Sept. 1, 1964 A. L. A. POSENER 3,146,555

APPARATUS FOR OPENING CANS AND SHARPENING KNIVES

Original Filed March 5, 1962 4 Sheets-Sheet 1

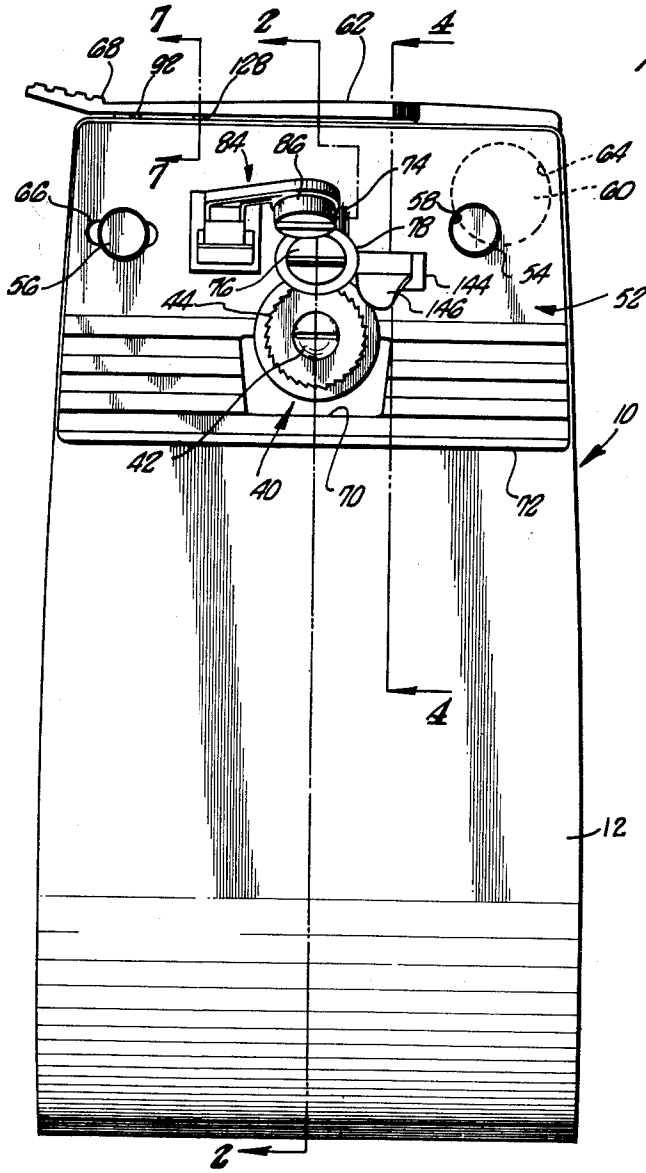



FIG. 1

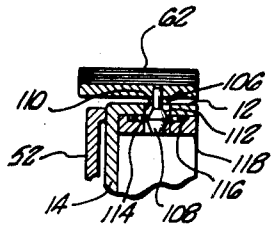



FIG. 7

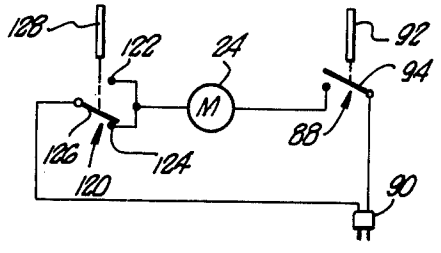



FIG. 3A

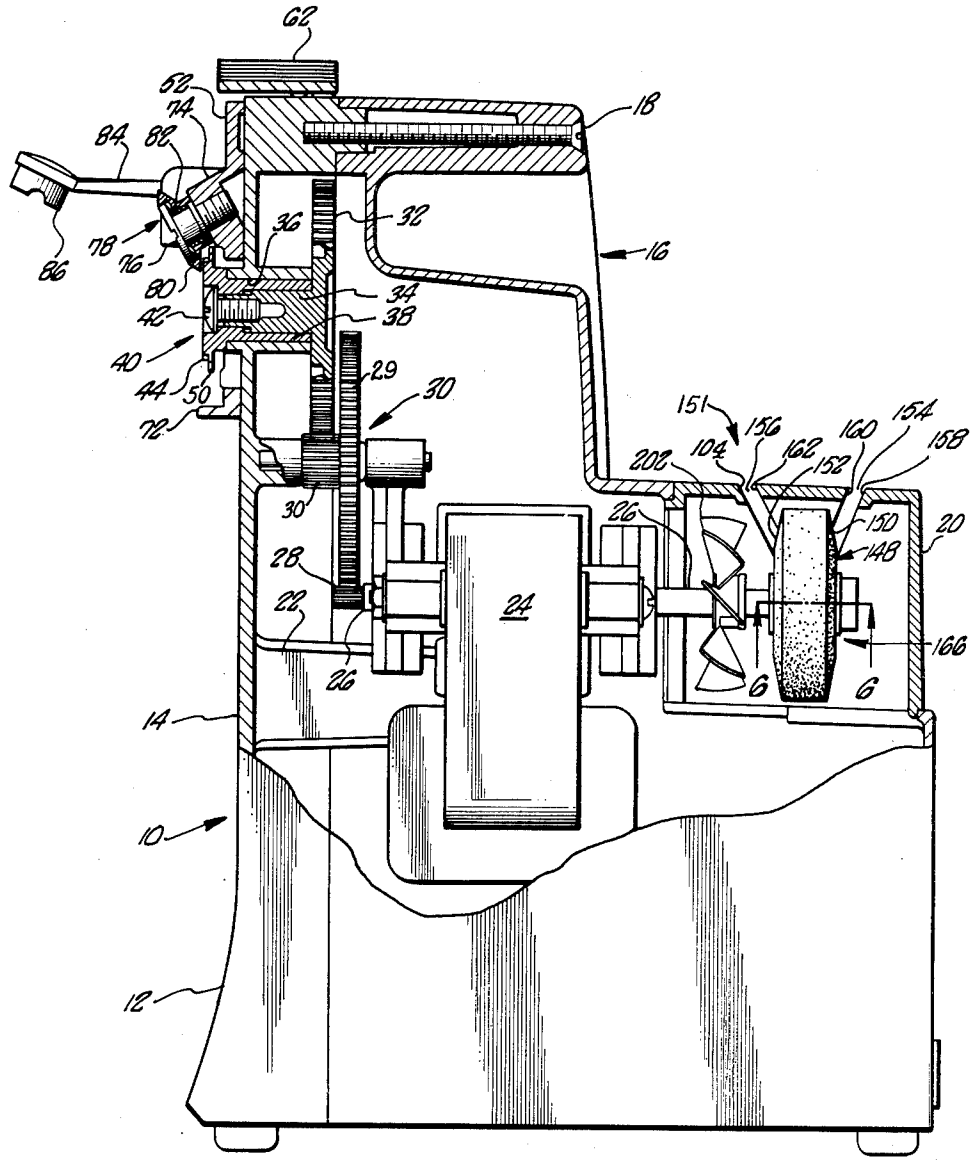
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APPARATUS FOR OPENING CANS AND SHARPENING KNIVES

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FIG. 2



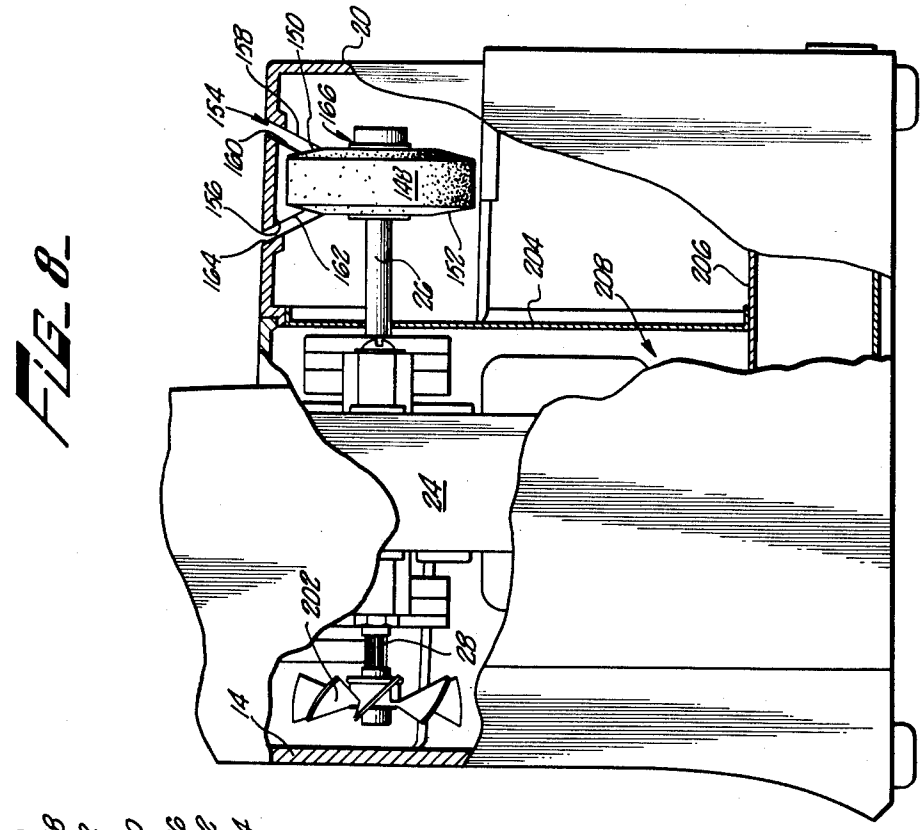

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APPARATUS FOR OPENING CANS AND SHARPENING KNIVES

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FIG. 2



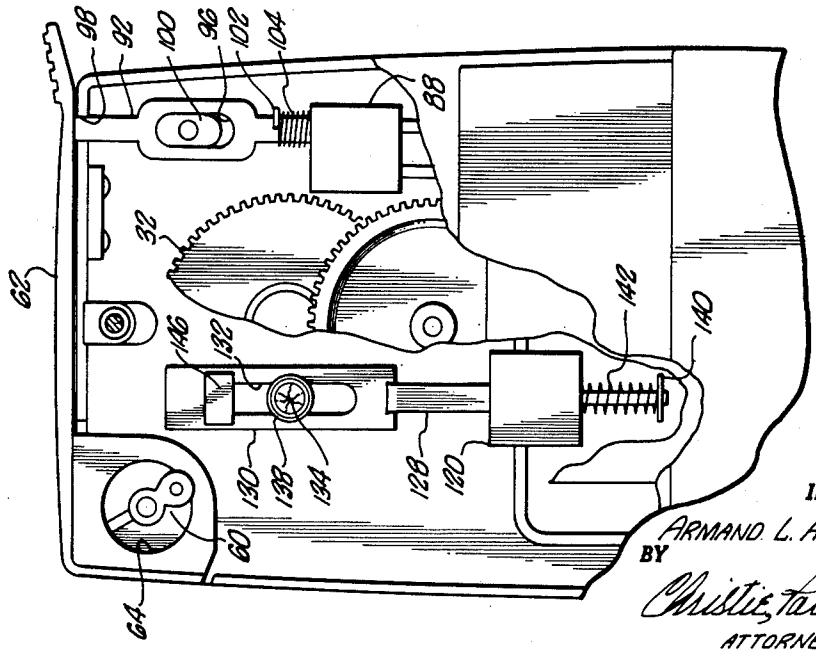




FIG. 3

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APPARATUS FOR OPENING CANS AND SHARPENING KNIVES

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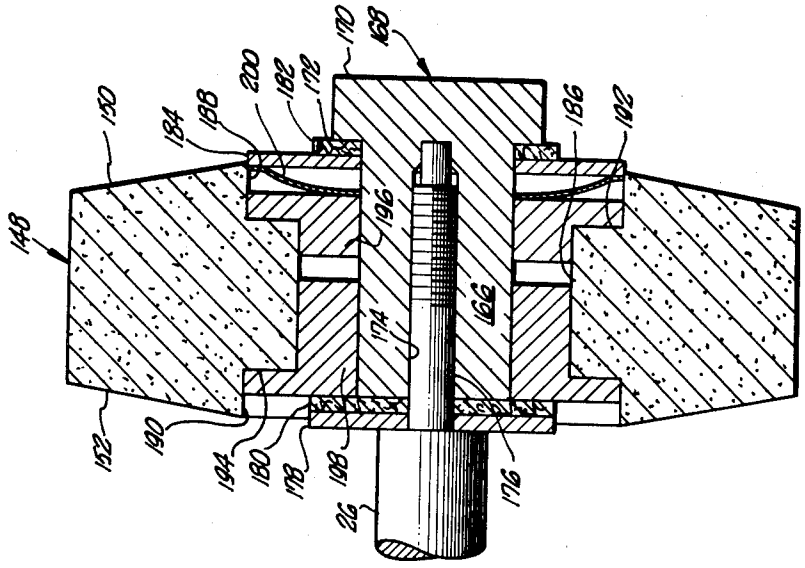


FIG. 6.

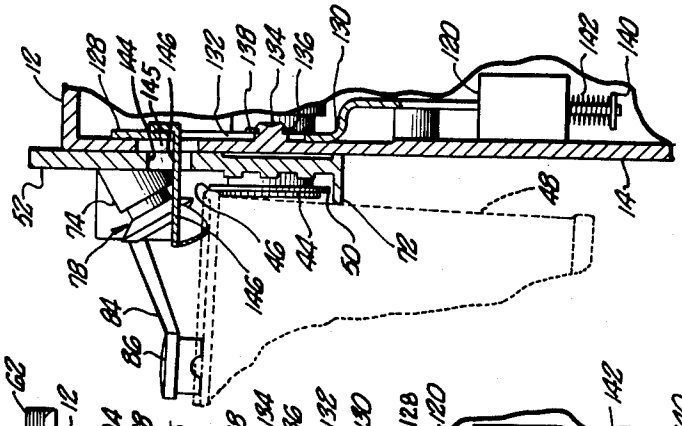


FIG. 5.

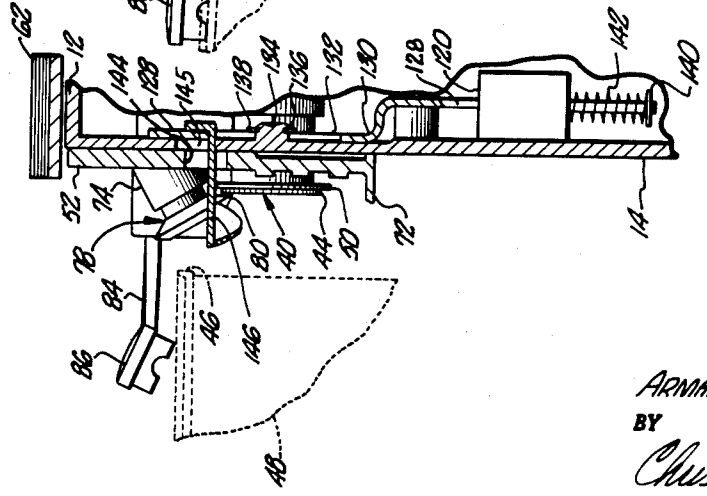


FIG. 4.

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United States Patent Office

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Patented Sept. 1, 1964



3,146,555

# APPARATUS FOR OPENING CANS AND SHARPENING KNIVES

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Original application Mar. 5, 1962, Ser. No. 177,620. Divided and this application Feb. 7, 1963, Ser. No. 256,863

3 Claims. (Cl. 51—128)

This is a divisional application of the co-pending patent application, Serial No. 177,620, filed March 5, 1962, and is directed to improvements in apparatus for automatically opening cans and sharpening knives.

It is a general object of the apparatus for performing the combined operation of opening cans and sharpening knives to have an optimum utility in the home kitchen at a minimum of expense to the consumer. To accomplish this it is desired that the apparatus be simple, compact and portable as well as rugged in its deisgn. Further, the apparatus should operate automatically to simply and efficiently open cans and sharpen knives with a minimum or servicing over a maximum period of time.

To provide this, can opener-knife sharpener apparatus generally includes, varying with specific designs, the basic combination of an electric motor mounted within a housing to rotate both a grinding wheel and a driving wheel. The driving wheel is rotatably carried by the housing to engage the under side of the bead of a can. Movably coupled to the housing, above the driving wheel, is a rotary cutter. The cutter is shiftable, by operation of a hand-operated lever, into cutting position with the driving wheel by engaging the top of the can immediately adjacent the bead. In this position rotation of the driving wheel rotates the can in contact with the rotary cutter to completely sever the top from the can.

Although by this combination of elements the prior art apparatus has effected a can opening and knife sharpening operation, they have only partially accomplished the above objective. For example, to energize the electric motor, thereby causing a rotation of the driving wheel as well as the grinding wheel, a switch is provided which is generally operated by the final movement of the hand-operated lever in shifting the rotary cutter into cutting position with the driving wheel. Thus, to open a can or to perform a grinding operation with the prior art apparatus, the operator must often manually maintain the lever in a position to close the switch. When sharpening a knife this means that only one hand is free to hold and guide the knife, a fact which may lead to nonuniform sharpening of the blade unless special guiding apparatus is provided. When employing the apparatus to open a can, this means that the operator is required to remain at the apparatus until the can is completely open. He is not free to perform other acts.

Further, it has been found in practice that the rotary cutter of most prior art apparatus, with use, tends to become frozen by foreign matter working between the rotary cutter and the coupling to the housing. When this occurs the cutting operation is materially impeded. Freezing of the cutter in such apparatus is prevented by frequently cleaning the cutter and its coupling to the housing. This entails completely removing the cutter from the housing.

In addition, the driving wheel design of the prior art apparatus is such that the wheel, in contacting the underside of the bead, also engages the side of the can below the bead. Thus, as the can rotates, the driving wheel tends to crush and tear any paper label on the can. The torn label accummulates at the driving wheel



to interfere with the rotary movement of the can which impedes the cutting operation of the can opener.

Also, when utilizing a motor driven grinding wheel to sharpen knives, it is desirable to provide means for preventing damage to the knife blade resulting from abnormal pressure of the blade on the wheel. This may be accomplished by effectively stopping the grinding wheel when the blade pressure on the wheel reaches a predetermined safe maximum. In the past this has been accomplished by employing a special motor design and by maintaining a particular relationship between the motor speed power requirement and the diameter of the grinding wheel, which combination stalls the motor when the predetermined safe blade pressure is reached. Such an arrangement, however, is both complex in design and relatively expensive. Another prior art arrangement for protecting the grinding wheel employs a pair of critically designed spring-loaded clutches to provide a slipping coupling between the grinding wheel and the motor drive shaft, see e.g. Bednarski Patent 2,898,709. Such a dual clutch arrangement, however, has also proven to be unduly complex in design and relatively expensive to construct.

The present invention, therefore, provides an improved can opener and knife sharpener design which is fully automatic, simple and efficient in its operation and one which overcomes the above-identified weaknesses in the prior art apparatus.

To accomplish this, the present invention combines a housing having an electric motor mounted therein, a shaft coupled to the motor, a freely rotatable grinding wheel mounted on the shaft and coupled thereto, and a driving wheel rotatably coupled to the shaft. The shaft and the grinding wheel are rotatably locked together by singular means. The locking means, which preferably takes the form of a slipping clutch, has a predetermined torque transfer characteristic which provides slippage between the shaft and the grinding wheel when excessive pressures are exerted against either side of the grinding wheel by a blade.

The driving wheel is carried by the housing and is positioned to contact the underside of a can bead to rotate the can in response to rotary movement of the shaft. The driving wheel has an annular toothed portion which engages the under side of the bead and means for limiting the contact of the toothed portion with the side of the can below the bead. Preferably, the limiting means takes the form of an annular shoulder extending radially outward beyond the toothed wheel. The shoulder engages the side of the bead when the toothed portion is in contact with the under side of the bead to maintain the toothed portion out of contact with the side of the can.

Movably supported by the housing above the driving wheel is a rotary cutter. The rotary cutter is adapted for shifting movement into cutting position relative to the driving wheel by engaging the top of the can immediately adjacent to the bead. Preferably, the rotary cutter is bearing mounted for rotation relative to the housing by a sleeve arrangement composed of a plastic-like material. The sleeve arrangement prevents the rotary cutter from freezing. A clean cutting operation by the rotary cutter is thus assured.

The rotary cutter is shifted into cutting position relative to the driving wheel by hand-operated means. Once the cutter and driving wheel are in cutting position, the hand-operated means is engaged by a lock member which maintains it in position. Moreover, the hand-operated means is adapted to energize the motor automatically after the rotary cutter is in cutting position relative to the driving wheel.

Means are further included for automatically shutting

off the motor when the top has been completely severed from the can. As a consequence, after once energizing the electric motor, the operator is free.

In view of the above, the present invention, by its specific combination of improved design features, provides overall improved apparatus for automatically opening cans and sharpening knives that eliminates the need for continuous manual control while in operation and provides an improved rotary cutter-drive wheel combination which does not freeze with use and which does not bind or tear the paper labels of the can to impede the cutter operation; and coupling the grinding wheel to the motor shaft to provide an efficient yet inexpensive coupling between the shaft and the wheel that prevents damage to knife blades during the sharpening operation.

The above, as well as other features of the present invention, may be more clearly understood by reference to the following detailed description when considered with reference to the drawings, in which:

FIGURE 1 is a front view of the apparatus of the present invention;

FIGURE 2 is a sectional right side view of the apparatus of the present invention taken along line 2—2 of FIGURE 1;

FIGURE 3 is a partial rear view of the apparatus with certain parts broken away to illustrate the novel automatic shut-off feature;

FIGURE 3A is a schematic diagram of the electrical circuit of the present invention;

FIGURE 4 is a sectional view of the apparatus taken along line 4—4 of FIGURE 1;

FIGURE 5 is a sectional view taken along line 4—4 of FIG. 1 with a can engaging the driving wheel of the apparatus;

FIGURE 6 is a cross section view of the grinding wheel and clutch coupling arrangement taken along line 6—6 of FIGURE 2;

FIGURE 7 is a partial section taken along line 7—7 of FIG. 1 to more clearly illustrate the locking arrangement for the hand-operated lever of the exemplary embodiment of the invention; and

FIGURE 8 is a partial side view of the apparatus with certain parts broken away to illustrate an alternative arrangement of the electric motor grinding wheel and cooling fan part of the present invention.

Although the specific improvements embodied by the overall design of the present invention are applicable to power can openers and knife sharpeners in general, they will be described in detail as specific improvements in an electric can opener and knife sharpener apparatus of the type descibed in the U.S. Patent 2,897,589, issued August 4, 1959. Accordingly, for more specific details on the operation of the apparatus not constituting parts of the present invention, reference may be made to this patent.

Referring to the drawings, particularly FIGS. 1 and 2, the exemplary embodiment of the present invention includes a housing represented generally at **10**, which includes three body sections, namely, a front section **12** having a vertical side or front wall **14**, a rear section **16** coupled to the front section by a screw member **18**, and a cover section **20** mounted on the rear section **16** to cover a knife sharpening portion of the apparatus indicated generally at **151**.

Mounted within the housing **10** by an arm member **22** which extends from the side wall **14** is an electric motor **24**. Coupled to the electric motor for rotation therewith is a shaft **26**, which extends on either side of the motor **24**.

The end of the shaft **26** adjacent the side wall **14** forms a gear **28**. The gear **28** engages a gear **29** in a reduction gearing arrangement, represented generally at **30**. The gear **29** is staked to pinion **30** which engages gear **32**. Gear **32** is affixed to shaft member **34** which is journalled in the side wall **14** for rotation about the centerline axis of gear **32**. Extending around the shaft **34** and supported within a tubular opening **36** in the side wall **14** is



the hub or hollow shaft **38** of a driving wheel **40**. The driving wheel **40** abuts an outer surface of the side wall **14** adjacent the tubular opening **36** and is coupled to the shaft **34** by a screw **42**. In this manner, the driving wheel **40** rotates with the gear **32** in response to the rotation of the motor shaft **36**.

The driving wheel **40** includes an annular toothed portion **44** adapted to contact the under side of the bead **46** of a can **48** (illustrated in FIGS. 4 and 5). Immediately adjacent the gear or toothed portion **44** is an annular shoulder **50**. The annular shoulder **50** extends radially outward beyond the toothed portion **44** between the toothed portion and the side wall **14**. The toothed portion **44** is proportioned to allow the annular shoulder **50** to act as a stop for the can **48**. Specifically, the shoulder **50** engages can bead **46** to prevent the outer surface of the toothed portion **44** from contacting the side of the can **48**. This prevents the driving wheel **40** from damaging a paper label that might be on the can **48**; and it avoids. the possibility of a torn label binding the driving wheel **40**.

Positioned along the side wall **14** and apertured at **70** to allow the driving wheel **40** to extend therethrough is a mounting plate **52**. The mounting plate **52** is movably coupled to the side wall **14** by a a pair of screw members **54** and **56**. As illustrated in FIGURE 1 and described in detail in the aforementioned U.S. patent, the screw member **54** extends through an opening **58** in the mounting plate **52** and is coupled to a cylindrical hub **60**. The hub **60** forms a component part of a hand-operated lever arm **62** and is mounted for rotation in an opening **64** in the side wall **14**. The screw **56** is threaded into wall **14** through a longitudinal slot **66** in the mounting plate **52**. Due to this arrangement, movement of an end **68** of the lever arm **62** in a clockwise direction (with reference to FIG. 1) produces an upward sliding movement of the mounting plate **52** relative to the side vertical wall **14**.

Extending outwardly (toward the front of the apparatus) from the lower part of the mounting plate **52** is a shoulder member **72**. The shoulder member **72**, as illustrated in FIGURE 5, is engaged by the side of the can **48** when it is positioned for opening. The shoulder **72** positions the can laterally from the outer face of the driving wheel **40**. It also acts as a guide for the can as it rotates in response to the rotary movement of the driving wheel **40**.

Extending outward and down from the mounting plate **52**, at a point above the driving wheel **40**, is a support member or projection **74**. A cutter **78** is rotatably supported on the support member **74** by a screw **76**. The rotary cutter **78** is positioned so that its annular cutting edge **80** can be moved immediately adjacent the outer surface of the driving wheel **40**. Further downward movement of the rotary cutter **78** causes cutting edge **80** to puncture the top of the can **48** directly adjacent the inner side of the bead **46**. At this point it cooperates with the driving wheel **40** and the guide shoulder **72** to clamp the can **48** in a cutting position with the under side of the bead **46** bearing on the toothed portion of the driving wheel **40**. Rotary movement of the driving wheel **40** thereafter rotates the can **48** because the teeth of gear **44** grip bead **46**. The result is that the cutting edge **80** severs the top from the can **48** adjacent the inner side of the bead **46**.

As illustrated in FIGURE 2, a sleeve member **82** supported on screw **76** acts as a bearing for the rotary cutter **78**. Preferably, the bearing member **82** is formed of a plastic-like material such as nylon or Teflon. This provides a long life bearing for the rotary cutter **78** and it substantially prevents the cutter from freezing due to impaction of foreign matter between the cutter **78** and its support member **74**.

Also coupled to the mounting plate **52**, at one side of the rotary cutter **78**, is a spring-loaded arm **84** carrying a magnet **86**. The arm **84** is normally maintained in a horizontal plane outward from the mounting plate **52**

to provide close spacing between the top of the can **48** and the magnet **86** when the can **48** is positioned for opening, as illustrated in FIGURE 4. In this manner, the magnet **86** readily attracts the top of the can **48** and the spring biased arm **84** moves downwardly, as indicated in FIGURE 5, to allow the top to engage the magnet. After the top of the can **48** is completely severed from the can, the spring returns the arm **84** (and the top of the can) to its normal position.

To selectively energize the electric motor **24** to produce the above-described rotary movement of the driving wheel **40**, the present invention utilizes a mechanically operated switch **88**. The switch, which is most clearly represented in FIGURE 3, operates in an electrical circuit illustrated in FIGURE 3A. In particular, the switch arrangement includes a normally open switch **88** connected between one side of the winding of motor **24** and an electrical power plug **90**. The plug **90** is connectible to a conventional 120 volt 60 cycle A.C. power supply. To provide for the selective closing of the switch **88**, an arm member **92** is coupled to the movable switch arm **94** of the switch **88**. The arm member **92**, which includes a vertical slot **96**, extends upward from the switch **88** and through an opening **98** in the top of the front section **12** of the housing **10** (FIG. 3). Extending from the rear of the wall **14** through the slot **96** is a lug **100**. The slot **96** is longer than the lug **100** to allow the arm **92** to be movable in a vertical direction, guided by the lug **100**. Extending around the arm **92**, between a shoulder **102** and the upper mounting surface of the switch **88**, is a spring member **104**. The spring member **104** normally urges the arm **92** upward to extend beyond the opening **96**. In this position the switch **88** is open to prevent current flow to the motor **24**. Since the arm member **92** normally extends above the top of the housing **10** the lever arm **62** in shifting the rotary cutter **78** into cutting position with the driving wheel **40** engages the arm **92**. Downward movement of the lever arm **62** thus causes the arm **92** to mechanically close the switch **88**, thereby completing an electrical circuit to energize the motor **24**.

When the lever arm **62** is in a position to effect an energizing of the motor **24**, it is engaged by locking arrangement that holds the arm in a down position and thereby maintains the switch **88** closed. This permits the operator, after once energizing the motor, to move away from the apparatus of the present invention and perform other acts within the kitchen. Preferably, the locking apparatus of the present invention includes, as illustrated in FIGURE 6, a locking pin **106** extending from the lower surface of the lever arm **62**. The locking pin **106** has an enlarged, diamond-shaped end section **108** which passes through an opening **110** in the top of the front section **12** of the housing **10**. In passing through the opening **110** the pin **106** engages and is forced within the central opening **112** of a retaining spring **114**. The retaining spring **114** is positioned within the slot **116** formed by cooperating adjacent surfaces of the top of the front section **12** and a plate **118**.

To further provide complete automatic operation of the can opener apparatus of the present invention, means are included for automatically shutting off the motor **24** after the top has been completely severed from the can **48**. Preferably, the automatic shut-off arrangement of the present invention, as illustrated in FIGS. 3–5, includes a normally closed switch **120**. The switch **120** is electrically connected between the motor **24** and the plug **90**, thereby permitting the completion of an electrical circuit for the motor **24** when switch **88** is operated.

The switch **120** as schematically illustrated, includes a pair of fixed electrical contacts **122** and **124** spaced above and below a movable switch arm **126**. The switch arm **126** normally engages the contact **124** when a can is not in the opener (illustrated in FIG. 4). When a can is placed in position, arm **126** engages contact **122** (switch **120** closed) and when the top has been completely severed from the can **48**, arm **126** is intermediate contacts **122** and **124** which opens the electrical circuit including the motor **24** thereby causing the motor to shut off.

Switch **120** must be held closed when a can is not inserted in the opener so that the motor may be energized to perform other operations of the apparatus. For example, as disclosed in the drawings, the apparatus includes a knife sharpener indicated generally at **151**. It must specifically be operable when a can is not being opened.

To effect the automatic opening of the switch **120**, the switching apparatus of the present invention includes an arm member **128** extending through the mounting structure of the switch **120**. The arm member **128** is coupled to the switch arm **126** within the mounting structure and includes an enlarged portion **130** which extends upward along the rear of the side wall **14**. The enlarged section **130** has a vertical slot **132** formed therein. Extending from the wall **14** through the slot **132** is a lug member **134** having an annular slot **136** therein. Positioned around the lug **134** and disposed within the slot **136** is a snap ring **138**. The snap ring **138** extends radially beyond the lug **134** to engage the sides of the enlarged portion **130** adjacent the slot **132**. In this manner the combination of the lug **134** and the snap ring **138** provides a vertical guide for the arm member **128**.

As illustrated, the arm member **128** extends downward through the mounting structure of the switch **120**. Positioned around the arm **128** between a shoulder **140** and the lower surface of the mounting structure for the switch **120** is a spring **142**. The spring **142** normally exerts a downward forces on the shoulder **140** to urge the arm **128** in a position to keep the switch **120** closed (with the switch arm **126** engaging the contact **124**).

Coupled to the enlarged section **130** to extend horizontally outward through aperture **145** in wall **14** and an opening **144** in the mounting plate **52** is a can guiding arm **146**. Due to the spring **142** the can guiding arm **146** is effectively spring-loaded and is normally positioned (absent a can) along the mounting plate **52** at the upper edge of the driving wheel **40**, as illustrated in FIGURES 1 and 4. In positioning the can **48** in cutting position, with the bead **46** resting on the toothed portion of the driving wheel, the can guiding arm **146** is raised to engage and rest upon the top of the can **48**, as illustrated in FIGURE 5. This is accomplished by moving the lever arm **62** away from the top of the housing **10** to move the rotary cutter **78** upward from the driving wheel **40**. This causes the lower edge of the opening **144** in mounting plate **52** to lift the can guiding arm **146** and the arm member **128**. The movement of the arm member **128** produces a movement of the switch arm **126** (mounted in switch **120** and shown schematically in FIG. 3A. Downward movement of the lever arm **62** then allows the spring biased can guiding arm **146** to engage the top of the can **48** as illustrated in FIG. 5.

With the can guiding arm **146** resting on top of the can the spring **142** is in a state of compression and causes the arm **146** to press tightly against the top of the can **48**. In this manner the can guiding arm **146** cooperates with the driving wheel **40** and its shoulder member **72** to maintain the can **48** in a cutting position relative to the rotary cutter **78**. Also, when the can guiding arm **146** is resting on the top of the can **48** the arm member **128** is positioned to cause the switch arm **126** to engage the other contact **122**, thereby again completing the electrical circuit to the motor **24**.

At vertical positions for the can guiding arm **146** between its normal position, as illustrated in FIGURES 1 and 4, and its raised position illustrated in FIGURE 5, the switch **120** is open. Thus, when, by operation of the rotary cutter **78** and the driving wheel **40**, the top has been severed from the can **48**, the spring **142** forces the can guiding arm **146** and arm member **128** downward to open switch **120** which interrupts the electrical circuit including motor **24**. In this manner the motor **24** is auto-

matically shut off when the top has been completely severed from the can 48.

As previously mentioned, the housing 10 of the present invention includes a cover section 20 (see FIG. 2). The cover section 20 is mounted over a portion of the rear section 16 of the housing 10 to provide a cover for the knife sharpener apparatus 151 of the present invention. The knife sharpener apparatus 151 includes a grinding wheel 148 mounted for rotation with and, in part, around the motor shaft 26, as hereinafter explained. To guide a knife or other blade into contact with the sides 150 and 152 of the grinding wheel 148 the cover section 20 has a pair of slots 154 and 156 formed in its upper surface. The slots 154 and 156 extend down and inward at an angle toward the sides of the grinding wheel 148 to define side walls 158, 160, 162 and 164 which guide a knife blade into contact with the sides 150 and 152, respectively, of the grinding wheel 148. In this manner, a knife blade in contacting the grinding wheel exerts a force thereon having vertical and horizontal components which urge the gringing wheel 148 axially along the motor shaft 26.

To resist the axial movement of the grinding wheel 148 as well as to couple the wheel to the shaft 26 for rotation therewith, the apparatus of the present invention includes a coupling arrangement 166 between the shaft 26 and the grinding wheel 148 which possesses a preselected torque transfer characteristic. This means that whenever an external force is applied to the grinding wheel 148 which requires a greater transfer of torque than the one pre-selected, slippage will occur between the shaft 26 and the grinding wheel 148. A preferred embodiment of such a coupling arrangement is illustrated in FIGURE 6.

As represented, the coupling arrangement 166 generally includes a bearing shaft 168, wheel bushings 196 and 198 supported thereon and means to frictionally couple the shaft to the bushings. More specifically, the coupling arrangement includes a shaft extension or bearing shaft 168 having an outwardly flanged end section or hub 170 that defines an annular shoulder 172 which extends around the shaft 168. The shaft 168 also includes a threaded bore 174 to receive the reduced diameter, threaded extension 176 of the shaft 26. Positioned on extension 176 between the end of the shaft 26 and the reduced end of the shaft 168 are washer members 178 and 180. Preferably, the washer 178 is composed of a hard metal, such as steel, while the washer 180 is composed of a relatively soft fibrous material. On the other side of the grinding wheel 148, washers 182 and 184 encircle shaft extension 168 intermediate shoulder 172 and bushing 196. Preferably, the washer 184 is composed of a hard metal, such as steel, while the washer 182 is composed of a relatively soft fibrous material.

The grinding wheel 148 is apertured at 186 with a central reduced radii section defining annular shoulders 192 and 194 adjacent counterbores 188 and 190.

Bushings 196 and 198 are apertured to receive the shaft 168 and also mount the grinding wheel 148. The bushings 196 and 198 include outwardly flanged end sections for engaging the respective shoulders 192 and 194 of the grinding wheel 148. Preferably, the bushings 196 and 198 are composed of a relatively soft metal or a plastic-like material such as zinc, brass, nylon, Teflon, etc. In this manner a bushing of relatively soft material is maintained in contact with the shaft extension 168.

Coupling between the grinding wheel 148 and the shaft 168 is obtained by biasing the spring washer 200 which is located between the washer 184 and the bushing 196. As illustrated, the spring washer 200 is positioned with its concave surface outwardly and, when loaded, exerts a resilient force on the bushing 196 which urge the grinding wheel 148 toward the shoulder on the end of the shaft 26. The spring washer 200, and the bushings 196 and 198 are constructed to make a controlled friction contact with the surface of the shaft 168. Under normal operating conditions, the force provided by the spring 200 to urge the bushing 198 against the fiber washer 180 and the friction contact between the bushings 196 and 198 and the shaft 168 are sufficient to lock the grinding wheel 148 to the shaft 168. However, these elements define a spring-loaded slip clutch which possesses a predetermined torque transfer characteristic, depending on the degree to which shaft 26 is threadedly telescoped into the shaft extension 168. Thus, as defined above, when a force is exerted on the grinding wheel 148 which requires a transfer of torque greater than the preselected characteristic of the clutch, the clutch slips. In the coupling arrangement 166 of the present invention the clutch is constructed to compensate for the drag on the grinding wheel by the pressure of a knife blade up to the point when the maximum torque transfer characteristic is reached which uncouples the grinding wheel 148 and the shaft 168.

For example, when a knife blade is guided into pressure contact with the right hand side 150 of the grinding wheel 148, the grinding wheel tends to move axially along the shaft 168 toward the end of the motor shaft 26. This compresses the fiber washer 180 and urges the metal washer 178 against the motor shaft 26 which increases the torque that the clutch is required to transfer from the grinding wheel 148 to the shaft 168. However, when the pressure of the blade reaches the predetermined safe maximum, the torque transfer characteristic of the clutch is exceeded and the clutch permits the shaft 168 and the motor shaft 26 to rotate relative to the bushings 196, 198 and the grinding wheel 148.

In a similar manner, when the blade is guided into pressure contact with the left side 152 of the grinding wheel 148, the grinding wheel 148 tends to move axially toward the shoulder 172. This compresses the spring washer 200 and increases the coefficient of friction between washers 182, 184 and shoulder 172 to compensate for the added drag on the grinding wheel 148. However, when the pressure of the blade reaches the predetermined safe maximum the torque transfer characteristic of the clutch is again exceeded to cause the clutch to slip. This again allows the shaft 168 to rotate relative to the grinding wheel 148 to thereby protect the blade from possible damage.

Thus, the present invention includes a knife sharpening arrangement having a grinding wheel 148 which is coupled by a single slipping clutch arrangement 166 for rotation with the motor shaft 26 to sharpen knives and which is effectively disengaged from the motor shaft when a predetermined maximum safe pressure is exerted on the wheel by a blade.

As illustrated in FIGURE 2, a fan 202 is fixably supported on the shaft 26 between the motor 24 and the grinding wheel 148 of the knife sharpener 151. As the shaft 26 rotates in response to the operation of the motor 24, the fan blows air past the motor 24, thereby effecting a cooling of the motor.

A preferred arrangement for the fan is illustrated in FIGURE 8. As represented, the fan is coupled to the shaft 26 at a side of the motor 24 remote from the grinding wheel 148. Pressure fitted between the cover section 20 and a lower surface of the housing 10 is a dust shield 204. The dust shield 204 includes an opening 206 permitting the shaft 26 to pass therethrough. The dust shield 206 together with the housing 10, forms a compartment 208 for the motor 24 which is isolated from the grinding wheel 148. Thus, the fan 202 cools the motor 24 without allowing shavings, dust and the like, from the area around the grinding wheel 148 from entering into contact with the motor 24.

What is claimed is:

1. An electric sharpener for knives and the like comprising:

a housing;

an electric motor having a shaft with spaced apart shoulders mounted within the housing;

electric circuit means for energizing the motor;

a grinding wheel having an interior, Teflon-type split bushing rotatably supported on the shaft intermediate said shoulders;

means including the housing for supporting and guiding a blade to be sharpened into engagement with a side of the wheel such that the blade, in being pressed against the wheel, exerts a force on the wheel tending to slide the wheel axially on the shaft;

compressible fiber washers disposed intermediate said shoulders and said bushing;

and a spring-biased slip clutch connected between the shoulder on one side of the wheel and one side of said wheel bushing to urge said bushing against the other shoulder, said clutch having a predetermined torque transfer characteristic which allows the bushiing and wheel to slip relative to the shaft before the axial force of the blade against the wheel is sufficient to damage the blade.

2. An electric sharpener for knives in accordance with claim 1 wherein said wheel is counterbored on one side, the spring of said slip clutch is convex shaped and the convex face thereof abuts a side of said bushing interior of said counterbore and means are provided to seal said spring interior of said counterbore.

3. An electric sharpener for knives and the like comprising, in combination,

a housing;

an electric motor having a shaft mounted within the housing, said shaft having a reduced section at its outer end;

a shaft extension telescoping over the reduced section of said motor shaft, said shaft extension having a hub at its outer end which defines a shoulder;

a centrally apertured grinding wheel having counterbores on each side thereof;

a two-part, Teflon-type bushing affixed interior of the aperture of the grinding wheel to mount the grinding wheel on said shaft extension intermediate the shoulders on said motor shaft and said shaft extension; and

an apertured, cup-shaped spring member mounted on said shaft extension interior of one of said counterbores with its convex side bearing against one side of said bushing;

a first washer mounted on said shaft extension intermediate said resilient member and one of the said shoulders and proportioned to seal the spring member interior of said counterbore;

a second washer mounted on said shaft extension intermediate the other of said shoulders and the other side of said bushing and the small end of said shaft extension;

fiber washers mounted on said shaft extension between the shoulder thereof and said first washer and between said second washer and the end of said bushing and said shaft extension;

and means to compress said spring member axially to provide a preselected torque transfer characteristic for the grinding wheel whereby said shaft extension and said bushing means rotate as a unit until the torque transfer characteristic is exceeded, at which point slippage therebetween occurs.

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