skater's foot. Additionally, no special skill is required for using this device and relatively light pressure need be applied to obtain a sufficiently sharp edge.

In the area of portable mechanically-powered sharpening devices, most, if not all, of the conventional devices now on the market or patented are adapted to be used in conjunction with an auxiliary motor source, such as an electric drill, which is directly attachable to a power take-off shaft from the device. Examples of such devices are illustrated in U.S. Pats. Nos. 3,125,833 and 3,164,932; neither of these illustrative patents cited utilize an abrading stone which is internally mounted within a sharpener head as in the present invention. In many of these previously disclosed sharpener devices a relatively large diameter grinding wheel

is used; such wheels have a tendency to nick or damage the skate blade. Additionally, these wheels must be periodically dressed to insure proper cutting. Furthermore, the skate boot must be removed and firmly set on a cobbler's last or clamped in a fixed position and both hands are generally required to operate the sharpener.

BRIEF SUMMARY OF THE INVENTION

The portable sharpener of this invention concerns a hand-held mechanically driven device powered by an electric motor actuated by a battery supplied energy source. The sharpener, although particularly applicable for sharpening ice skate blades, can have other sharpening applications and should not be considered as so limited in scope. Furthermore, the features incorporated in this sharpener overcome many of the disadvantages and inconveniences of the prior art devices.

The present sharpener is designed with a contoured or curvilinear head portion defining a blade registration slot. A cylindrical abrading stone having an integral axial shaft is mounted within a central bore passing through the sharpener head. The abrading stone is adapted for rotation in a plane transverse to the longitudinal axis of the skate blade and has a radius which corresponds to the transverse curvature of the blade. The axial shaft is journaled through a "floating" bearing assembly which permits pivotal movement of the abrading stone to relieve blade contact pressure and thus protects the blade from abrasion damage.

Another advantage of this sharpener device relates to the plug-type depth gauge for controlling the amount of "cut" by the abrading stone; the plug is frictionally held within the central bore and can be axially removed so that the abrading stone can be withdrawn for cleaning and replacement.

A further feature of this invention, as described in an alternate embodiment, includes multiple blade registration slots of different widths; this enables one sharpener to be used with both hockey and figure skates.

Having thus summarized the invention, it will be seen that an object thereof is to provide a sharpener device of the general character described herein which is not subject to the disadvantages of the prior art.

Specifically, it is an object of the instant invention to provide a mechanically operated sharpener particularly applicable for sharpening ice skate blades.

Another object of this invention is to provide a sharpener device which is compact in size, readily portable, and does not require special skill to operate.

An additional object of this invention is to provide a sharpener which achieves a hollow blade edge and includes an abrading stone having a diameter corresponding to the transverse curvature of the blade edge.

Still another object of this invention is to provide a sharpener which can control the amount of cut and has a depth gauge for limiting the insertion of the blade in the registration slot.

It is a further object of this invention to provide a sharpener device which prevents abrasion damage to the skate edge caused by excessive blade contact and has a floating bearing to relieve the pressure.

The above and other objects, features and advantages of this invention will be apparent from the following description of the preferred embodiment when con-

sidered in connection with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a hockey skate and the sharpener of this invention illustrating the manner in which the device is operated for sharpening the skate blade;

FIG. 2 is a perspective view of the sharpener device showing a curvilinear head and a blade registration slot;

FIG. 3 is an enlarged side elevational view of the sharpener with a cover plate removed to expose a battery, motor and belt drive for rotating an abrading stone mounted in the sharpener head;

FIG. 4 is an exploded view of the sharpener head and shows the relationship among the component elements including a depth gauge, an abrading stone, a floating bearing assembly, and a belt drive pulley;

FIG. 5 is an enlarged sectional view taken longitudinally and substantially through the sharpener head and shows the component parts as assembled in the sharpener head with a skate blade being positioned in the registration slot;

FIG. 6 is a sectional view through the sharpener head substantially along lines 6—6 in FIG. 5 and shows the abrading stone within a central bore and two lateral ports;

FIG. 7 is a sectional view through the sharpener head substantially along lines 7—7 of FIG. 5 and shows the bearing assembly and blade registration slot; and

FIG. 8 is a sectional view through a modified embodiment of the sharpener head, corresponding to FIG. 6, showing two radial extending blade registration slots.

DETAILED DESCRIPTION OF THE INVENTION

Referring now in detail to the drawings, the reference numeral **10** denotes generally the sharpener device of this invention. The skate sharpener **10** is comprised of a sharpener head **12** secured to a casing **14** which houses a small electric motor **16** and an energy supply source, such as rechargeable batteries **18.** A pressure-switch mechanism **20** is preferable for use in activating the motor **16,** and a mechanical linkage, such as a belt or chain drive **22,** transmits power from the motor **16** to the sharpener head **12.** interconnect

Although the device is shown as being battery operated, it can also be adapted for operating on conventional house current. As best illustrated in FIGS. **3** and **5,** the drive belt **22** is used to inerconnect a motor output shaft **24** and an abrading stone **26** mounted in the sharpener head **12;** other linkage mechanisms such as gears can also be applied for this purpose. It should be noted that the motor **16** and output shaft **24** are offset from the sharpener head **12** and positioned generally below and parallel to the head. This permits the abrading stone **26** to be held parallel and contiguous to successive sections along a skate blade **28** and will be further discussed hereinafter. The casing **14** has a removable cover plate **30** which includes a cowl portion **32** for shielding the drive belt **22.** The cover plate **30** is affixed by screws, releasable clips or other similar fasteners to facilitate removal for servicing of the sharpener.

From the drawings, particularly FIGS. **1** and **2,** it should be apparent that in size and general configuration, the sharpener **10** resembles a conventional electric razor and can be conveniently held in one hand during the sharpening operation. The pressure switch **20** can be easily held in a depressed or "power on" position by the user such that upon release of the switch **20** power will be "off" and the sharpener will automatically stop; this feature insures against accidental blade damage.

By way of background information, ice skate blades, as currently manufactured, are commonly made of high carbon, heat-treated steel and have blade thicknesses which range from approximately .1 inches for hockey skates to about .2 inches for figure skates. The longitudinal curvature and shape of the blade will also vary depending on whether it is used for hockey or figure skating. However, both hockey and figure skates have blade edges which are hollow ground to provide the skater with the proper balance and control.

Accordingly, the abrading stone **26** of this device is cylindrically shaped and in cross-section has a relatively small diameter corresponding in dimension to the transverse blade edge curvature. The sharpener head **12** is provided with a longitudinal central bore **34** forming a cavity for accommodating the abrading stone **26** which is mounted transversely to the longitudinal blade axis and in complementary fit with the blade edge concavity for hollow grinding. The abrading stone **26** has an integral axial shaft **36** which is journaled in a floating bearing assembly **38** located in a reduced diameter portion of the central bore **34.** The shaft **36** is rotatably driven by a drive pulley **40** which is affixed to the extremity of shaft **36** by a set screw **42.** The drive pulley **38** further serves as a locking ring to secure the abrading stone **26** within the bore **34** and eliminates excessive travel or play. In this connection, a spacer ring **44** on shaft **36** is positioned between the stone **26** and bearing assembly **38;** the ring **44** also prevents abrasive contact as between the stone **26** and the bearing assembly **38.**

The sharpener head **12** is provided with a blade registration slot **46** which extends into the bore **34** along its length except as to that portion overlying the bearing assembly **38** which forms a check or blade stop **48.** A depth gauge **50,** which can be in the form of a removable nylon plug, is used to control the amount of blade cut. The gauge **50** is insertable into the open end of the central bore **34** and is frictionally held in place. During the sharpening operation the blade **28** enters the registration slot **46** at the depth gauge **50.** The amount of cut will be determined by the extent of blade penetration; a shank portion **52** of the gauge **50** is provided with a flat surface **53** which serves as a guide for the proper amount of cut under normal sharpening conditions. However, a groove **54** within the shank **52** can be selectively aligned within the slot **46** for a deeper cut as necessary for removing blade nicks. The gauge **50** also prevents the blade **28** from contacting the abrading stone **26** at an acute angle which can burn or damage the blade. The shank **52** has an integral head forming a knob **56** with a knurled surface to permit the operator to selectively rotate the shank **52** and to align the groove **54** with the blade registration slot **46.** Furthermore, the depth gauge **50** may be removed by firmly grasping and withdrawing the knob **56;** the abrading stone **26** may then be removed through the opening in the central bore **34** after first loosening the set screw **42** on the belt pulley **40.** The upper portion of the knob **56** has a flat cut-away portion **58** to provide clearance for

the skate blade **28** during the sharpening operation. The bottom of the groove **54** is at an elevation which is below the uppermost circumferential projection of the abrading stone **26.**

In order to achieve effective contact between the blade **28** and abrading stone **26,** especially at the ends of the blade **28,** as where a plastic heel guard **60** is frequently attached on hockey skates or where toe picks or points are present as in figure skates; the upper surface of the sharpener head **12** is contoured in a generally arcuate shape having a convex cross section as more particularly shown in the drawings, FIGS. **4, 5** and **6.** The cylindrical abrading stone **26** thus provides a circumferential grinding surface which can be held parallel and contiguous to successive segments of the blade **28** as the sharpener **10** is moved therealong. The opposite ends of the abrading stone **26** are tapered or rounded to prevent possible blade nicks caused by sharp edges.

A lateral port **62, 64** on either side of the sharpener head **12** vents the central bore **34** adjacent to the location of the abrading stone **26** and thus provides an exhaust for the removal of grit, metal filings, and friction sparks.

The floating bearing assembly **38** is incorporated into the sharpener head **12;** the axial shaft **36** from the abrading stone **26** is thus journaled so as to provide flexibility or pivotal movement to the abrading stone **26.** The bearing assembly **38** includes a pair of bearing **66, 68** separated by a spacer sleeve **70,** which are housed within a bearing race **72.** The bearing race **72,** has a smaller outside diameter than bore **34** and is pivotally mounted within bore **34;** for this purpose the race **72** is formed with a recess **74** and a diametrically opposed projection **76.** A threaded pin **78** is removably insertable through aperture **80** and engageable within the recess **74.** The projection **76** is similarly, seated in a recess **82** formed in bore **34.** The bearing race **72** is pivotally displacable in response to excessive blade contact pressure upon abrading stone **26.** The belt drive **22** provides sufficient flexibility to absorb this movement, and will upon removal of the blade pressure, restore the abrading stone **26** to its original alignment within the bore **34.** Alternatively the motor **16** can be resilient or "shock" mounted as when other drive mechanisms are to be used. The actual displacement of the abrading stone **26** will be limited to the total clearance within the bore **34;** however, the extent of movement will be no greater than the difference in elevation between the groove **46** and the circumferential projection of the abrading stone **26.**

In a alternate embodiment, suitable for sharpening both hockey and figure skate blades, a sharpener head **12***a*, provided with a central bore **34***a*, an abrading stone **26***a*, and a lateral port **62***a*, **64***a*, is modified by providing two blade registration slots **46***a*, **47***a*, both extending radially from the longitudinal axis of the central bore **34***a*. The slots **46***a*, **47***a* are each of different widths, slot **46***a* corresponding to the thinner hockey skate blade, while slot **47***a* corresponding to the thicker figure skate blade. The depth gauge plug **50,** can also be altered so as to provide two grooves, corresponding in width to the slots **46***a*, **47***a*. In all other respects, the modified sharpener is substantially the same as the preferred embodiment previously described.

In operation, the skate blade **28** is fitted into a registration slot **46** after the depth gauge plug **50** has been inserted in central bore **34.** The motor **16** is then turned on by depressing switch **20;** with the abrading stone **26** in rotation, it is gently eased against the blade **28.** When contact with the blade is made, the sharpener **10** is moved generally parallel to and along the blade edge with a smooth even motion and with the application of a light to moderate pressure against the blade **28.** Several passes may be required to provide a sufficiently sharp edge; the skate is then turned around inverting the heel and toe positions, or the sharpener **10** is reversed, and the procedure repeated. This is done so that each side of the blade edge is ground with the same direction of abrading stone rotation. A few additional strokes, with the power off, will smooth the newly formed hollow ground edge and will remove any burrs. This "stoning" operation can also be performed by a small hand stone. The sharpener head **12** is contoured and has a concavely tapered nose **84** to permit the abrading stone **26** to effectively grind the entire length of the blade **28** without interference from the heel guard **60** or toe picks which would tend to block the registration slot **46** and prevent movement of the sharpener **10** at the ends of the blade **28.** It should also be noted that the cowl **40** will shield the belt drive **22** from the sharpened blade **28** during this procedure.

The above cited embodiments are intended as exemplary, and while it has described the invention with a specific implementations thereof, other modifications and various changes might be made in the embodiment as so set forth and will be apparent to those skilled in the art.

It should therefore be understood that all material described or shown in the accompanying drawings is to be interpreted as illustrative and not in a limiting sense.

Having thus described the invention, there is claimed as new and desired to be secured by Letters Patent:

1. A portable sharpener device comprising a sharpener head having a central bore extending longitudinally therethrough, a cylindrical abrading stone internally mounted within said bore for continuous rotation in a plane transverse to the axis of the bore to grind an edge on a blade, independent internally powered drive means for rotating the abrading stone with the rotational axis of the abrading stone being concentric with the longitudinal axis of the bore and no portion of the abrading stone being exposed beyond the bore, a longitudinal blade registration slot defined in the sharpener head, said registration slot being in a plane coincident with a plane passing through the rotational axis of the abrading stone, said drive means being offset from the rotational axis of the abrading stone and slot so as to provide clearance for the blade, whereby an ice skate blade is insertable into the registration slot for frictional contact with the abrading stone.

2. A portable sharpener device as claimed in claim **1** further including blade depth limiting means for adjustably controlling the amount of blade penetration within the registration slot.

3. A portable sharpener device as claimed in claim **1** wherein the abrading stone includes an integral axial shaft extending through said central bore, and further including flexible bearing means for journaling said shaft to permit displacement of the abrading stone in response to excessive blade contact pressure.

4. A portable sharpener device as claimed in claim **2** wherein the blade depth limiting means includes a plug

gauge axially insertable and snugly fitting into an open end of the bore.

5. A portable sharpener device as claimed in claim **4** wherein the plug gauge includes a shank portion corresponding in diameter to the diameter of the central bore for determining a depth of blade penetration, and further including an elevation groove defined within the shank portion whereby the plug gauge is selectively rotatable within the bore and the elevation groove is alignable with the registration slot for increasing the depth of blade penetration.

6. A portable sharpener device as claimed in claim **3** where the flexible bearing means includes a bearing race pivotally mounted within the bore to permit limited movement of the abrading stone during rotation.

7. A portable sharpener device as claimed in claim **3** wherein the drive means includes a motor, an output shaft from the motor, coupling means for transmitting power to the abrading stone shaft, said output shaft being parallel to and offset from the axial abrading stone shaft to provide clearance so that the abrading stone can be held parallel to and in contact with successive sections of the blade as the sharpener is moved relative to the blade.

8. A portable sharpener device as claimed in claim **1** wherein the diameter of the abrading stone corresponds in size to the diameter of a transverse concavity of the blade edge, whereby the sharpener will produce a hollow ground edge.

9. A portable sharpener device as claimed in claim **1** wherein the sharpener head is provided with a plurality of radially extending blade registration slots, with each slot having a width corresponding in dimension to a particular ice skate blade thickness.

10. A portable sharpener device as claimed in claim **7** further including a drive pulley attached to the end of the axial abrading stone shaft, said pulley being removably affixed to the shaft for releasably securing the abrading stone within the bore to facilitate disassembly.

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