AUTOMATIC ELECTRIC CAN OPENER

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UNITED STATES PATENTS

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ABSTRACT

An automatic electric can opener including a shaft supported cutter, rotatable between angular positions comprising a retracted condition for loading of a can into position for opening, a ready position for commencing the power piercing engagement of the can lid, an operative cutting position for providing a peripheral cut around the can lid, and a holding position for retaining the opened can in supporting engagement on the opener until the can is manually removed. A combination lid lifter and switch actuator means is operatively associated with the cutter support shaft and a switch for energizing motor driven can rotating means in order to initiate an automatic can opening cycle commencing with the power piercing of the can lid, followed by the peripheral cutting of the can lid until completely severed from the can body and finally automatic shutdown of the can rotating means after the can is opened.

11 Claims, 12 Drawing Figures
AUTOMATIC ELECTRIC CAN OPENER

The present invention relates to an automatic electric can opener and is an improvement on the automatic can opener disclosed and claimed in the copending Meyer et al. U.S. Patent application, Ser. No. 732,977, filed May 29, 1968, now U.S. Patent No. 3,550,271 and assigned to the same assignee as the present application.

The present invention is directed towards a new and improved automatic electric can opener wherein a movable cutter assembly is actuated to initially pierce the lid of the can, complete a peripheral cut around the lid, and thereafter automatically stop rotation of the can when the lid is completely severed from the can body. After the peripheral cut has been completed, the can body and contents therein remain in a fully supported position on the can opener until manually removed after release of cutter engagement with the can. After the release of the cutter and removal of the open can, the can opener is in a ready position for receiving the next can to be opened.

Many prior art automatic or semiautomatic electric can openers require the use of expensive and relatively complicated cutter control mechanisms which are subject to frequent maintenance and failures and which are relatively high in cost. The automatic can opener of the present invention is extremely reliable in operation, relatively low in cost, simple in construction, and does not require expensive and complex cutter and switch operating mechanisms in order to provide a fully automatic device.

It is therefore an object of the present invention to provide a new and improved automatic can opener.

Another object of the present invention is to provide a new and improved automatic can opener having a motor controlling switch means actuated to initiate a can opening cycle and upon completion to automatically open and de-energize the can drive motor.

Another object of the present invention is to provide a new and improved automatic can opener of the character described wherein a cutter assembly and switch actuator means are combined with a lid lifter and switch for automatically controlling a motor driven can rotating means.

Still another object of the present invention is to provide a new and improved automatic can opener of the character described wherein movement of the lid lifter initially commences the can opening cycle by closing contacts of the switch and wherein the switch is maintained in a closed position during the cutting cycle by reaction force developed between the cutter and can lid.

Other objects and advantages of the present invention will become apparent as the following description proceeds and the features of novelty which characterize the invention will be pointed out with more 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 front perspective view of a new and improved automatic electric can opener constructed in accordance with the features of the present invention;

FIG. 2 is an enlarged fragmentary front elevational view of the upper portion of the can opener with portions broken away and in section showing the cutter in an upper or retracted can loading position ready for receiving a can to be opened;

FIG. 3 is an enlarged, fragmentary, front elevational view similar to FIG. 2, but illustrating the can opener with the cutter in position ready for power piercing action to open the can lid;

FIG. 4 is an enlarged, fragmentary, front elevational view similar to FIG. 3, illustrating the can opener with the cutter in a cutting position severing the can lid from the body;

FIG. 5 is a fragmentary, vertical sectional view taken substantially along lines 5—5 of FIG. 2;

FIG. 6 is a vertical sectional view taken substantially along lines 6—6 of FIG. 1;

FIG. 7 is an enlarged, fragmentary section view of the upper portion of the can opener looking forwardly in the direction of the arrows 7—7 of FIG. 6;

FIG. 8 is a fragmentary, enlarged perspective view taken from the underside of a motor controlling switch mechanism for the can opener constructed in accordance with the features of the present invention;

FIG. 9a is an enlarged schematic elevation view embodying a composite of FIG. 7 and FIG. 2 and illustrating a first operative position of the switch actuator and the cutter in a retracted position ready for loading of the can;

FIG. 9b is an enlarged, schematic presentation similar to FIG. 9a illustrating the can opener in a second operative position with the switch actuator closing the switch and the cutter ready to commence power piercing of the can lid;

FIG. 9c is an enlarged, schematic presentation similar to FIG. 9b illustrating the can opener with the cutter in a can lid cutting position; and

FIG. 9d is an enlarged, schematic presentation similar to FIG. 9c illustrating the can opener after completion of a can opening cycle with the cutter in a can supporting holding position.

Briefly, an illustrated embodiment of the present invention comprises a new and improved automatic electric can opener including an upstanding housing having an electric drive motor and reduction gear means therein for driving a can rotating wheel mounted externally of the housing on the front wall thereof. Switch means is provided for controlling the motor and a cutter is mounted on a rotatable cutter support shaft positioned above the can rotating wheel, so that the cutter may be rotated between several angular positions of operation for a can opening cycle. A magnetic lid lifter is pivotally mounted on the housing and is manually movable to initiate an automatic can opening cycle by closing the switch which energizes the motor means powering the can drive wheel. A cutter cam and a lever are operatively associated with the lid lifter and cutter shaft, whereby reaction forces developed between the cutter and the can lid as the cutting takes place is operable through the cutter cam for maintaining the switch in a closed position. After the lid is severed from the can body the reaction force diminishes and the switch is opened shutting down the motor. However, the cutter still retains the opened can and its contents in a supported position on the can opener. Manual movement of the lid lifter to an upward or retracted position releases the cutter so the can may be removed and the can opener is ready to receive another can to be opened.

Referring now more particularly to the drawings, there is illustrated an automatic electric can opener designated generally by the reference numeral 10 and constructed in accordance with the features of the present invention. The can opener 10 includes an upright housing generally indicated by the numeral 11 and preferably formed by a pair of cooperative front and back enclosure members comprising a front frame wall structure 12 and a cup-shaped rear cover structure 13.

The front frame member 12 includes a front wall panel 14, a pair of relatively narrow width sidewall sections 15, and a top wall panel 16. The respective wall panels of the front frame member 12 are adapted to cooperate and abuttingly engage a top wall panel 18 and a pair of sidewall panels 19 of the rear cover member 13. The rear cover member 13 includes an internally formed rear wall 20 having an enlarged hand-hold recess 21 formed therein to facilitate grasping and carrying of the can opener 10. The cup-shaped rear cover wall 13 also includes a pair of integrally formed, vertically spaced bottom walls 22 and 23, and an opening 24 is provided in the rear wall 20 between the spaced bottom walls to permit an AC electric line cord 25 of a conventional type to extend into the interior of the housing 11. A foot projection 26 is provided adjacent the lower forward edge of the housing and is supported from the wall 23 by means of a bushing 26a and cap screws 27 which project upwardly into threaded engagement into enlarged bosses 23a integrally formed on the upper side of the wall 23 (FIG. 6).
Supported in the housing 11 is an electric motor 28 in driving engagement with a reduction gear train indicated generally by the numeral 29. The motor and gear train are supported on the front frame member 12, and the gear train drives an output shaft 30 which is supported in the can lid 34 by an integral bearing 31 located in the boss 14c. The shaft 30 is enlarged at the outer end of the shaft 33 and is provided with a plurality of pointed teeth around the periphery thereof for engagement with the underside of an upper end rim 32 of a can 33 mounted on the can opener to be opened (FIGS. 3 and 4). When energized, the shaft 30 and the can rotating drive wheel 31 are driven in a clockwise direction (FIG. 4) and engagement between the peripheral teeth of the drive wheel and the underside of the upper rim 32 causes the can 33 to rotate about its vertical, longitudinal axis in a clockwise direction, (looking downward from above the lid 34 of the can).

In addition to rotating the can 33, the drive wheel 31 supports the weight of the can and contents and, in order to maintain and stabilize the can during rotation a projection of ridge 14b (FIGS. 1 and 6) is formed on the outside face of the front wall 14b below the wheel 31 to engage and guide the side surface of the rotating can body. In addition, a guide pin 35 is provided to provide the can feed wheel 31 (FIG. 4) which projects outwardly of the front wall 14. The guide pin 35 serves as a stop against which the upper edge of the can rim 32 rides during rotation of the can.

The guide pin 35 further aids in guiding the can 33 as it is rotated about its longitudinal axis by the can drive wheel 31. The general arrangement of the motor 28, gear train 29, can wheel supporting arbor shaft 30, and the manner in which these elements are mounted on the front frame member 12 are described in greater detail in Hubrich U.S. Pat. No. 3,254,406, which patent is assigned to the same assignee as the present application.

In order to initially puncture or pierce the can lid 34 and thereafter to provide a continuous cut around the periphery of the lid to open the can, the automatic electric can opener 10 of the present invention is provided with a cutter blade 36 having a sharpened lower edge 36a disposed at an acute angle relative to the longitudinal axis of the cutter. The cutter is supported for radial adjustment on an enlarged head portion thereof, at the outer end of a cutter support shaft 37. The cutter shaft includes an elongated shank portion 37b journaled for rotation in a bore 38 which is defined by a cylindrical boss 14c (FIG. 6) integrally formed on the front wall structure 14 of the housing and spaced above and parallel to the boss 14c in which the can drive wheel support shaft 30 is mounted. The cutter shaft 37 is biased outwardly of the front wall 14 by a Belleville spring washer 40 (FIG. 6) which is disposed between the outer surface of the housing front wall and a rearwardly facing annular shoulder portion formed between the enlarged head 37a of the shaft and the reduced diameter shank portion 37b. The cutter blade 36 is mounted in a radial slot 41 formed in the outer face of the head portion 37a, as best shown in FIG. 6 and the cutter is provided with a longitudinal slot to accommodate a cap screw 42 for securing the cutter in place on the cutter shaft. The Shank of the screw 42 is threadedly engaged in an axial bore provided in the enlarged head portion 37a of the cutter support shaft.

Referring now, more particularly, to FIGS. 7, 9a, 9b, 9c, and 9d, a cutter control cam 43 is mounted on the inner end of the cutter shaft 37 and is keyed thereto by means of flattened portions formed on the cutter. The cutter cam 43 is secured to the inner end of the shaft by a cap screw 44 having a threaded shank which is received in an axial bore formed in the inner end portion of the cutter shaft.

In order to provide means for adjusting the portion of the cutter 36 with respect to the outer face of the can drive wheel 31 so that the can rim 33 will be properly oriented for cutting of the can lid 34, the cutter support shaft 37 is movable axially within the supporting bore 38 of the boss 14c. The Belleville washer 40 continuously biases the shaft 37 outwardly and the amount of outward travel is regulated by the head of the cap screw 44 which has a washer-like bearing face engaging the back side of the cutter cam 43. The cap screw 44 is of the self locking type so that once adjusted in the threaded axial bore of the shaft 37 the proper adjustment is maintained. The flatted key portions on the shaft 37 are longer in an axial direction of the shaft than the thickness of the cutter cam 43 as shown in FIG. 6 and by tightening or loosening the cap screw 44 in the shaft bore, the cutter 36 can be adjusted toward or away from the plane of the outer end of the can drive wheel 31. By providing a precise adjustment between the plane of the cutter 36 and the can drive wheel 31, an optimum cutting arrangement can be achieved wherein the can does not tend to slip off of the drive wheel as the cutting action is proceeding or after the cutting action is complete. The Belleville washer 40 permits some resilient adjustment to help in accommodating all sizes and diameters of cans.

The cutter cam 43 rotates with the shaft 37 between several angular positions in order to move the sharpened cutter edge 36a into and out of cutting engagement with the lid 34 of a can 33. The cutter cam 43 is biased in a clockwise direction from the position of FIG. 9c toward the position of FIG. 9d through coil spring 45 having an end connected to the cam outwardly of the axis of the shaft 37 and a lower end of the spring is connected to a fixed pin-like projection 14d integrally formed on the front wall 14 of the housing. In addition to the spring 45 a relatively strong main biasing spring 46 having a plurality of convolutions is mounted in coaxial alignment on the cylindrical boss 14c which supports the cutter support shaft 37. The main biasing spring 46 is effective to oppose clockwise rotation of the cutter cam 43 from the position of FIG. 9b to the position of FIG. 9c and normally returns the cutter cam to the position shown in FIG. 9d at the end of a can opening cycle. The coil spring 46 includes one end leg 46a which extends radially outwardly of the convolutions of the spring and is maintained in a position between a projection 14e and the upper end of a projection 14f formed on the inside surface of the front wall 14. The main cutter bias spring 46 includes another radially extending leg 46b having a stop leg 46c at the outer end projecting perpendicularly from the front wall 14 of the housing. The stop leg 46c engages the lower surface of a stop lug 43c formed on the can 43. The lower spring leg 46b normally rests against the lower end of the projection 14f formed on the inside surface of the front wall 14, but is movable away from the projection whenever the cutter cam 43 is rotated from the position of FIG. 9b to the position of FIG. 9c. When the cutter cam is rotated clockwise from the position of FIG. 9b to the position of FIG. 9c, the spring 46 is compressed and upon release the spring returns the cutter cam back to the position of FIG. 9d. Reaction force developed between the cutter 36 and the can lid 34 as the cutting takes place causes the cutter to move from the position of FIG. 9b to the cutting position of FIG. 9c and after the can lid is completely severed from the can body, this reactive force diminishes and the spring 46 then rotates the cutter cam 43 in counterclockwise rotation from the position of FIG. 9c to the position of FIG. 9d wherein the spring leg 46b again rests against the lower end of the projection 14f.

The cutter cam 43 includes an actuating arm 43b extending outwardly of the shaft 37 in a direction generally opposite that of the stop lug 43c. The actuating arm 43b includes an upper cam surface 43a and a generally radially extending slot 49 which is formed adjacent the outer end. The slot 49 includes a notched out or enlarged portion 49a at the outer end which is adapted to receive a pin 47a on the outer end of a lever 47 which is pivotally supported at its opposite end on a projection of the shaft 37 formed on the inside surface of the front wall of the housing 14. As shown in FIGS. 7 and 9a-9d, the lever 47 is pivotable in a counterclockwise direction from the position of FIG. 9a to the position of FIG. 9b, and the position of FIG. 9c and when in the position of FIG. 9c the pin projection 47a is seated within the notched out recess 49a at the outer end of the slot.
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49 in the arm 43b. This engagement locks the cutter cam 43 and the lever 47 in an over-the-center toggle-like position wherein the cutter 36 is maintained in an upward retracted position. In the position of FIG. 9a, the elongated coil spring 45 acts as a return spring and slot connection and pivots the cutter cam in a clockwise direction. As this occurs the lower edge surface of the stop finger 43c moves downwardly towards engagement with the spring leg 46c of the mainspring 46. Further rotation of the cutter control cam 43 from the position of FIG. 9b to the position of FIG. 9c, causes the leg 46c of the spring 46 to be moved away from the projection 44f, and while this occurs, the spring 46 exerts a substantial counter-clockwise bias against the cutter control cam 43. This bias is offset during a cutting cycle by the reactive force developed between the lower edge 36e of the cutter and the can lid. After the can lid is completely severed from the body of the can, this reaction force disappears and the spring 46 then acts to return the cutter control cam 43 in the direction opposite the position of FIG. 9c to the position of FIG. 9d. As this occurs, the cutter 36 rotates and the lower edge moves upwardly somewhat but still extends below the upper edge of the can rim (FIG. 9d). In this position the cutter is retained against the upper sideward all of the can holding the opened can contents in place in the drive wheel 31.

In order to move the cutter from the position of FIG. 9d to the retracted position of FIG. 9a so that the open may be removed from the can opener, and for the purpose of moving the cutter end from the position of FIG. 9e into the position of FIG. 9b to commence a can opening cycle, the can opener 10 includes a manual actuator comprising a lid lifter 48, preferably formed of sheet metal stamped to shape. The lid lifter includes a top wall 48a having an enlarged opening therein and a pair of depending sidewalls or arms 48b which extend through elongated, spaced apart, vertical, parallel slots 50 formed in the front wall 14 of the housing.

As best shown in FIG. 2, an upwardly engaging control tab 48c is formed along the inner edge of the top wall 48a and is adapted to be easily moved inwardly with respect to the front wall 14 with the finger. The lid lifter 48 is pivoted in an opposite direction causing outward movement of the tab 48c by downward pressure on the top wall 48a adjacent the outer end of the lifter as shown in FIG. 3. After a can has been loaded onto the opener with the lid lifter 48 in the position of FIG. 2, the can opening cycle is initiated by downward pressure on the outer end of lid lifter which causes the cutter to rotate from the position of FIG. 2 and FIG. 9c to the position of FIG. 3 and FIG. 9b, ready to initiate a power piercing opening of the can lid and thereby starting the automatic can opening cycle. The lid lifter 48 is preferably formed of noncorrosive stainless steel and includes a down-turned lip or flange 48d along the front face and in order to support the lid of a can after removal from the can body, the lid lifter includes a permanent magnet 51 which is mounted in a channel shaped holder 52 having depending side flanges and an integral top wall. The magnet and holder are secured together by a pin or rivet 53 having a shank portion extending upwardly from the top wall 48a terminating in an enlarged head on the upper end. The magnet assembly is supported from the side wall flanges 48b of the lid lifter by an elongated spring member 54 having a central coil disposed on the shank of the headed pin 53 and hooked opposite ends which project into and seat within slots 55 (FIG. 5) in the side flaps 48e. The elongated spring 54 provides a flexible support for the magnet 51 and permits good magnetic holding attractive forces to be easily established between the lower surface of the magnet and the lid of a can mounted on the can opener. The spring 54 permits the magnet to remain in a substantially level position relative to a work surface, even though the lid lifter 48 is pivoted between several positions as shown in the drawings in solid and dotted lines of FIG. 5.

The lid lifter is supported for pivotal movement about a horizontal axis spaced outwardly from the front wall 14 of the housing and generally parallel thereto by means internally of the housing including a pair of generally rectangular mounting blocks 56 which are formed of plastic material or the like. The mounting blocks are seated in rectangular recesses defined in integrally formed inwardly projecting rectangular bosses 41 (FIG. 7) and are held in position by retaining screws 57. As best shown in FIG. 5, the mounting blocks 56 have generally planar vertical, parallel opposite side faces which are normal to the front wall 14 of the housing, and opposite side faces of each block are formed with a pair of spaced outwardly arcuated shaped lugs or projections 56a thereon. The opposed inwardly facing sides of the mounting blocks are in alignment with the inside edges of parallel slots 50 formed in the front wall 14 of the housing so that the arms 48b of the lid lifter may extend through the slots and bear against the inside faces of the respective mounting blocks. The side arms 48b of the lid lifter are formed with enlarged, inner end portions 48c having elongated arcedly curved slots 58 defined therein and adapted to accommodate and ride outwardly on the mounting blocks. In this manner the lid lifter 48 is supported for pivotal movement about a horizontal axis which is parallel to and remotely outward of the front face of the front wall 14 but without external support brackets or pins, or the like, being required on the front wall member 12 of the housing. Manufacture and polishing of the front face of the can opener is thus greatly simplified by the absence of projections, lugs, pins, etc. for supporting the lid lifter. In addition, because of the unique support arrangement for the lid lifter, a small amount of upward movement of the outer portion of the lid lifter results in a relatively large amount of travel of the inner end portion 48e inside of the housing.

Referring now more particularly to FIGS. 5, 7, and 9a-9d, and as best shown in FIG. 5, the left-hand side flange 48b of the lid lifter is formed with a pair of vertically spaced apart, inwardly extending switch and lever actuating lugs 48f and 48g on the enlarged inner end portion 48e. The lever 47 extends loosely between the lugs 48f and 48g to provide a lost motion connection between the lugs and lever. Referring to FIG. 5, when the finger tab 48c is moved inwardly to retract the cutter, the lugs 48f and 48g move downwardly and the lever 47 is pivoted in a clockwise direction from the position of FIG. 9d to the position of FIG. 9a. In the position of FIG. 9a engagement of the lever pin 47a within the notch 49a in the outer end of the slot 49 of the cutter cam arm 43b maintains the cutter in an upper or retracted position so that the can opener is set at ready to receive a can. When the outer end of the lid lifter 48 is then moved downwardly, the lug 48g moves upwardly against the underside of the lever 47 causing the lever to pivot in a counterclockwise direction. As this occurs the locked engagement between the lever pin 47a and the notch 49a in the slot 49 is released and the spring 45 then pivots the cam lever 43 and cutter to the position of FIG. 9b wherein the lower edges of the cutter rests on the can lid in readiness for a power piercing action to begin the cut. The lug 48f is provided with a generally rectangular switch actuator member 48h formed of electrically insulating material such as polycarbonate resin or the like and the switch actuator block is adapted to directly engage the outer end portion of a spring action cantilever type switch member 60 supported at its opposite end by a terminal assembly 61. As best shown in FIGS. 9a-9d, the switch member 60 is formed of a pair of leaf spring type members secured together at one end by the terminal pin assembly 61. The cantilever type pin assembly 61 projects through the insulating base member 62 and is electrically connected to a first lead 63 which in turn is connected to one of the leads of the line cord 25. The other lead of the line cord 25 is connected to one side of the field coil of the motor, as shown in
FIG. 6, and the opposite field coil lead is connected to a line 64 which is connected to a second switch terminal pin assembly 65 mounted at the opposite end of the insulating base 62. The terminal pin 65 projects through the base 62 and includes an enlarged contact button 65a which is adapted to make and break contact with the free outer end portion of the switch member 60. In an unstressed condition, the switch member 60 is normally open with respect to the contact button 65a of the second terminal pin 65. When contact is made, the motor 28 is energized from the line cord and runs until contact is again broken.

As best shown in FIG. 8, the contact strip has a shallow V-shaped bend intermediate its ends to assure that the switch assumes a normally open position with relation to the contact pin head 65a when in an unbiased condition. The contact member 60 itself provides the biasing force normally urging the lever arm 47 downwardly or in a clockwise direction (FIGS. 9a-ad) via the switch actuating block 48b and consequentially, an upward holding force against the contact member 60 is required to maintain switch closing contact with the contact button 65a for starting and energizing the motor. When the external upward force on the contact member 60 is withdrawn, the member acts to open or break the motor connection while the insulating base 66 and a pair of tongues 62a at opposite ends and also includes an integral sidewall 66 and a pair of protective end walls 67 (FIG. 8). The switch base is secured in place in the rear face of the front wall 14 of the housing by pressing and wedging the tongues 62a into spaced recesses formed in integral bosses 14 (FIG. 7) formed on the housing front wall.

Referring now to FIGS. 9a-9d, when the lid lifter 48 is moved to the upper or cutter retracting position by pressing inwardly against the tab 48c as shown in FIG. 2, the switch actuator block 48b is moved downwardly away from the switch member 60 (FIG. 9a) which is in a normally open position with respect to the contact button 65a. Downward travel of the switch actuator block 48b engages the lever 47 causing it to pivot in a clockwise direction. The cutter cam and lever are maintained in this position because of the over center toggle locking engagement between the lever pin 47a and the notch 49a of the slot 49. When the cutter cam 43 is pivoted to the position of FIG. 9a the cutter 36 is pivoted to move the pointed end upwardly so that the tip is retracted above the level of the can rim as shown in FIGS. 9a and 2. As the cutter cam 43 is pivoted in a counterclockwise direction, the return spring 45 is extended as shown in FIG. 9a; however, the lever 47 and cutter cam 43 are maintained in the position shown by the locking engagement of the pin 47a in the notched portion 49a of the slot 49 of the lever 47. In such position the upper end portion 49c of the lever 47 is in a position to maintain the cutter cam 43 in a raised position, and set the lid lifter 48 to pivot upwardly, however, engagement of the lug 48g and the underside of the lever 47 is not sufficient to unlock the lever and cutter cam and the actuator 48b does not exert sufficient force on the spring switch member 60 to close the contact.

After a can has been loaded onto the can opener with the lower edge of the can rim 32 resting onto the drive wheel 31, as shown in FIG. 3, the outer end of the lid lifter 48 is pressed downwardly causing the lower actuator lug 48g to bias the lever 47 upwardly in a counterclockwise direction and out of locked engagement with the cutter cam 43. After unlocking the cam 43, aided by the spring 45, pivots in a clockwise direction as shown in FIG. 9a to the position of FIG. 9b. As this occurs, the pointed end of the cutter 36 is lowered to engage the upper surface of the can lid 34 and the upward movement of the switch actuator block 48b forces the switch member 60 upwardly into a switch closing contact with the contact button 65a. This causes the motor 28 to be energized and rotate the can drive wheel 31. As this occurs, the cam 43 begins to rotate and a reactive force develops between the cutter 36 and the can lid 34 causing the can lid to be punctured and the cutting cyle to begin. As the cutting begins the cam 43 pivots further in a clockwise direction from the position of FIG. 9b to the cutting position of FIG. 9c, and the upper cam surface 43c of the cutter cam engages the apex of the V-shaped contact member 60 for holding the switch member in closed condition, as shown in FIG. 9c. During this time also, the stop lug 43a of the cutter cam 43 is moved against the mainspring leg 46b and causes the spring to be additionally loaded as the leg is moved away from the lower end of the stop projection 14f on the housing front wall. It will thus be seen that the reactive force developed between the can lid as it is cut and the cutter 36 rotates the cutter shaft 37 so that the switch is maintained in a closed condition by engagement of the upper cam surface 43c of the cutter cam 43 against the lower apex of the V-shaped portion of the switch contact member 60.

After the can lid 34 is completely severed from the body of the can 33, the reactive force between the cutter 36 and the can lid diminishes rapidly, the mainspring 46 is then effective to bias the cutter cam 43 from the position of FIG. 9c in a counterclockwise direction to the position of FIG. 9d. As this occurs, the cam surface 43c of the cam lever moves downwardly away from the apex of the V-shaped portion of the contact member 60 and the switch opens shutting down the motor. When this occurs, the contact member 60 biasses the switch actuator lug 48h downwardly and this lifts the can lid 34 from the can body. When complete severance of the can lid occurs the reactive force disappears and the switch contact 60 opens automatically to shut down the motor. The can opening cycle is thus terminated automatically.

Movement or rotation of the cutter 36 from the cutting position of FIG. 9c to the position of FIG. 9d, as the lid is severed from the can body, does not release the can and its contents from support on the can opener. A lower portion of the cutter extends below the upper level of the can rim and the opened can and its contents are supported in position on the can opener by engagement of the cutter against the can sidewalls which holds the can in place until manually removed. In order to remove an opened can from the can opener, the actuator tab 48c of the lid lifter 48 is pressed inwardly, as shown in FIG. 2, causing the cutter 36 to pivot from the position shown in FIG. 9d to the retracted position of 9e wherein the lower end of the cutter is raised upwardly above the upper edge of the can rim. When this occurs, the can is released and manually removed from the can opener. The can opener is then ready to receive the next can. While there has been shown and discussed a particular embodiment of the invention, it will be apparent to those skilled in the art that various changes and modifications may be made without departing from the invention in its broader aspect, and it is therefore contemplated in the appended claims to cover all such 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. An automatic electric can opener comprising a housing enclosing an electric motor, rotating means on the outside of said housing for rotating a can about its axis, means drivingly interconnecting said motor and said rotating means, a switch in circuit with said motor to permit selective energization of said motor to drive said rotating means, a cutter assembly mounted on the exterior of said housing for pivotal movement about a generally horizontal axis, a downwardly extending cutting blade positioned to pierce the cover of a can engaged with said can rotating means, manually operable means including a lid lifter pivotally supported from said housing for rotating said cutter assembly to a first position with said blade raised upwardly to permit the loading of a can and to a second position in which said blade pierces the cover of the can and said switch is closed to drive said can rotating means,
spring means biasing said cutter assembly toward said first position when it is in said second position, the reaction force of said blade cutting said cover retaining said cutter assembly in said second position means biasing said cutter assembly toward said first position when the cutting of the cover is completed at which time said spring means moves said cutter assembly out of said second position thereby opening said switch, said cutter assembly including a cutter control cam and an actuating lever operatively connected and movable to an over center toggle locking position for retaining said cutter in said first position, said lid lifter including switch actuator means for closing said switch means and releasing said control cam and lever from said locking position to initiate a can opening cycle upon pivotal movement of said lifter from an upwardly retracted position for receiving a can to a downward operating position.

2. The can opener of claim 1 wherein said cutter control cam includes a cam surface engageable to maintain said switch in closed position while said reaction force is present and movable to permit opening of said switch when said reaction force is removed upon severance of the can lid from the can body.

3. The can opener of claim 1 wherein said switch includes a spring contact member normally open with respect to a fixed contact, said switch actuator means being engageable with said switch member to move the same from said normally open position to a closed position against said fixed contact.

4. The can opener of claim 1 wherein said spring means biases said cutter assembly away from said second position to an intermediate position between said first and second position and exerts no bias on said assembly when between said intermediate position and said first position.

5. The can opener of claim 4 including second spring means for biasing said cutter assembly from said first position toward said intermediate position for moving said cutter assembly out of said toggle locking position toward power piercing engagement with a can lid.

6. A cutting mechanism for an automatic can opener comprising a support structure, a can rotating drive means driven by an electric motor, a cutter assembly including a cutting blade support mounted for pivotal movement on said support structure about a fixed horizontal axis and a cutting blade carried by said cutting blade support, said blade being pivotal between a raised position and a can engaging position, switch actuating means supported on said cutting blade support and pivotal with said cutting blade, a single switch operated by said switch actuating means to control said motor, a lid lifter including a switch actuator operable to close said switch independently of said switch actuating means and initiate a can opening cycle, said cutting blade engaging the lid of a can at a point spaced below said axis whereby the reaction force on said blade from cutting the can lid maintains said switch actuating means in a switch closing position until the cutting of said can lid is completed, spring biasing means pivotally urging said cutting blade support in a direction opposite to said reaction force to rotate said switch actuating means to a switch open position when said cutting is completed, and lever means engaging said switch actuating means for retaining the same out of switch engaging contact until said lid lifter is moved to close said switch and initiate said can opening cycle.

7. The cutting mechanism of claim 6 wherein said lid lifter is manually movable between an upper position for receiving a can and a lower operative position while the can lid is being cut, and linkage means operatively connecting said lid lifter and cutting blade support for rotating the latter from said cutter raised position toward said can engaging position when said lid lifter is moved from said upper position to said lower position.

8. The cutting mechanism of claim 7 wherein said linkage means includes pivotal lever means having an outer end connected with said switch actuating means, said lid lifter including means engaging said lever means for pivoting the same in response to movement of said lid lifter, said lever means and said switch actuating means forming an over center toggle locking arrangement for retaining said lid lifter in said upper position until manually depressed toward said lower position to initiate a can opening cycle.

9. The cutting mechanism of claim 8 including pin and slot connector means between said lever means and said switch actuating means, said slot of said connector means including a recess at one end for holding said pin to maintain lever means and switch actuating means in said toggle locking position.

10. The cutting mechanism of claim 9 wherein said lid lifter and said lever means are interconnected with lost motion connector means whereby limited movement of said lid lifter is permitted without moving said lever means.

11. An electric can opener including a housing, drive shaft means journaled in said housing, a can rotating drive wheel carried on the outer end portion of said drive shaft means, cutter shaft means supported for rotation on said housing spaced above said drive shaft means, bearing means for at least one of said shaft means having radial shoulders at opposite ends, said one shaft means including a shoulder surface facing one of said shoulders of said bearing means, spring means between said shoulder surface and said one shoulder biasing said one shaft means longitudinally of its axis, a cutter mounted on the outer end portion of said cutter shaft means for rotation therewith between a disengaged position spaced upwardly away from said drive wheel and a can engaging position extending downwardly below the periphery of said drive wheel, and adjusting means including an adjustment member threadedly engaged longitudinal of said one shaft means and including a shoulder surface facing the other of said shoulders of said bearing means for adjusting the compression on said spring means for longitudinally adjusting at least one of said shaft means relative to the other to set up a desired clearance between a can engageable face of said drive wheel and a cutting edge of said cutter.