An electrically powered can opener has a driving wheel actuated by an electric motor to move the can opener itself around a can to be opened. By lowering a lever carrying a rotary cutter, an arm is actuated to close temporarily a switch of the electric motor circuit. On piercing of the rotary cutter into a can lid, the switch is closed by the reaction force of can opening operation and the lever is locked. When the reaction force disappears, the electric motor is deenergized automatically.
ELECTRICALLY POWERED CAN OPENER

BACKGROUND OF THE INVENTION

This invention relates to an electrically powered can opener which can cut a can lid, moving itself along the end rim of a can. A can opener of this type is provided, at one side, with a driving wheel actuated by an electric motor and with a rotary lever carrying a rotary cutter. The driving wheel is made to contact with the outside of the end rim and the lever is lowered, at the same time, to pierce the rotary cutter into the can lid just inside the end rim. In this way, the can opener is held peripherally on the upper portion of the can. As the driving wheel rotates, the can opener moves, and the rotary cutter cuts the can lid. The conventional can opener of this type, however, continues to move along the periphery of the can even after the completion of can opening operation. So an operator of the can opener has to watch the can opener near it until can opening operation is finished and then to stop the actuation of the can opener. Moreover, when the operator deenergizes the driving wheel of the can opener, the can opener is inconveniently from the can unless the operator holds the can opener with his hand. Thus, several points to be improved are left in the view point of the automatic operation of the can opener moving around the can.

SUMMARY OF THE INVENTION

A can opener according to the present invention includes an arm actuated from a lever carrying a rotary cutter, those locking means provided on the lever which is adapted to engage with the arm to prevent the lever from returning and maintain the same at the lower position when the rotary cutter is pierced into the can lid, those switch for the motor energizing circuit which is positioned so as to be closed temporarily as the result of the movement of the lever before the lever is locked in the lower position, a releasing element provided on the lever for releasing the lock of the lever and a switch closing mechanism actuated to a switch closing position by the reaction force of can opening operation when the reaction force is applied through the driving wheel to a torque transmitting mechanism interposed between the driving wheel and the electric motor. In using a can opener of this type, the operator of it has only to lower the lever in order to initiate can cutting operation and thereafter the lever can be held in the lower position, continuing the smooth can opening operation even if the operator detaches his hand from the lever. Namely, as the consequence of the lowering down of the lever, the rotary cutter is pierced into the can lid and the switch is closed to initiate the rotation of the driving wheel. Due to the reaction force of the can opening operation, the switch closing mechanism is actuated to close the switch. As the can opening operation is finished, the reaction force disappears and the switch closing mechanism is returned to stop the movement of the can opener but the lever remains locked due to the cooperation between the arm and the locking means. For the can opener to be removed from the can, only the releasing element is operated.

As the salient features of the present invention have been described, it will be understood from the following detailed description that the can opener according to the present invention is a convenient one, highly automated, requiring no operation and watching by the operator during can opening process, facilitating automatic stop of its movement after the completion of can opening operation and being in position to be held peripherally on the can thereafter.

IN THE DRAWINGS

FIG. 1 is a perspective view of an electrically powered can opener opening a can.
FIG. 2 is a transverse section showing the positional relationship among a driving wheel, a rotary cutter and so on.
FIG. 3 is a longitudinal section of the can opener.
FIGS. 4(a)-4(d) are fragmental longitudinal sections showing various operational situations of the lever.
FIG. 5 is a section taken on a line 6—6 in FIG. 4(c).

Referring to the drawings, a body 10 comprises a pair of cover means 11 and 11' made of stiff material such as plastics. One cover means 11 has a window 12 with a rotary cutter extending therethrough and on the inside surface of the cover means 11 is secured a mounting plate 13 to mount various members therein. An electric motor 14 is mounted on the mounting plate 13. The motor 14 includes a stator winding 15, stator core 16, an armature 17, armature shaft 18 and a fan 19. The armature 17 is adapted to be thrust axially i.e., in the direction shown by an arrow 20 and the magnetic resistance through the stator core 16 and the armature 17 is made minimum when the armature 17 is displaced more left-hand as shown in FIG.3. On the intermediate portion of the armature shaft 18 is provided a worm gear 21 and one end portion of the armature shaft 18 is received rotatably in a bearing means 22. On one extreme end of the shaft 18 is secured fixedly a depressing piece 23 and a compression spring 24 is interposed between the worm gear 21 and the bearing means 22 so as to bias the shaft 18 to the right-hand side of FIG.3. Instead of being secured fixedly, the depressing piece 23 may be mounted in such a manner that it can move axially i.e., in the direction shown by the arrow 20 but does not rotate. A worm wheel 25 of a large diameter is drivingly engaged with the worm gear 21 and is mounted on a driving shaft 27 inserted rotatably in a bearing sleeve 26 formed integrally with the mounting plate 13. A toothed driving wheel 28 is mounted on the end portion of the driving shaft 27 protruding through the cover member 11. A switch 29 to close or open the electrical circuit for the motor 14 comprises a push rod 30 to actuate one of the switch contacts, a resilient member 31 to urge the push rod 30, cord terminals 32 and a cord 33. The resilient member 31 is disposed sufficiently near to the depressing piece 23 so that the depressing piece 23 may depress the resilient member 31 to close the switch 29 as the result of the axial movement of the shaft 18. Next a lever 34 with a grip portion 34' is pivoted to the mounting plate 13 by a pivot pin 35. The lever 34 is provided with a L-shaped guiding slot 36 to lock the lever 34 in the lower position and to close the switch 29 temporarily and this slot comprises an arm actuating portion 37 and an arm locking portion 38 having an inclined plane 39 extending from the lower edge of the arm locking portion 38 obliquely so as to depart from the surface of the lever 34. The lever 34 has also an opening 40 sufficiently large to pass the bearing sleeve 26 freely, which is, thus, not obstructive to the lever 34 in operation. Between the lower end 34' of the lever 34 and the body 10, a tension spring 41 is connected thereby biasing the lever 34
in the clockwise direction so as to raise the grip portion 34'. An arm 42 made of resilient material is pivoted by a bolt 43 to a protruding portion 44 of the mounting plate 13. A stopper 42' is provided for the arm 42. The arm 42 has, on its one end portion, an engaging projection 45 which engages movably with the guiding slot 36. The engaging projection 45 has such a length that it does not get out of place from the guiding slot 36 but can lay its tip portion on the deviating end of the inclined piece 39. Around the bolt 43 a spring 46 is mounted in order to bias the arm 42 in the counterclockwise direction of FIG.3. On the other end of the arm 42, a touching member 47 for urging the depressing piece 23 is secured fixedly. On the lever 34 is threadedly mounted a cutter base 48, extending partly through the window 12 of the cover means 11. A rotary cutter 50 is mounted rotatably on the extending portion of the cutter base 48 by a screw 49. Further, on the front surface of the body 10 is pivoted a magnet arm 51 by a pin 52 and a magnet 53 to attract a can lid cut off from a can is disposed on the extreme end of the magnet arm 51. When the magnet 53 is not used, it can be turned up in the direction shown by the arrow 54. A can receiving portion 55 is provided on the front surface of the body 10 under the driving wheel 28.

The operation of the can opener described above is as follows. Firstly, the driving wheel 28 is positioned to contact with the lower end of an end rim 57 of a can 56 and at the same time, the can receiving portion 55 is made to contact with the side surface of the can 56. In this situation, the lever 34 is lowered to cause the rotary cutter 50 to pierce into the can lid 58 immediately inside of the end rim 57. The can opener is held on the can by the cooperation of the driving wheel 28, rotary cutter 50 and the can receiving portion 55. As the engaging projection 45 is engaged with the L-shaped guiding slot 36 of the lever 34 at this time, the arm 42 rotates in the clockwise direction with the downward movement of the lever 34 and as shown in FIG.4(a), the touching member 47 urges the depressing piece 23 to close the switch 29 temporarily. When the operator of the can opener detaches his hand from the lever 34, it rises slightly due to the force of the tension spring 41 and as shown in FIG.4(b), the engaging projection 45 is disposed in the arm locking portion 38, being in contact with the side of the inclined piece 39. In this situation, the lever 34 and the arm 42 are held stationary but the depressing piece 23 is out of engagement with the touching member 47. Thus, the arm 42 and the guiding slot 36 constitute a means to close the switch 29 temporarily as well as a means to lock the lever 34. After the motor 14 is energized on account of the temporary closure of the switch 29, the driving wheel 28 rotates and the can opener begins to move circumferentially around the can 56. As the result, the rotary cutter 50 begins to cut the can lid 58 and the reaction force of can opening operation then generated is transmitted to the worm wheel 25 through the driving wheel 28. This reaction force is directed clockwise because with the present embodiment, the rotation direction of the worm wheel 25 is clockwise in FIG.3. This reaction force thrusts the worm gear 21 to the left and is still in mesh with the worm wheel 25 in the thrust position. Thus, the depressing piece 23 depresses the resilient member 31 to close the switch 29 and the worm wheel 25 continues to be actuated, being in mesh with the worm gear 21 thrusted. Once this situation is established, the weight of the can opener is supported by the can 56 even if the operator detaches his hand from the lever 34 and the can opener cuts the can, moving around the can 56. When the can lid 58 is cut completely, the reaction force disappears and the armature shaft 18 is returned to the former position due to the force of the compression spring 24 as shown in FIG.4(c). Consequently, the switch 29 is opened, the motor 14 is deenergized and the can opener stops to move. In order to remove the can opener from the can 56 after the finish of can opening operation, the operator has only to lower the lever 34 slightly. As the result of this operation, the tip of the engaging projection 45 becomes in position to be in contact with the inclined piece 39 and the arm 42 is rotated by the force of the spring 46 in the counterclockwise direction, having its engaging projection 45 in contact with the inclined piece 39. This situation is shown in FIG.4(d). If the operator frees the lever 34, it is rotated counterclockwise due to the force of the spring 41 and so the inclined piece 39 urges the engaging projection 45 thereby bending the arm 42 and disengaging the engaging projection 45 with the locking portion 38 of the guiding slot 36. The engaging projection 45 engages again with the arm actuating portion 37 after being in contact with the surface of the lever 34 as the same rotates. Thus, the lever 34 itself rises and the rotary cutter 50 comes out from the can lid 58. At this time the arm 42 is prevented from rotating by the stopper 42'.

As is clear from the foregoing description, the electrically powered can opener according to the present invention is one of self moving type which can be automatically stopped to operate as soon as the can opening operation is finished. Moreover, the can is left held on the can opener even after the can opener is stopped automatically. Although the present invention has been described with preferred embodiments, it should be understood that the many changes and modifications are possible to the present invention without departing from the spirits of the present invention and the scope of the claims accompanying.

What I claim is:

1. An electrically powered can opener adapted to move circumferentially around a can, comprising a body, an electric motor mounted in said body, a driving wheel extending rotatably from said body, a torque transmitting mechanism interposed between said electric motor and said driving wheel, said transmitting mechanism being provided with a switch closing member, adapted to be actuated by the reaction force of can opening operation applied through said driving wheel, a lever mounted rotatably on said body, a rotary cutter carried rotatably by said lever, a biasing means for biasing said lever so as to keep said lever away from the position where said rotary cutter pieces into the can, a switch for the electric circuit of said electric motor disposed in a suitable position where it can be closed by said switch closing member actuated by the reaction force of can opening operation, an arm mounted rotatably on said body and engaged operably with said lever, an arm locking means adapted to lock said arm in the situation where said rotary cutter is piercing in the can lid, said arm locking means being mounted on said lever and said arm being disposed in such a position that one end of said arm can temporarily close said switch and a release member mounted on said lever to release the lock of the same.
2. An electrically powered can opener according to claim 1 including a L-shaped guiding slot comprising an arm locking portion and an arm driving portion as means to drive and lock said lever, an engaging projection provided on said arm and having a form suitable to engage movably with said guiding slot, said arm being made of resilient material, a biasing means for biasing said arm in the direction opposite to that of the actuation of the lever by an operator and an inclined piece as said release member of said lever, said inclined piece extending from the edge of said arm locking portion in a direction deviating from the surface of said lever.