March 7, 1967 F. M. HUBRICH 3,307,255

CONTROL MEANS TO ENERGIZE A COMBINATION CAN OPENER AND KNIFE SHARPENER

Filed Aug. 18, 1964 3 Sheets-Sheet 1

Fig. 1.

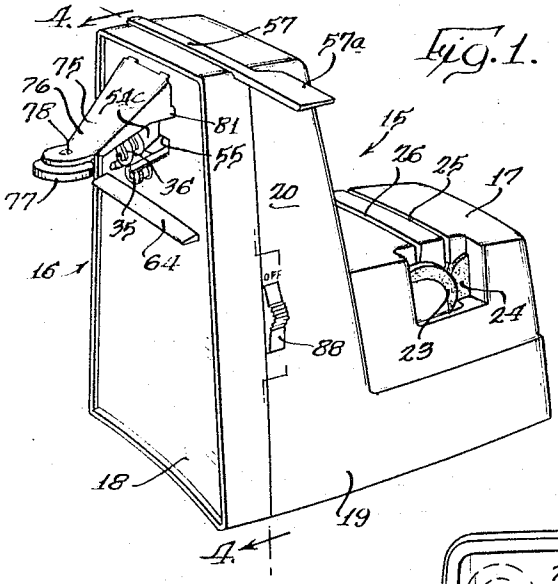


Fig. 2.

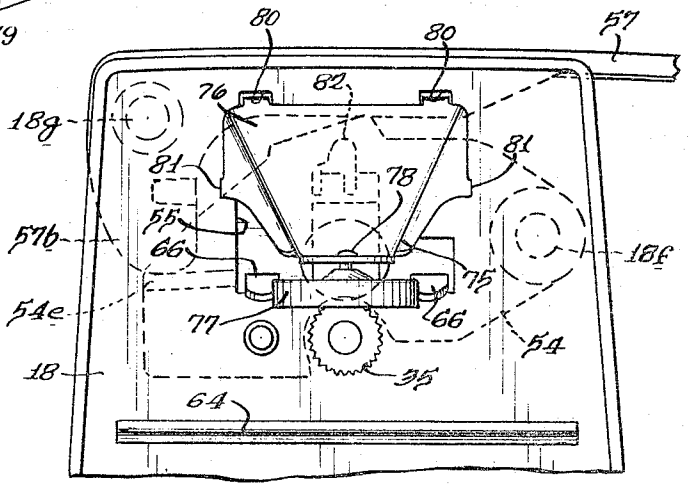


Fig. 3.

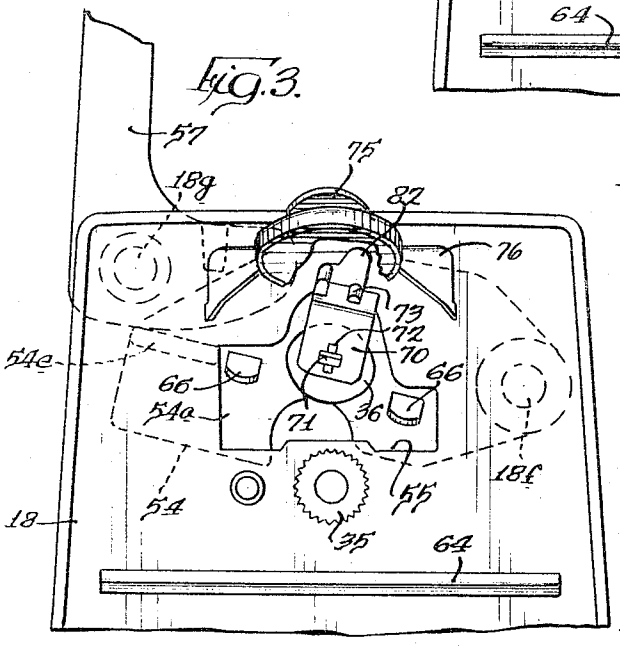
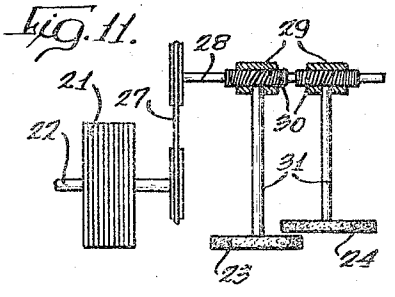


Fig. 11.



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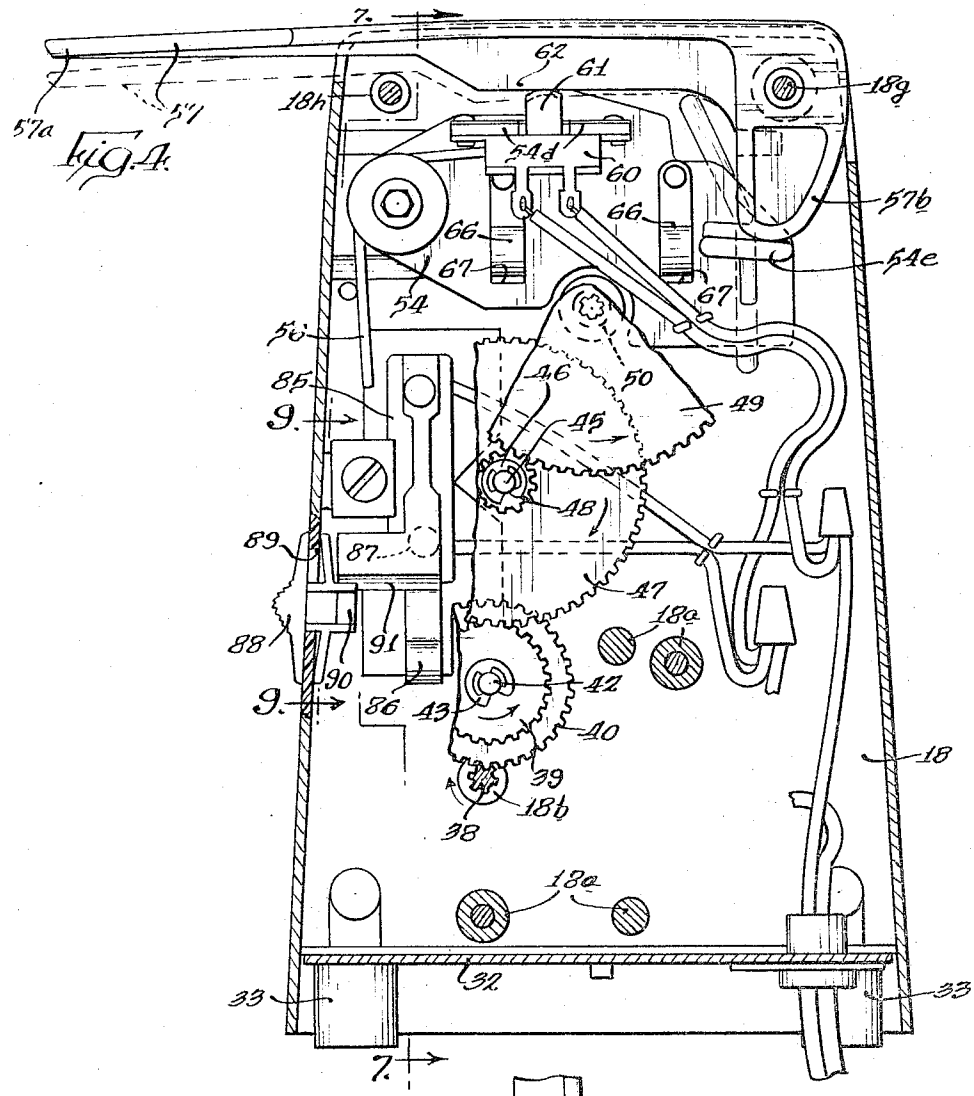


Fig. 4.

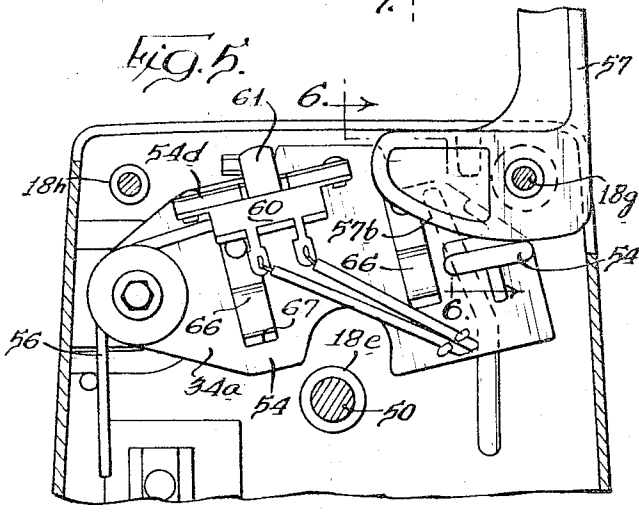


Fig. 5.

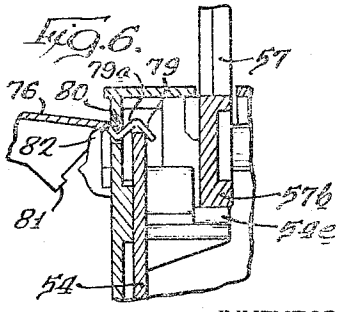


Fig. 6.

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Fig. 7.

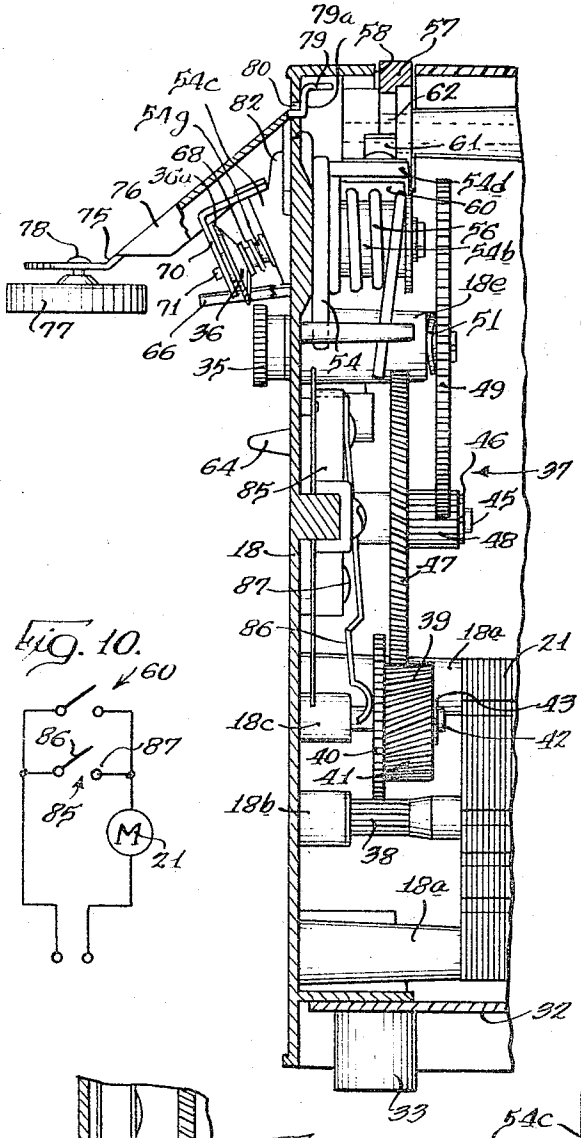


Fig. 8.

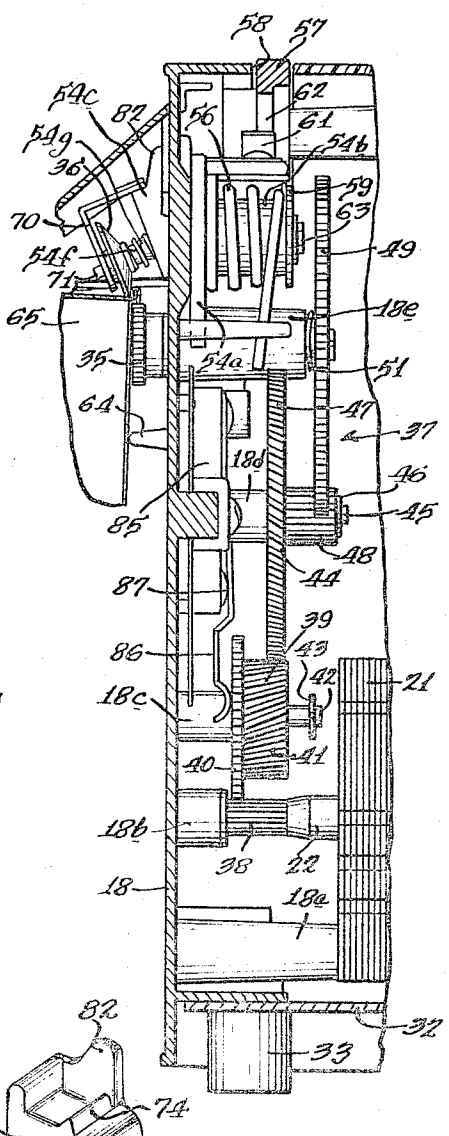


Fig. 10.

Fig. 9.

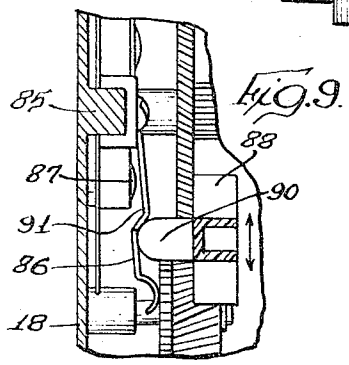
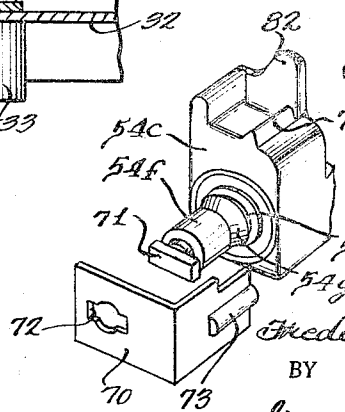


Fig. 12.



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United States Patent Office 3,307,255 Patented Mar. 7, 1967

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Filed Aug. 18, 1964, Ser. No. 390,285
14 Claims. (Cl. 30—4)

The present invention relates to an improved can opener and more particularly to an automatic can opener of the type in which the can opening cycle is initiated manually and is terminated by automatic means.

During the past few years, the electric can opener has become one of the most popular household appliances on the market. With the increased popularity of the electric can opener, a demand has developed for more sophisticated models which require less effort and less attention on the part of the consumer to open a can. To satisfy this demand, can openers have been designed and marketed which include automatic means for terminating the cutting cycle after it has been initiated manually. Some of these automatic means include mechanisms for shutting off the can opener after it has run a predetermined time. One of the shortcomings of a time controlled mechanism is the lack of compensation for the varying sizes of cans. As a consequence, the operation of the opener may be continued far longer than necessary in the case of a small can.

Another approach to the automatic can opener involves the utilization of a sensing member which engages the can lid and, when the lid is displaced as a result of its being completely severed from the can, the sensing member operates a shutoff for the can opener. The principal problem involved in such a mechanism is that the can lid is not always displaced when completely severed from the can because of burrs or other obstructing projections on the adjacent severed edges of the can. As a consequence, even though the lid is completely severed, the lid is not displaced sufficiently to operate the can opener shutoff. The third, and perhaps most effective type of automatic shutoff, utilizes the reaction force on the can cutter to maintain the can opener in the operating condition. When the reaction force ceases to be exerted on the cutter, the power means is shut off. There are many types of mechanisms known in the art which are designed to utilize this reaction force as the control means for the can opener cycle. Most of these prior art mechanisms are very complicated and form expensive additions to the can opener structure. In addition, because of their complicated structure, they are very subject to malfunctioning problems.

The present invention is concerned with an improved automatic shutoff mechanism which utilizes the reaction force on the cutter as a means of controlling the length of the can opening cycle. The design is extremely simple adding little more than the cost of a switch to the conventional mechanism found in a nonautomatic type of can opener.

It is an object of the present invention to provide an improved can opener having means for automatically terminating the can cutting cycle.

It is a further object of the present invention to provide an improved can opener having a simple and effective means for automatically terminating the can opening cycle after the lid of the can has been severed.

Another object of the present invention is to provide a simple means for terminating the can opening cycle automatically utilizing the reaction force exerted on the cutter and the gear train by means of which the can is driven.

A still further object of the present invention is to provide a combined knife sharpener and can opener having a manual switch for operating the knife sharpener independently of the can opening mechanism.

Another object of the present invention is to provide a combination can opener and knife sharpener having a simplified switch mechanism for manually controlling the knife sharpener and for automatically terminating the can cutting cycle.

A further object of the present invention is to provide an improved means for detachably mounting the cutter of a can opener so that it may be readily removed for cleaning.

Still another object of the present invention is to provide an improved can opener having an improved lid retaining magnet holder which is both simple in structure and effective from a functional point of view.

Further objects and advantages of the present invention will become apparent as the following description proceeds and the features of novelty which characterize the invention are pointed out with particularity in the claims annexed to and forming a part of this specification.

For a better understanding of the present invention, reference may be had to the accompanying drawings in which:

FIG. 1 is a perspective view of a combination can opening and knife sharpening appliance constructed in accordance with the invention;

FIG. 2 is an enlarged front elevational view of the upper portion of the appliance of FIG. 1;

FIG. 3 is a front elevational view similar to FIG. 2 but with the parts shown in the position for loading a can into the appliance;

FIG. 4 is a vertical sectional view of the appliance taken substantially on line 4—4 of FIG. 1;

FIG. 5 is a fragmentary sectional view similar to FIG. 4 but showing only the upper portion thereof with the parts shown in the position for loading a can;

FIG. 6 is a fragmentary vertical sectional view taken substantially on line 6—6 of FIG. 5;

FIG. 7 is a vertical sectional view taken substantially on line 7—7 of FIG. 4;

FIG. 8 is a vertical sectional view similar to FIG. 7 but showing a can being operated upon and showing the parts in the positions assumed during the can cutting operation;

FIG. 9 is a fragmentary vertical sectional view taken on line 9—9 of FIG. 4;

FIG. 10 is a schematic wiring diagram of the appliance of FIG. 1;

FIG. 11 is a schematic diagram of the driving connection between the motor and the knife sharpening wheels; and

FIG. 12 is an enlarged exploded perspective view of the parts which mount and retain the can opener cutter.

The invention relates to an improved can opener having automatic means for terminating the can opening cycle after it has been initiated manually. During the opening of the can, the cutter, which is in piercing engagement with the lid of the can, exerts a force against the can as it is rotated into engagement with the cutter by means of a serrated feed wheel. The feed wheel is rotated at a relatively low speed by a motor driving through a reduction gear train. As long as the cutting of the can lid continues, a substantial amount of power is transmitted through the reduction gear train to the feed wheel which rotates the can. As soon as the lid has been severed from the can, the cutting wheel no longer exerts any substantial force on the can and it rotates freely. At this point, the power required by the feed wheel to rotate the can is diminished considerably from

that which was required during the can cutting operation. This change in power passing through the reduction gearing after the can has been opened is used in accordance with the present invention as the means of terminating the can cutting cycle automatically. A pair of helical spur gears are included in the train and the change in axial thrust exerted by one of these gears is used as the means of signalling when the can cutting operation has been completed. The switch controlled by the axially displaceable helical spur gear is also provided with a manual control means which is useable in connection with the knife sharpening attachment.

Referring to the drawings, there is illustrated a combination can opening and knife sharpening appliance or device designated generally by reference numeral **15**. The device includes a vertically extending can opener portion **16** and a laterally extending knife sharpening portion **17**. As may best be seen in FIGS. 1 and 7, the device is made up of a front frame member **18** and a cover member **19** which members cooperate to form a housing **20** within which there is enclosed an electric motor **21**, preferably a shaded pole induction motor.

The electric motor **21** is provided with an armature shaft **22**, the front end of which drives the can opener of the appliance and the rearwardly extending end of which drives the knife sharpener of the appliance. The knife sharpener includes a pair of abrasive grinding wheels **23** and **24** which are mounted in the knife sharpening portion **17** and are accessible for sharpening knives and scissors through the slots **25** and **26**, respectively. The details of the knife sharpener are completely disclosed in copending application Serial No. 320,282, filed October 31, 1963, now Patent No. 3,258,878 and assigned to the same assignee as the instant application. The manner in which the grinding wheels **23** and **24** are driven from the electric motor **21** is shown schematically in FIG. 11. The rearwardly extending end of armature shaft **22** is drivingly connected to a horizontally extending shaft **28** by means of a flexible belt **27**, which belt is carried by pulley sheaves attached to each shaft. The shaft **28** is formed with worm gear portions **29** which drivingly engage helical gears **30** which are suitably secured to shafts **31** upon which the grinding wheels **23** and **24** are mounted. The knife sharpener structure including the shafts **28** and **31** are supported by bearing means set forth in detail in the above copending application. To mount the knife sharpener with respect to the front frame member **18**, there is provided a secondary frame member **32** which extends horizontally and is secured to frame member **18** by assembly means (not shown) extending upwardly through resilient supporting feet **33**. The secondary frame member **32** serves as a closure for the bottom of housing **20** as well as providing a support for the knife sharpener.

The frame or front frame member **18** consists of a die casting having integrally formed bosses **18***a* for supporting the motor **21**. Assembly screws extend through the field of motor **21** into threaded engagement with bosses **18***a*.

Mounted toward the upper end of the frame member **18** is a serrated feed wheel **35** and a cutter wheel **36**. The outer periphery of the feed wheel **35** is provided with V-shaped grooves or serrations as is well known in the art to assure good driving engagement between the feed wheel and the lip of a can being opened. The cutter wheel **36** is mounted for movement relative to the feed wheel **35** and is provided with a sharpened cutting edge **36***a* against which the cover of the can is rotated to sever the lid therefrom. While the invention is disclosed herein in the form using a cutting wheel and a feed wheel, it should be understood that various types of cutting members could be employed while practicing the broader aspects of the invention.

For the purpose of drivingly relating the motor **21** and the serrated feed wheel **35**, there is provided a reduction gear train **37** which is completely supported on the front frame member **18** as is best shown in FIGS. 4, 7 and 8. The first gear in the train **37** is a small spur gear **38** formed integrally with the armature shaft **22** of the motor **21**. The forward end of the armature shaft **22** is provided with a reduced diameter portion which is journaled in an opening in a boss **18***b* in the frame **18**. Drivingly engaged with the gear **38** is a gear member **39** which includes a large spur gear **40** and a helical spur gear **41** of smaller diameter as is best shown in FIGS. 7 and 8. To support the gear member **39**, there is provided a stub shaft **42** which has a suitable retaining means **43** at its outer end to prevent the gear member **39** from being removed therefrom. The stub shaft **42** is received in a boss **18***c* extending rearwardly from the frame **18**. As is obvious from FIGS. 7 and 8, there is a substantial amount of clearance between the boss **18***c* and the retaining means **43** thereby permitting the gear member **39** to move axially about a quarter of an inch. It should also be noted that the spur gear **38** is elongated so that the spur gear **40** remains in driving engagement in any of its positions of axial displacement.

A second gear member **44** is mounted on the frame member **18** to rotate about an axis parallel to the axis of rotation of gear member **39** and spaced therefrom. The gear member **44** is rotatably supported on a second stub shaft **45** which is rigidly mounted in a boss **18***d* on the frame member **18**. A suitable retaining means **46** is mounted on the end of the stub shaft **45** to prevent the gear member **44** from being displaced axially.

The gear member **44** includes a large helical gear **47** which is in driven engagement with the helical gear **41** of the gear member **39**. Extending axially from the helical gear **47** is a small spur gear **48** which drives a large spur gear **49** mounted coaxially with the feed wheel **35**.

The front frame member **18** is formed with an elongated bearing boss **18***e* within which is journaled a shaft **50**, as shown in FIGS. 4 and 5. The shaft **50** carries at its outer end the feed wheel **35** and on its inner end the large spur gear **49**. The portion of the shaft **50** extending between the feed wheel **35** and the spur gear **49** is longer than the mounting boss **18***e* thereby permitting a small amount of axial movement of the shaft **50** with respect to the frame member **18**. As is best shown in FIGS. 7 and 8, a curved spring washer **51** is positioned between the gear **49** and the rearwardly extending end of the boss **18***e* to bias the feed wheel shaft **50** rearwardly.

To support the cutter wheel **36** for movement relative to the frame member **18** and the feed wheel **35**, there is provided a plate **54** best shown in FIGS. 4 and 5. The plate **54** is mounted on the frame member **18** for pivotal movement about a mounting boss **18***f* (FIG. 3) extending rearwardly from the frame member **18**. The cutter supporting plate **54** is a die cast member having a flat, vertically extending portion **54***a* and a rearwardly extending mounting boss **54***b* at one end thereof. The boss **54***b* is received over the projection **18***f* extending from the frame **18**. Formed integrally on the front side of the supporting plate **54** is a cutter wheel supporting portion **54***c*. As is best shown in FIG. 3, the front frame member **18** is formed with an irregular opening **55** through which the portion **54***c* extends. Thus, the supporting plate **54** is mounted for pivotal movement on the inside of housing **20** with the portion **54***c* projecting out from the housing **20** through the opening **55**.

The supporting plate **54** is biased to an upper or can loading position by means of a spring **56**, which spring is received on the mounting boss **54***b* as shown in FIGS. 7 and 8. One end of the helical spring **56** engages a projection on the frame **18** while the other end engages a switch mounting projection **54***d* and thereby biases the plate **54** counterclockwise upwardly as viewed in FIG. 5.

To cause the cutter wheel **36** to move downwardly into piercing engagement with the lid of a can, there is provided an operating lever **57** which extends through a slot **58** in the housing **20** into pivotal engagement with a pro-

jection 18*g* on the frame 18. The lever 57 is formed with an enlarged end or handle portion 57*a* suitable for applying hand pressure to the outer end of the lever 57. This handle portion 57*a* extends horizontally past the edge of the housing 20 as is best shown in FIG. 1. Within the housing 20, the lever 57 is formed with a cam portion 57*b* which rides in engagement with a cam follower surface 54*e* on the cutter supporting plate 54. In FIG. 5, the operating lever 57 is shown in the position which it assumes when a can is being loaded in the can opener. When the lever is pivoted about 90° counterclockwise as shown in FIGS. 4 and 5, the cam surface 57*b* engages the cam follower portion 54*e* causing the cutter supporting plate 54 to be rotated clockwise to the position shown in FIG. 4. In the position shown in FIG. 4, the force exerted by spring 56 tends to rotate plate 56 counterclockwise against the cam surface 57*b*. Since the direction of the force exerted by the cam follower 54*e* is substantially through the pivot axis 18*g* of the lever 57, there is no tendency for the spring 56 to rotate lever 57 from the position shown in FIG. 4. As a consequence, the cutter and feed wheels 36 and 35 remain in the can cutting position even after release of manual pressure from handle 57*a*.

To energize the motor 21 when the cutter and feed wheels move into their operative or can cutting positions shown in FIG. 2, a switch 60 is provided on the cutter supporting plate 54 where it is mounted by means of the switch mounting projection 54*d* mentioned above in connection with the biasing spring 56. The switch 60 is a normally open switch which is closed on depressing a vertically extending button 61. The lever 57 is formed with a switch operating portion 62 which engages the button 61 when the lever is rotated to the horizontally extending position shown in dashed lines in FIG. 4. The button 61 is spring biased upwardly to return the switch to its open position on release of pressure from the lever 57 and the button 61. Thus, upon release of hand pressure from handle portion 57*a*, the switch 60 forces the lever 57 upwardly from the dashed line position shown in FIG. 4 to the solid line position thereby opening the switch 60. It should be understood that the switch opening biasing means which urges the lever 57 to the solid line position of FIG. 4 may be integral with the switch 60 as in the disclosed embodiment or be a separate biasing spring acting upwardly on lever 57. To prevent damage to switch 60 or overtravel of the lever 57, a boss 18*h* on the frame 18 serves as a stop which is engaged by lever 57 as shown in FIG. 4.

To assure proper positioning of a can when operated on by the can opener 15, several guides are provided. On the front wall of the frame member 18 there is a horizontally extending bar 64 which engages the side wall of a can 65 as is best shown in FIG. 8. To maintain the can 65 against twisting from a substantially vertical position, there are provided two L-shaped guide members 66 which are secured to the cutter supporting plate 54 and extend outwardly to the opening 55. The guides 66 are secured to the rear face of the plate 54 as is best shown in FIG. 4 and extend forwardly through openings 67 in the plate 54. The guides 66 are somewhat resilient and engage the top of the end seam of a can and restrain the can against the above-described twisting movement.

As is best shown in FIGS. 7, 8 and 12, the cutter wheel supporting portion 54*c* is formed at its outer face with an inclined portion from which extends the cutter wheel mounting projection 54*f*. The projection 54*f* is generally cylindrical in shape and supports a biasing spring 68 as well as the cutting wheel 36 which is rotatable thereon. The spring 68 engages the rear face of the cutter wheel 36 and permits the cutter wheel to be displaced rearwardly. The projection 54*f* adjacent the supporting portion 54*c* is formed with a conical portion 54*g* which is undercut at 54*h* as is best shown in FIG. 12. The innermost turn of spring 68 is received in the undercut 54*h* to prevent accidental detachment of spring 68 when cutter 36 is removed for cleaning. In order to retain the cutter wheel 36 on the projection 54*f*, there is provided an L-shaped cutter retainer or clip 70 which is received on the outer end of the projection 54*f* and when assembled thereto, retains the cutter wheel 36 thereon while providing a readily detachable means for disassembling the cutter 36 for cleaning purposes. The projection 54*f* is formed with a small T-shaped portion 71 at the outer end. The retainer 70 has an opening 72 formed therein which is of sufficient length to fit over the end 71 when properly oriented so that the long dimension of the opening 72 is aligned with the long dimension of the end 71. After the end 71 passes through the opening 72, the retainer 70 may be rotated 90° to the position shown in FIG. 3 in which the T-shaped end 71 locks the retainer 70 against axial displacement with respect to the projection 54*f*. To lock the retainer 70 at the rotary position shown in FIG. 3, there is provided a rearwardly extending latch 73 which snaps into engagement with a projection 74 formed on the cutter wheel support portion 54*c*. Thus, to remove the cutter wheel 36 from the supporting plate 54, it is necessary only to rotate the retainer 70 90° clockwise from the position shown in FIG. 3. At that point, the opening 72 in the retainer 70 is so aligned with the T-shaped projection 71 as to permit the retainer 70 to be moved axially of the cutter wheel as shown in FIG. 12 thereby permitting removal of the cutter wheel itself for cleaning purposes.

To grip the cover of a can and facilitate its removal after it has been severed, the can opener 15 is provided with a magnetic lid lifter or lid retainer 75. The lid retainer 75 is extremely simple in design and provides an inexpensive and effective lid retaining mechanism. The lid retainer 75 comprises only a simple plate or stamping 76 to the outer end of which is secured a magnet 77 by means of a rivet 78 which supports the magnet loosely with respect to the stamping 76. To mount the lid retainer 75 with respect to the housing 20, the stamping 76 is provided with two somewhat Z-shaped projections 79 which extend through openings or slots 80 in the frame 18. The projections 79 support the lid retainer 75 for limited pivotal movement with respect to the frame 18. During such limited pivotal movement, a vertically extending portion of each of the tabs 79 engages the inner face of frame member 18 adjacent opening 80 and prevents outward displacement of the plate 76.

During the can opening operation or when the lever 57 is in the horizontally extending position shown in FIG. 4, the lid retainer 75 assumes the position shown in FIGS. 7 and 8. This position is determined by the projections 79 and a pair of inwardly extending stops 81 which are best shown in FIGS. 1, 2 and 6. When the cutter supporting plate 54 moves or pivots upwardly to the position shown in FIG. 5, the lid retainer 75 is rotated upwardly to an approximately horizontal position by means of a projection 82 which is carried by the plate 54 and which engages the underside of the stamping 76 as is best shown in FIG. 6. This projection 82 extends upwardly from the cutter wheel supporting portion 54*c* and causes the lid retainer 75 to pivot about its Z-shaped supporting projections 79. The purpose of this action is to cause the lid retainer 75 to lift the lid of the can upwardly out of engagement with the side walls of the can at the time the operating lever is moved to the position shown in FIG. 5 permitting withdrawal of the can from the can opener. When it is desired to remove the lid retainer 75 from the mounted position on the front of frame member 18, the stamping 76 is lifted to an upwardly angled position in which the normally vetrically extending portions 79*a* of the Z-shaped projections 79 as shown in FIGS. 7 and 8 are extending horizontally and may be slid through the openings 80. At that point, the stamping 76 is again lowered at the same time the outer ends of the projections 79 are slid outwardly through the openings 80. Thus, by a simple pivotal movement of the stamping 76 while at the same time exerting an outward pressure, the lid retainer

75 may be detached from the frame 18. This arrangement provides an extremely simple and effective mounting for the lid retainer while at the same time permitting easy detachment from the can opener for cleaning purposes.

To prevent the lid retainer 75 from being inadvertently detached from the can opener when a can cover is removed from the magnet 77, a locking means is provided to prevent detachment when the plate 54 is in its raised position as shown in FIGS. 5 and 6. In this raised position, the upper edge of plate 54 engages one of the projections 79 as illustrated in FIG. 6 thereby preventing the pivotal movement of lid retainer 75 which is necessary for detachment. When the plate 54 is pivoted downwardly, this locking action is eliminated and the lid retainer may be readily removed in the manner described above.

Before considering the automatic control aspect of the can opener, a brief review will be made of the operation of the parts described above. When it is desired to open a can, the operating lever 57 is moved to a vertically extending position as is shown in FIG. 5. In that position, the spring 56 urges the cutter supporting plate 54 in a counterclockwise direction as shown in FIG. 5 thus carrying the cutter wheel 36 to the raised position which is shown from the front in FIG. 3. In this position, the projection 82 on the cutter supporting plate 54 has pressed upwardly on the underside of the stamping 76 causing the lid retainer to move upwardly to the raised position shown in FIG. 3. The can 65 is then placed in the can opener with the end seam of the can overlying the feed wheel 35 as shown in FIG. 8. The operating lever 57 is then pivoted approximately 90° to a horizontally extending position shown in dashed lines in FIG. 4. Switch operating portion 62 of the lever 57 engages the button 61 of the control switch 60 completing the circuit to energize the electric motor 21. The motor 21 acting through the reduction gear train 37 rotates the serrated feed wheel 35 which in turn rotates the can 65 in continuous cutting engagement with the cutter wheel 36.

For the purposes of illustration, the direction of rotation of the various gears as well as the armature shaft 22 are shown in FIG. 4. The small spur gear 38 on the armature shaft 22 rotates clockwise as shown therein causing the mating gear member 39 to rotate counterclockwise. When a load is applied to the feed wheel 35 by virtue of the reaction forces applied by the cutter wheel 36, the gear member 39 is caused to move axially as a consequence of the axial thrust which is always present on a helical spur gear under load. In this instance, the axial thrust causes the gear member 39 to move inwardly toward the front frame member 18, or to the position shown in FIG. 8. This movement of the gear member 39 is used to control the operation of the electric motor 21. A second switch 85 is mounted on the front frame member 18 and includes a downwardly extending switch actuating arm 86. The lower end of the actuating arm 86 engages the front face of the spur gear 40. When the gear member 39 moves from the position shown in FIG. 7 to the position shown in FIG. 8, the actuating arm 86 is deflected forwardly until the arm 86 engages a switch contact 87 thereby closing the circuit and energizing the motor 21.

As is shown in the schematic wiring diagram of FIG. 10, the motor 21 may be energized by either the switch 60 or the switch 85 which are connected in parallel in the motor circuit. In operation of the can opener, the switch 60 is initially closed by the operating lever 57. As the cutting cycle begins, the load applied through the reduction gearing 37 causes the gear member 39 to move forwardly thereby closing switch 85. At this point the operator has removed hand pressure from the operating lever 57 and the spring biasing force of the switch 60 urges the lever 57 upwardly a small amount thereby opening the switch 60. Since the switch 85 is now closed, however, the motor 21 continues to run until the cover is completely severed from the can, at which time there is little or no load transmitted through the reduction gearing 37. The resilience of the actuating arm 86 then urges the gear member 39 rearwardly opening the switch 85. While the means biasing the gear 40 rearwardly is an integral part of switch 85, i.e. the arm 86, it is obvious that a separate spring might be used to apply the biasing force. The only requirement is that the spring supply enough force to overcome the axial force on helical gear 39 when it is carrying enough load to rotate but not cut a can gripped between the wheels 35 and 36.

It should be appreciated that once the operating lever 57 has been actuated to close switches 60 and then 85, hand pressure may then be released. The lever 57 will then rotate upwardly only enough to open switch 60 but the can 65 will continue to be retained between the feed and cutter wheels 35 and 36. While the spring 56 tends to rotate the cutter wheel upwardly with plate 54, the cam portion 57*b* of the lever 57 is in locking engagement between the cam follower portion 54*e* of plate 54 and the axis of rotation of the lever 57 thereby preventing rotation of the plate 54.

The above-described arrangement provides a simple and effective means of automatically controlling the operation of a can opener. The operator need only insert the can between the wheels 35 and 36 and depress the operating lever 57 until the can is punctured by the cutter 36. At that point, manual pressure may be released from the lever 57 since the switch 85 will have immediately closed to maintain the motor in operation until the cover is completely severed from the can body. The only structure necessary to accomplish the automatic operation is the second switch 85 and the structure necessary to mount one of the helical gears for axial movement.

To permit the motor 21 to be actuated for driving the knife sharpening wheels 23 and 24, there is provided a manually operable button 88 which is slidably received in an opening 89 formed between the front frame member 18 and the cover member 19. The inner end of the button 88 is provided with an actuating portion 90 which engages a sidewardly extending projection 91 on the actuating arm 86. Thus as the button 88 is moved upwardly, the portion 90 engages the projection 91 to urge the arm 86 against the switch contact 87 thereby energizing motor 21. The switch 85, therefore, serves the dual purpose of controlling the automatic operation of the can opener and also serving as a manual control for use when sharpening knives or scissors.

It should be appreciated that the switch 60 could be used to actuate the knife sharpener even though it is intended primarily for operation of the can opener portion of the appliance. Since the switch 60 is a normally open switch, however, it would be necessary for the operator to apply pressure continuously to the lever 57. This would be awkward and inconvenient since it is frequently necessary or desirable to have both hands free to hold and guide knives or scissors being sharpened. The switch 85 would not be actuated automatically if the motor 21 were operated by the lever 57 for knife or scissors sharpening. Since there would be no load on the feed wheel 35, there would be no loading forces in the reduction gearing 37 to cause the helical gear 39 to move axially and actuate the switch 85. The provision of the manually operable button or slide 88 eliminates the problem of holding the lever 57 in switch actuating position and provides a means for maintaining the motor 21 in continuous operation for knife sharpening. By combining the button 88 with the switch 85, the additional advantages for knife sharpening are achieved with very little increase in cost of the appliance. All that is involved is the plastic button and the sidewardly extending projection 91 on the switch arm 86.

While there has been illustrated and described an embodiment of the present invention, it will be appreciated that numerous changes and modifications will occur to those skilled in the art, and it is intended in the appended

claims to cover all those changes and modifications as fall within the true spirit and scope of the present invention.

What is claimed as new and desired to be secured by Letters Patent of the United States is:

1. In an applicance for automatically opening cans, the combination comprising a cutter member and a can rotating member supported for relative movement, a manual control means for moving said members into a can cutting position, means including a motor and a pair of intermeshed helical gears for driving said can rotating member, one of said helical gears being mounted for limited axial movement, a normally open switch connected in series with said motor and operated by the movement of said one helical gear, means biasing said one helical gear axially in a direction opposite to the direction of force exerted by said one gear when operating under load, said biasing means having sufficient force to move said one gear out of a switch closing position to a switch open position only when the cover has been severed from the can and the power transmitted through said helical gears is only that necessary to rotate the can.

2. In an appliance for automatically opening cans, the combination comprising a cutter member and a can rotating member supported for relative movement, a manual control means for moving said members into operative engagement with a can, a motor drivingly connected to said can rotating member by a reduction gear train, said gear train including a pair of intermeshed helical gears one of which is mounted for limited axial movement, a normally open switch connected in series with said motor and operated by the movement of said one helical gear, the transmission of power through said gear train during the can opening operation causing said one gear to move axially to a position in which it closes said switch, means biasing said one gear axially out of the switch closing position, said biasing means having sufficient force to move said one gear out of said switch closing position and to open said switch only when the cover has been severed from the can and the power transmitted through said gear train is only that necessary to rotate the can.

3. The combination of claim 2 wherein said normally open switch comprises a fixed contact and a movable contact supported in spaced relationship to the fixed contact on a resilient arm which is supported at one end only, the free end of said resilient arm engages said one helical gear serving as the means biasing said gear axially out of the switch closing position.

4. The combination of claim 2 wherein said motor and reduction gear train are supported on a vertically extending frame member, said reduction gear train including an axially elongated spur gear formed on the output shaft of said motor, a large spur gear drivingly engaging said elongated gear and secured to said one helical gear and movable therewith, said normally open switch having a resilient arm engaging the inner face of said large spur gear and biasing said gear outwardly from said frame, power transmitted through said gear train producing an axial thrust which forces said one helical gear and large spur gear axially toward said frame into switch closing position when a can cover is being cut, said large spur gear remaining in driving engagement with said elongated gear over the complete range of axial movement of said large spur gear and said one helical gear.

5. In an appliance for automatically opening cans, the combination comprising a cutter member and a can rotating member supported for relative movement, a manual control means for moving said members into a can cutting position, a first normally open switch connected in circuit with said motor, said manual control means closing said switch when said members are moved into can cutting position, said switch opens on release of force from said manual control means, means including a pair of intermeshed helical gears for driving said can rotating member, one of said helical gears being mounted for limited axial movement, a second normally open switch connected in parallel with said first switch and operated by the movement of said one helical gear, means biasing said one helical gear axially in a direction opposite to the direction of force exerted by said one gear when operating under load, said biasing means having sufficient force to move said one gear out of a switch closing position to a switch open position only when the cover has been severed from the can and the power transmitted through said helical gears is only that necessary to rotate the can.

6. In an appliance for opening cans and sharpening knives an improved control system comprising a motor drivingly connected to a can opening mechanism and to at least one abrasive knife sharpening wheel, said can opening mechanism including a cutting means and a can rotating means, cord means for connecting said motor to an external power source, a first switch and a second switch connected in parallel between said motor and said cord means, manual lever means for actuating said can opening mechanism and closing said first switch, an appliance housing enclosing said motor and said switches, said lever means being pivotally supported within said housing and having a handle portion extending outside of said housing, automatic means responsive to the transmission of a predetermined amount of power from said motor to said can opening mechanism for closing said second switch, said predetermined amount of power being that required to rotate a can while the cutting means is in cutting engagement with the cover, and a manual control means extending through the wall of said housing for opening and closing said second switch independent of said automatic means when said automatic means is not in use.

7. The combination of claim 6 wherein said second switch includes a fixed contact and a movable contact supported in spaced relation to said fixed contact by a resilient arm, said automatic means engaging an extension on said arm to close said second switch, said manual control means comprising a slide member movable between a first inoperative position and a second position in engagement with a second extension on said arm whereby said second switch is retained in the closed position for knife sharpening.

8. The combination of claim 6 wherein said motor and can opening mechanism are drivingly interconnected by reduction gearing, said automatic means includes a pair of helical gears in said reduction gearing, one of said gears is supported for limited axial movement, resilient means biasing said one gear in the direction opposite to the direction of the axial thrust exerted by said one gear under load conditions, said axial thrust during can opening being sufficient to overcome said resilient means, said second switch being held closed by said one gear during the opening of a can.

9. In an automatic can opener, the combination comprising a power driven can rotating wheel supported on an upright frame, support means for movably mounting a cutter on said frame, said cutter being movable between a can loading position in which said cutter and wheel are vertically spaced and a can cutting position in which said cutter overlaps said feed wheel, a magnetic lid retainer pivotally mounted on said frame above said cutter, said lid retainer being mounted on said frame independently of said support means, stop means on said lid retainer to limit downward pivotal movement of said retainer to a position in engagement with the lid of a can being opened therein, and cam means on said support means positioned to engage said lid retainer when said cutter moves to the can loading position to pivot said retainer upwardly to a retracted position.

10. In an automatic can opener, the combination comprising a frame supporting a motor and a can rotating means driven thereby, a cutter carried by a plate pivotally connected to said frame, spring means biasing said plate

upwardly to a position in which said cutter is spaced above said can rotating means, manual operating means for rotating said plate downwardly to an operating position in which said cutter overlaps said can rotating means, a magnetic lid retainer pivotally connected to said frame above said plate, stop means positioning said retainer in a downwardly angled position for engagement with the lid of a can, cam means on said plate extending upwardly for engagement with said lid retainer to pivot said retainer to an upwardly angled position when said cutter is moved to its position spaced above said can rotating means.

11. An automatic can opener comprising a housing enclosing a motor and reduction gearing driven thereby, a can rotating means driven through said gearing and extending outside of said housing, a cutter, a plate pivotally mounted at one end in said housing, said plate having a mounting portion extending through an opening in said housing and supporting said cutter thereon outside of said housing, manual operating means for rotating said plate between a can loading position in which said cutter is spaced above said can rotating means and a can cutting position in which said cutter overlaps said can rotating means, a lid holder pivotally connected at one end to said housing above said plate, magnet means secured to the other end of said holder and positioned to engage the lid of a can being opened, cam means extending from said mounting portion of said plate and operable to engage said holder and rotate it upwards to a retracted position when said cutter moves to the can loading position.

12. Cutting means for a can opener comprising a cutting wheel having a cutting edge and a mounting hole in the center thereof, a boss having a wheel mounting shaft extending therefrom, the outer end of said shaft having a T-shaped projection, said wheel being received on said shaft, an L-shaped retaining clip having a slot in one leg thereof and a detent portion in the other leg thereof, said clip being assembled to said shaft by moving said clip axially thereof with said projection entering said slot, rotation of said clip after axial movement causing said projection to lock said clip against withdrawal axially, and detent means on said boss cooperating with said detent portion on said clip to lock said clip against rotary movement.

13. Cutting means for a can opener comprising a cutting wheel having a cutting edge and a mounting hole in the center thereof, a boss having a wheel mounting shaft extending therefrom, a T-shaped projection in the outer end of said shaft including a coaxial cylindrical portion and a transverse bar at the end thereof, said wheel being received on said shaft, an L-shaped retaining clip having in one leg thereof an elongated slot of slightly larger dimensions than said bar and a detent portion in the other leg thereof, said clip being assembled to said shaft by moving said clip axially thereof with said projection entering said slot, rotation of said clip after axial movement causing said bar to engage the outer face of said clip, and detent means on said boss cooperating with said detent portion on said clip to lock said clip against rotary movement whereby said bar remains in locking engagement with said clip.

14. A can opener comprising a frame supporting a motor and reduction gearing, said gearing drivingly connecting said motor to a can rotating member, a can cutting member supported for movement relative to said can rotating member by a plate which is pivotally connected to said frame, spring means biasing said plate about its pivotal mounting to a position in which said cutter member is spaced upwardly from said can rotating member, a normally open switch connected in series with said motor and mounted on said plate, a manual operating lever pivoted to said frame and having a cam portion engaged with said plate whereby rotation of said lever pivots said plate moving said cutting member into close proximity to said can rotating member to open cans, switch operating means on said lever engaging said switch to energize said motor when said cutting member is moved to the can opening position, means biasing said lever to open said switch on release of manual pressure from said lever, a second switch connected in parallel with the first-mentioned switch and controlled to automatically close on initiation of can cutting and to open on completion of can cutting, said cam portion of said lever being positioned to hold said plate and cutting member fixed and in the can opening position after the release of manual pressure from said lever, and a magnetic lid retaining means comprising a plate member supporting a magnet at one end and being pivotally connected to said frame at the other end independently of said plate, retracting means formed on said plate and engageable with said plate member for camming and pivoting said magnet and said retaining means upwardly upon movement out of the can cutting position.

References Cited by the Examiner

UNITED STATES PATENTS

1,845,213	2/1932	Ames	30—4
2,897,589	8/1959	Bodle	30—4
2,968,094	1/1961	Sachs	30—4
2,974,409	3/1961	Ghinazzi	30—4
2,979,815	4/1961	Rohde et al.	30—4
2,995,818	8/1961	Scott et al.	30—4
3,009,244	11/1961	Uthoff	30—4
3,078,568	2/1963	McLean et al.	30—4
3,082,636	3/1963	Steinlein	74—230.17
3,189,995	6/1965	Hicks et al.	30—6.4

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