Feb. 26, 1963 R. E. McLEAN ETAL 3,078,568

POWER OPERATED CAN OPENER

Filed Nov. 20, 1961 3 Sheets-Sheet 1

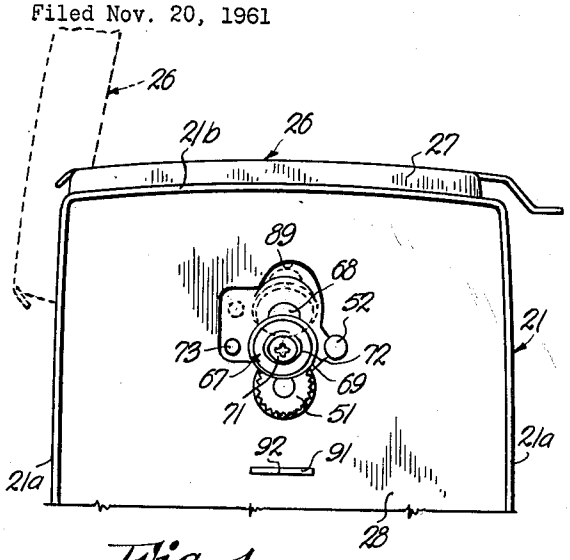

Fig. 1.

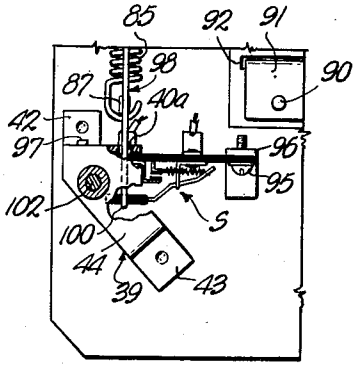

Fig. 3.

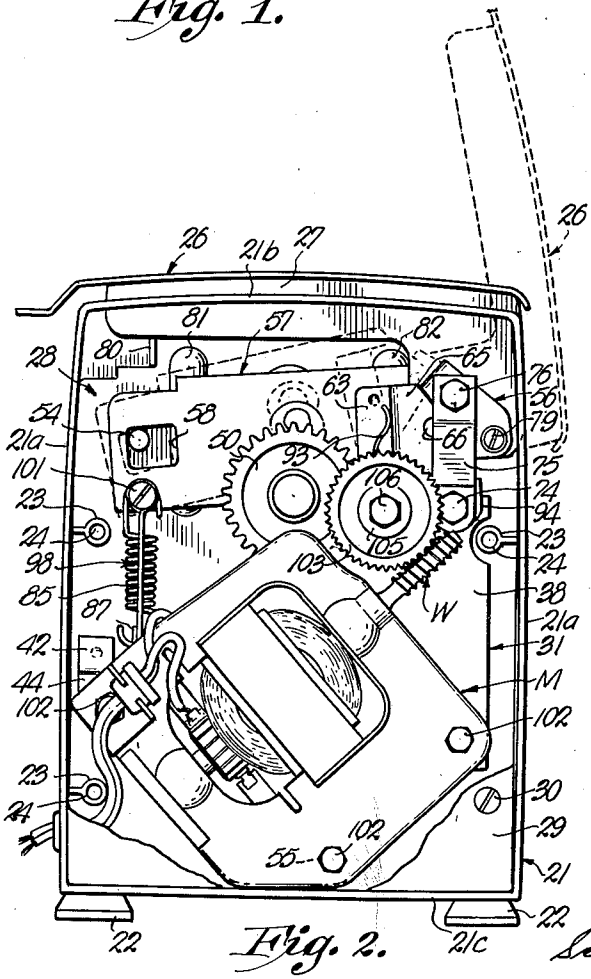

Fig. 2.

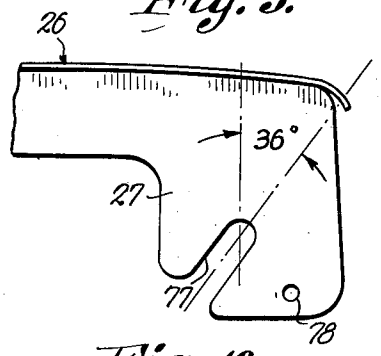

Fig. 12.

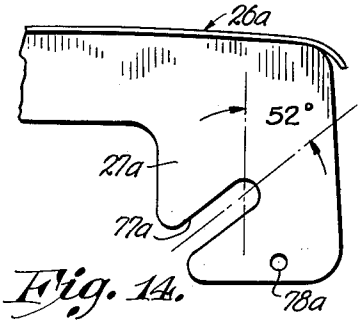

Fig. 14.

INVENTORS.
Robert E. McLean
William A. Chappell
Jack E. Briar

BY Seofield, Kajer, Seofield & Lowe
ATTORNEYS.

Feb. 26, 1963 R. E. McLEAN ETAL 3,078,568

POWER OPERATED CAN OPENER

Filed Nov. 20, 1961 3 Sheets-Sheet 2

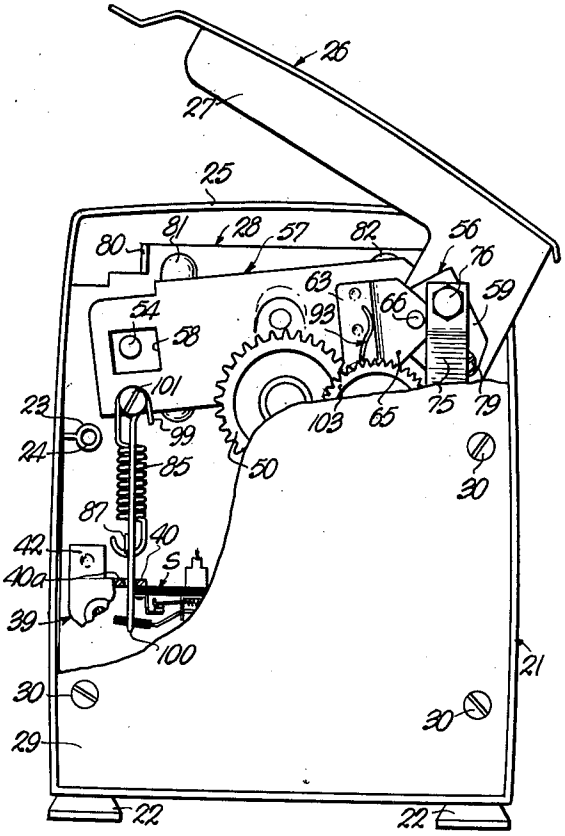

Fig. 4.

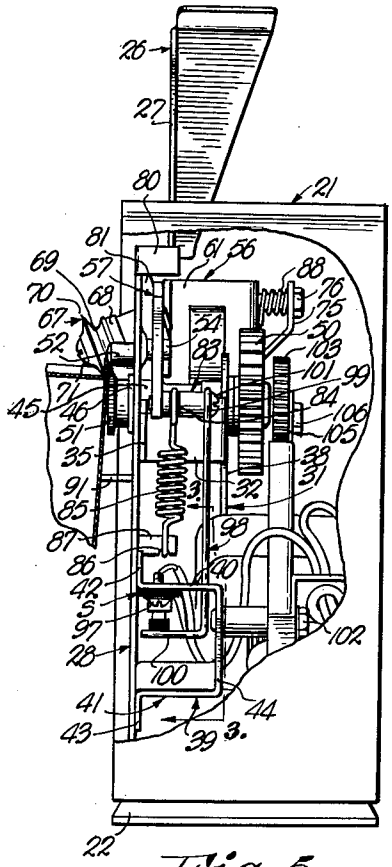

Fig. 5.

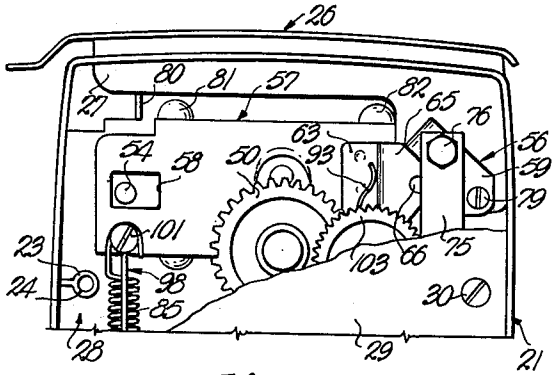

Fig. 6.

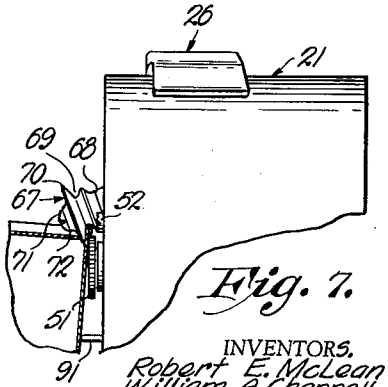

Fig. 7.

INVENTORS.
Robert E. McLean
William A. Chappell
Jack E. Briar

BY

Scofield, Kokjer, Scofield & Lowe
ATTORNEYS.

Feb. 26, 1963 R. E. McLEAN ETAL 3,078,568

POWER OPERATED CAN OPENER

Filed Nov. 20, 1961 3 Sheets-Sheet 3

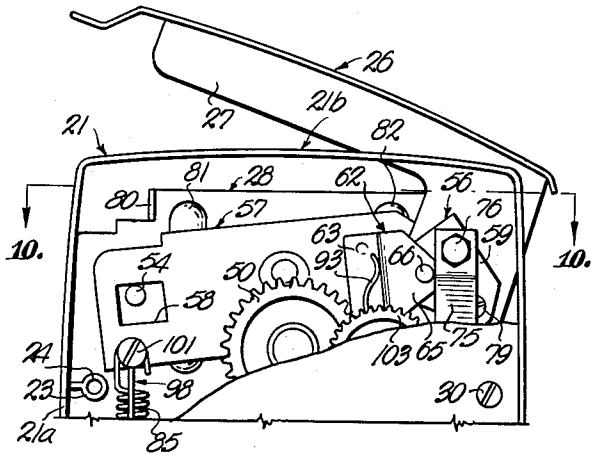

Fig. 8.

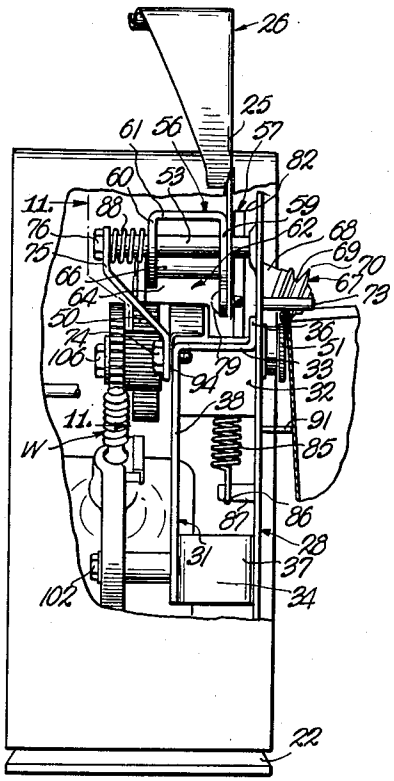

Fig. 9.

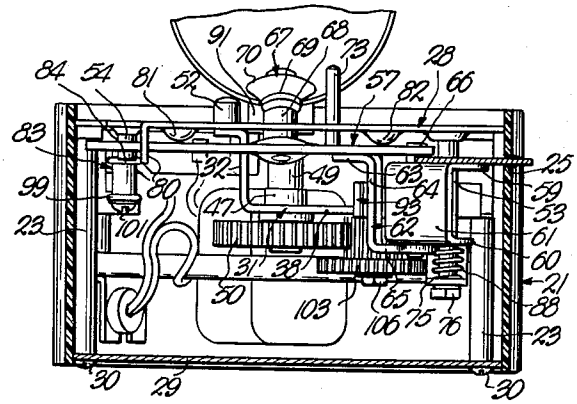

Fig. 10.

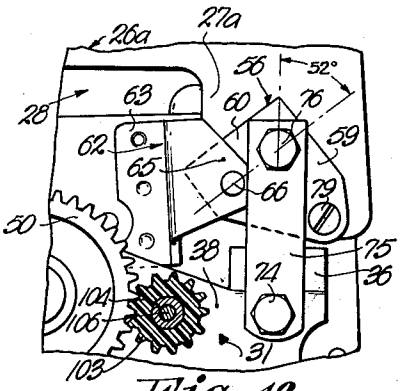

Fig. 13.

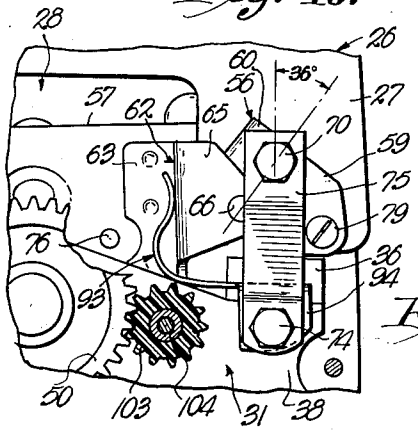

Fig. 11.

INVENTORS.
Robert E. McLean
William A. Chappell
Jack E. Briar

BY

Seofield, Kokjer, Seofield & Lowe
ATTORNEYS.

United States Patent Office 3,078,568 Patented Feb. 26, 1963

3,078,568

POWER OPERATED CAN OPENER

Robert E. McLean and William A. Chappell, Raytown, Mo., and Jack E. Briar, Shawnee Mission, Kans., assignors to John C. Hockery, trustee for Henry J. Talge and Foster L. Talge

Filed Nov. 20, 1961, Ser. No. 153,409
13 Claims. (Cl. 30—4)

This invention relates generally to can openers and refers more particularly to improvements in the construction of power operated can openers.

One of the principal objects of the invention is to provide an electrically driven can opener having a construction such that the main operating components, and particularly the movable mounting for the cutting member, are located inside the housing of the unit. Through such an arrangement it is possible to reduce materially the amount of decorative finishing work which heretofore has been required in units with exposed components. One of the main advantages achieved thereby is a material reduction in the over-all cost of the unit without sacrificing anything in the way of operating efficiency or reliability.

Another important object of the invention is to provide a greatly simplified, yet thoroughly reliable actuating mechanism which provides for quick and facile piercing and cutting of the can lid, and which has certain important characteristics which lend it particularly to the provision of a can opener which is capable of automatic operation. The term "automatic" is used in the sense that the can opener operates, once the lid is pierced, to complete the cutting operation without further attention thereto by the operator, and shuts off as the cutting operation is completed.

Another object of the invention is to provide a can opener of the automatic type in which the drive motor for the can opener is controlled and shut off responsive to the change in forces acting on the cutting member occurring as shearing of the end from the can is completed. Attempts to use the differential between forces exerted on the cutter wheel while the end is being severed from the can and those exerted thereon after the end has been completely severed from the can have previously been made in the can opener art. However, due to friction inherent between the functional parts, the over-all net differential in most cases has been so slight that the automatic shut-off has not been reliable. Accordingly, it is an object of the present invention to not only employ a dependable basic mechanical principle for accomplishing the automatic shut-off, but to effectively and most efficiently apply the principle toward the end of minimizing inherent friction between the functional parts involved in accomplishing such automatic shut-off in order that maximum differential may exist between forces as exerted on the cutter wheel while the end is being severed from the can and those exerted thereon after the end has been completely severed from the can.

Still another object of the invention is to provide a unique operating mechanism of the character described which, due to the limited number of component parts, can be manufactured at a much lower cost than other mechanisms of which we are aware. Despite the lower cost, the improved mechanism of the present invention is sturdy, efficient and capable of long operating with a minimum of maintenance and replacement of parts.

Still another object of the invention is to provide a can opener of the character described in which, during operation, the can is firmly maintained in tractive relationship with the feed wheel, yet seams will be easily passed without interrupting or interfering with the cutting action. It is a feature of the invention that the cutter member is

supported in unique fashion to move relatively freely in an up and down direction, even when a can is engaged in the cutting mechanism. Through the arrangement provided for the low friction mounting for the cutter element, we have been able to produce a greatly simplified can opener and the structure is easily adaptable to either manual or automatic operation.

A further object of the invention is to provide a can opener of the character described which has its components so arranged that insertion and removal from the casing of the entire operating mechanism is accomplished with great ease. Not only does this feature of the invention assist in the manufacturing operation in that it permits testing of the working mechanism prior to insertion in the case, but also it facilitates, simplifies and reduces effort and cost in such repair work as may be required.

Other and further objects of the invention, together with the features of novelty appurtenant thereto, will appear in the course of the following description.

In the accompanying drawings which form a part of the specification and are to be read in conjunction therewith, and in which like reference numerals indicate like parts in the various views;

FIG. 1 is a front view of the upper portion of a can opener embodying the invention;

FIG. 2 is a rear view of the can opener, the back closure plate being broken away to expose the interior mechanism;

FIG. 3 is a fragmentary detail view taken generally along the line 3—3 of FIG. 5 in the direction of the arrows;

FIG. 4 is another rear view of the can opener with part of the closure plate broken away to expose the interior mechanism, the can operating lever and other components being shown in the positions they assume immediately prior to piercing of the can lid;

FIG. 5 is a side elevation taken from the left-hand side of FIG. 4, the near wall of the casing having been broken away to expose the interior mechanism;

FIG. 6 is another rear view of the upper portion of the can opener, the closure plate again being broken away, the operating lever and other components being shown in the positions which they assume during opening of the can;

FIG. 7 is a fragmentary side elevation of the upper portion of the can opener taken from the left-hand side of FIG. 4;

FIG. 8 is another rear view of the upper portion of the can opener, the closure plate again being broken away and showing the relative position of the parts which occurs at the completion of the cutting operation;

FIG. 9 is a side elevational view taken from the right hand side of FIG. 8 with the component parts in the position of FIG. 8, the near wall of the casing having been broken away to expose the interior mechanism;

FIG. 10 is a sectional view taken along the line 10—10 of FIG. 8 in the direction of the arrows;

FIG. 11 is a fragmentary sectional view taken generally along the line 11—11 of FIG. 9 in the direction of the arrows;

FIG. 12 is a rear view of the pivoted end of the hand lever of the automatic form of can opener, considerably enlarged;

FIG. 13 is a fragmentary sectional view similar to FIG. 11, but showing a modified construction in which the operation of the can opener is manual rather than automatic; and

FIG. 14 is a view similar to FIG. 12, but showing the form of the operating lever in the manually operated unit.

Referring now to the drawings and initially to the embodiment of the invention shown in FIGS. 1 through 12,

inclusive, reference numeral 21 generally designates the case or housing of the can opener. The side walls 21*a*, top 21*b* and bottom 21*c* of the casing may conveniently be formed integral with one another to provide a tubular member open at the front and rear. The casing is supported on the feet 22, the latter being preferably of rubber material. Formed integral with the side walls 21*a* on the interior thereof are a plurality of bosses 23 (see FIG. 2). The bosses 23, each of which is provided with a hole 24 therethrough, terminate somewhat short of flush at the front and rear of the casing side walls. The top wall 21*b* is provided with an elongate transverse slot 25 (one edge of which is seen in FIG. 4). The slot 25 extends partially down into the right-hand side wall 21*a*, as may be seen in FIG. 4. The slot is designed to receive the vertical portion 27 of the can opener operating lever 26.

The main support frame for the can opener mechanism includes as one of its principal elements the front plate 28. This plate is contoured at its edges to fit within the front portion of the casing 21, with the rear face of the plate bearing against the front ends of the bosses 23. A rear closure plate 29 similarly contoured seats against the rear ends of the bosses 23 and screws 30 extend through suitable apertures in the closure plate 29, through the holes 24 of the bosses 23 and are threaded into inwardly tubulated bosses on the inside of the front plate 28, thus securely assembling the closure plate 29, the case 21 and the frame plate 28 as a unit.

An ornamental cover (not shown) of any suitable material and design can be affixed by adhesion to the exposed surface of the frame plate 28, if desired. Such ornamental cover would preferably fit closely within the contour of the case 21.

Included in the general frame assembly is a first bracket 31 (FIGS. 2, 5 and 9) having the main body portion 38 which is spaced rearwardly of front plate 28 by the three legs 32, 33 and 34. The latter are secured to the plate by welding foot portions 35, 36 and 37, respectively, thereof to the back of plate 28. A second, somewhat smaller bracket 39 is also secured to the inside of the front plate 28 by means of legs 40 and 41 which terminate respectively in feet 42 and 43 welded to the plate. The bight portion 44 of bracket 39 is spaced from the rear of plate 28.

Press fitted into a suitable aperture in the upper central portion of the front plate 28 is a bearing 45 having an end flange 46. A similar bearing 47, coaxial with the bearing 45, is press fitted into an aperture in the bracket 31. Extending through these bearings is the feed wheel drive shaft 49. A spur gear 50 is cast on the inner end of shaft 49 and the other end terminates in the toothed can feed wheel 51. As is evident, the can feed wheel is located in front of the front frame plate 28.

A curved spring washer (not shown) is preferably telescoped over the drive shaft 49 and interposed between the gear 50 and the flange of the bearing 47 to always urge the can feed wheel 51 toward its seat against the flange portion 46 of the bearing 45.

Anchored in the frame plate 28, preferably by hot heading process, are the right can guide 52 and the studs 53, 54 and 55. The can guide extends forwardly of the frame plate 28 with its lower edge approximately on a horizontal line with the upper edge of the toothed portion of the can feed wheel 51.

Studs 53, 54 and 55 all extend inwardly from the back of the frame plate 28. As is best seen in FIG. 9, the stud 53 is of substantial length and of relatively small diameter. In effect, it serves as an arbor on which the operating lever 26 and a substantially U-shaped link 56 are pivoted. More will be said of this later.

Stud 54 is located near the opposite edge of plate 28 from stud 53 and extends into a substantially rectangular opening 58 formed in the cutter mounting plate 57. The third stud 55 is located near the bottom of plate 28 and, as shown in FIG. 2, provides one of the supports for the driving motor M for the unit.

Returning now to further description of the operating lever 26 and the link 56, both of these, as previously noted, are mounted for limited swinging movement on the stud 53. The link 56 has the two parallel spaced legs 59 and 60 connected by the intermediate bight portion 61. The cutter wheel mounting plate 57 is connected with link 56 through the medium of a bracket 62. The bracket 62 has the foot portion 63 welded to the back side of the mounting plate, the rearwardly extending portion 64 (see FIG. 10) and the bent-over terminal portion 65 which lies adjacent the inner leg 60 of the link. A forwardly extending pin 66 is anchored in the portion 65 of bracket 62, this stud extending in a rotatable fit through suitable apertures formed in the legs 59 and 60 of the link, supported at its other end by the plate 57 (FIG. 10).

As will be seen, lever 26 and link member 56 are tied together to swing as a unit around the stud 53. It will be observed that the stud or pin 66 which connects the mounting plate 57 through bracket 62 to the link 56 is offset laterally from the stud 53. Thus the hand lever and cutter mounting plate 57 are connected together through a toggle-like linkage having a fixed pivot 53, a movable pivot 66 and a third pivot for the mounting plate subsequently to be described.

The cutter mounting plate 57 carries the cutter wheel 67 of the unit. An arbor 68 is mounted in and extends forwardly from the cutter plate. The cutter wheel has the grooved reduced diameter portion 69 immediately back of the larger cutting diameter portion 70. It is retained on its arbor 68 by any suitable means such as by screw 71 and washer 72. A left-hand can guide 73 (as viewed in FIG. 1) is anchored in the cutter mounting plate 57.

Returning now to the stud 53, it will be observed that the outer end of the stud is supported by a brace 75 whose lower end is anchored to the bracket 31 by screw 74. The upper end of the brace 75 is secured to the rearward end of stud 53 by screw 76. As shown in FIG. 12, the operating lever 26 is provided with the slot 77 and tapped hole 78. The operating lever is assembled to the link 56 and stud 53 after the latter has been assembled in the case 21. To assemble the operating lever to the remainder of the mechanism, the vertical portion 27 of the lever is inserted through the clearance slot 25 so that the slot 77 fits over studs 53 and 66 with the upper end of the slot 77 seating and pivotally bearing on stud 53. When in this position the lever is secured to the leg 59 of the link by the screw 79, the screw extending freely through a hole in leg 59. It will thus be seen that lever 26, when assembled with the remaining structure, is interposed between the leg 59 and the inner face of the cutter mounting plate 57. Obviously, as a result of this structure, the link 56 will rotate as a unit with the lever 26.

As viewed in FIG. 2, counterclockwise swinging of the operating lever 26 is limited by engagement of the under edge of the vertical portion 27 with an inturned ear 80 formed on the frame 28. Clockwise swinging of the lever 26 can be limited by engagement of the outer end of the rectangular opening 58 of the cutter mounting plate with stud 54; by engagement of the extended end of the screw 79 with the end edge of the cutter mounting plate 57; or by engagement of the leg 59 of the link 56 with the intermediate portion 64 of the bracket 62, whichever is desired.

The cutter mounting plate 57 is maintained in spaced relationship from the major portion of the rear surface of the plate 28 through the medium of a pair of spaced vertical ways or ribs 81 and 82. Since, as will subsequently be seen, the cutter mounting plate shifts position in its plane, it is advisable to round these ribs so as to establish essentially line contact between the mounting plate and ribs. The cutter mounting plate is lightly urged toward contact with the ribs by the coil compression spring 83 which encircles the outer portion of

stud 53 and is confined between the brace 75 and inner leg 60 of the link member 56.

At that end of the cutter mounting plate 57 opposite from the link 56, there is provided a rearwardly extending stud 83 having a groove 84. The upper end of a tension coil spring 85 is hooked into the groove. The lower end of spring 85 is hooked in a notch 86 formed in a lug 87 that is inturned from the back of the frame plate 28. As is best seen in FIG. 2, the primary purpose of tension spring 85 is to urge the free end of the cutter mounting plate 57 downwardly at all times. Downward movement of the cutter mounting plate is limited by engagement of the upper edge of the opening 58 of the cutter mounting plate with the stud 54.

It will be particularly noted from FIG. 5 that the upper end of spring 85 is slightly further from the frame plate 28 than the lower end. By virture of this arrangement the force exerted by the spring operates also to urge the cutter mounting plate 57 forwardly, thus assisting the previously described coil spring 88 in maintaining the cutter mounting plate seated against the ribs 81 and 82.

To accommodate the cutter wheel 67 and its arbor 68, the frame plate 28 is provided with a suitable clearance opening 89 which also is of a size to permit the left-hand can guide 73 to extend therethrough. Of course, the opening 89 must be of such contour and size to assure that there never will be interference between the parts 73 and 68 and the frame when the said two parts are in any of the positions they assume during operation of the can opener.

The usual can guard 91 is spaced below the feed wheel 51. In the preferred embodiment of the invention this can guard is a segment of an L-shaped member having the inner leg secured to the frame as by rivet 90. The guard 91 extends from the back side of the frame plate through the aperture 92. If desired, the can guard 91 could be struck from the frame 28 instead of being a separate part assembled thereto.

The cutter mounting plate 57 is acted on not only by the spring 85 which tends to pull its free end down, but also by the leaf spring 93 which, as best seen in FIGS. 2 and 11, slidingly bears against the outturned portion 64 of bracket 62. The lower end of spring 93 is anchored through the medium of a downturned ear 94 formed on the spring. The ear 94 is sandwiched between the lower end of brace 75 and the bracket 31 and is secured in place by screw 74. As shown in FIG. 11, spring 93 curves upwardly and to the right and then slightly to the left. The first curved portion is of relatively long radius and, substantially at the point where the curve starts upwardly, the free end of the spring seats downwardly on the inclined edge of portion 38 of the bracket 31. When the parts are in the position shown in FIG. 11, the spring is preferably not flexed; however, as shown, the upwardly curved end is closely adjacent the bight 64 of the bracket 62.

The electrical switch for starting and stopping the motor of the can opener is best seen in FIG. 3 and is designated by the letter S. It is of the usual snap-acting over-center type and of conventional design. One end of the switch is secured by screw 95 to the inturned lug 96 formed on the frame 28, while the other end is secured by screw 97 to leg 40 of the bracket 39. The switch is controlled by a switch control rod 98. The latter has a suitable loop 99 at its upper end, as best seen in FIGS. 4 and 5. The looped end 99 is freely pivoted on a reduced diameter portion of stud 83 and is secured thereon by the screw 101. The switch control rod extends downwardly through a suitable opening 40*a* in the leg 40. The switch is so installed that the spring thereof urges the free end of the switch actuating lever downwardly at all times so that it will always seat downwardly on the angularly formed portion 100 of the rod. Since the switch is of the type where the spring continuously biases the contacts to the open or "off" position, the switch will always be in the "off" condition unless the operating lever thereof is displaced upwardly.

It will subsequently be seen that vertical movement of the free end of the cutter mounting plate 57, limited by engagement of the upper and lower edges of the opening 58 thereof with the stud 54, is the determinant of the condition of the switch at any given time.

The drive from the motor M to the feed wheel shaft 49 is of the double reduction type. In addition to the stud 55 previously described, the base of the motor M is supported on the brackets 31 and 39 and is secured to these brackets and stud 55 by the screws 102. The motor drive shaft terminates in a worm W which meshingly engages the worm gear portion of a combination worm gear and spur toothed pinion 103 which is journaled on a stud 104, also secured to and extending from the bracket 31. The combination gear 103 is secured on stud 104 by a washer 105 and screw 106. The pinion portion of gear 103 meshes with the gear 50 attached to the feed wheel drive shaft 49.

Operation

The manner of operation of the automatic form of can opener is as follows. When not in use, the operating lever 26 will normally be in the solid line position of FIG. 1. As shown in FIG. 2, when there is no can in the can opener and the lever 26 is in its down position, the upper edge of the rectangular opening 58 of the cutter mounting plate 57 seats downwardly on stud 54. The opposite end of the cutter mounting plate 57 which is pivoted to link 56 at 66 also is in its lowermost position. It will be remembered that the cutter mounting plate is so pivoted to the link 56 as to establish a toggle connection. In addition, as previously noted, link 56 and the operating lever 26 are so connected as to rotate as a unit about the axis of stud 53, which axis may be considered as the center of screw 76.

To prepare the can opener to receive the can, operating lever 26 is first swung counterclockwise to its extreme position, as represented in broken lines in FIG. 1. Still referring to FIG. 2, it will be seen that counterclockwise rotation of the operating lever 26 is limited by engagement of the under edge of the vertical portion 27 thereof with the lug 80. Clockwise rotation is limited by any one of the three arrangements elected, as previously described. This swinging of the operating lever will rise the cutter wheel 67 from its lowermost position to its uppermost position and open a gap between the cutter wheel and feed wheel 51. The can (not shown) is then inserted in the can opener in such manner that the flange or rim of the can will be over the toothed portion of the feed wheel 51 and below the grooved diameter portion 69 of the cutter wheel with the end or lid of the can bearing upwardly against the cutting edge periphery of the cutter wheel. After the can is so engaged, the operating lever 26 is swung clockwise (FIG. 1) to its extreme position, which is the full down position shown in solid lines in FIG. 1. As will subsequently be made clear, it is not necessary for the operator to continue holding the operating lever 26 in such position. Instead, he may remove his hand from the lever and turn to other affairs until such time as he elects to remove the opened can from the device. The motor of the can opener will automatically be shut off after the lid has been completely cut from the can; however, the can opener will continue to retain the can in an engaged condition until such time as the operating lever is manually swung back to its starting position.

When the lever 26 is swung to its upper position (the broken line position of FIG. 2) and after the can to be opened is inserted in the device as above explained, the operating lever 26 is depressed to the solid line position. As this downward swinging occurs, the following events take place.

After only a few degrees of rotation of lever 26, the cut-

ting edge of the cutter wheel 67 will seat firmly downwardly on the end of the can and under edge of the flange or rim of the can will seat downwardly on the toothed periphery of the can feed wheel 51. The end of the can then becomes a fulcrum for the cutting edge periphery of the cutter wheel 67. As the can piercing lever is further rotated only a few more degrees, the left-hand, or free end of the cutter mounting plate 57, against tension of the spring 85, will move upwardly in such manner that the upper edge of the opening 58 will no longer seat on stud 54. When moved sufficiently upwardly, the switch control rod 98 will actuate the switch S to the on position. FIG. 4 shows the position of these parts after the free end of the cutter mounting plate 57 has been moved upwardly only sufficiently to cause the switch control rod to close the switch S. At this stage of the operation of opening a can, the end of the can will not have been pierced by the cutter wheel 67. However, the motor M of the can opener will be started and the can will be fed in relation to the cutter wheel 67 by the can feed wheel 51.

Further depression of the operating lever 26 toward the down position causes the end of the can to be pierced by the cutting edge of the cutter wheel, and the cutter wheel will enter into the can until the grooved diameter portion 69 thereof seats on top of the flange or rim. Rotation of the can by the motor M while the end thereof is being pierced by the cutter wheel greatly facilitates the piercing operation, resulting in much less force having to be applied by the operator to the lever than would be required should the can be stationary.

FIG. 6 illustrates the relative position of the parts which occurs while the can is engaged and the motor is operating to advance the can through the cutting mechanism. By referring to FIGS. 6 and 11, it will be seen that when the parts are in the positions assumed while the end is being cut from the can, a straight line through the axes of the studs 53 and 66 is at an angle of approximately 36° clockwise from the vertical. The invention is not limited to this angle; however, it has been found as being eminently satisfactory. Due to the forces exerted on the cutter wheel 67 while the end is being cut from the can, including resistance of the end of the can to the cutting edge of the cutter wheel, the cutter mounting plate 57 is urged to the right. In turn, because of the position of the axis of pin 66 below the axis of stud 53, the link 56 is urged in a counterclockwise direction. However, engagement of the operating lever 26, which is firmly secured to the link 56, with the lug 80, prevents the link from turning any further than the position shown in FIGS. 6 and 11.

As will be evident, the coil spring 85, of predetermined tension, urges the free end of the cutter mounting plate 57 at all times downwardly so as to resiliently maintain the cutter wheel in downward engagement with the rim of the can. During the cutting, the opening 58 is not seated on stud 54, and the pin 66 serves as a fulcrum for the cutter mounting plate, and the flange or rim of the can will be vertically, but yieldably, squeezed between the toothed periphery of the can feed wheel and cooperating grooved portion of the cutter wheel by force approximately double the tension of the spring 85.

We have previously seen that the grooved diameter portion 69 of the cutter wheel 67, when seated on the rim or flange of the can provides a second fulcrum for the cutter mounting plate 57. Accordingly, at all times when a can is engaged in the can opener and the upper edge of the opening 58 of the cutter mounting plate 57 is not seated on stud 54, the tension exerted by spring 85, working over the fulcrum provided by the cutter wheel, applies a force that urges the link 56 to rotate clockwise on its pivot stud 53. By reason of a selected angularity of the straight line through the axis of stud 53 and the axis of pin 66 to the vertical, the forces tending to rotate the link 56 counterclockwise (still viewed as in FIG. 6) while a can is engaged in a can opener and the end is being cut therefrom overcome the forces tending to rotate the link 56 clockwise. Accordingly, and as previously noted, the link 56 and cutter mounting plate 57 will remain in the position shown in FIGS. 6 and 11 while the end is being cut from the can.

However, after the end has been completely severed from the can, the lid no longer offers resistance to the cutting wheel and the combined forces tending to rotate the link 56 clockwise are sufficient to rotate the said link 56 clockwise. Therefore, upon completion of cutting, the link 56 will be rotated clockwise toward the position shown in FIG. 8.

FIG. 8 illustrates the relative positions of the components occurring automatically and immediately following completion of the severing of the end from the can. It will be observed that this is an intermediate position between the can end cutting position of FIG. 6 and the full open position shown in FIGS. 1 and 2 in broken lines. The spring 85 has pulled the free end of the cutter plate downwardly so that the upper edge of opening 58 seats on stud 54. After seating thereon there will be no force tending to rotate the link 56 either clockwise or counterclockwise.

The spring 93 serves as a brake to retard and yieldably arrest the automatic clockwise rotation of link 56 when severing of the lid has been completed. It will be noted that the toggle formed by the cutter mounting plate 57 and link 56 has been stopped short of its maximum length; in other words, pin 66 is still below a straight line drawn through the contact point of opening 58 with stud 54 and the axis of the cutter plate link stud 53, which is the center of screw 76. It is the stopping of the parts in the position shown in FIG. 8 that enables the can opener to retain the opened can engaged therein until the operating lever 26 is thereafter manually rotated further clockwise to the extreme open position.

It should be noted that the spring 93 exerts little or no resistance to the initial clockwise rotation of link 56. However, the resistance of the spring increases substantially after the initial rotation of the link. This is important, in order that there be a minimum of resistance to clockwise rotation of the link when the forces tending to so rotate it have a minimum of mechanical advantage due to the angle of application. It will be seen that after link 56 will have been rotated only a few degrees clockwise from the position of FIG. 11, the forces tending to rotate the link in that direction have a much better mechanical advantage and therefore the increased resistance offered by spring 93 will not prevent the link and lever 26 from reaching the intermediate position of FIG. 8.

The substantial length given the stud 53 and pin 66 and the corresponding substantial depth of the cooperating link 56 serve to minimize friction in the bearings of the link and between the cutter mounting plate 57 and the ribs 81 and 82 of the frame. Moreover, they assist in providing exceptionally good alignment of the cutter mounting plate in relation to the axis of the can feed wheel drive shaft 49.

The minimizing of friction in the bearings of the link 56 and between the cutter mounting plate 57 and ribs 81 and 82 is especially important in achieving the free and easy automatic movement of these parts to effect automatic shut-off of the motor M.

The low frictional resistance between the mounting plate 57 and the frame, and between the mounting plate and the pin 66 which connects it with link 56 contributes to the operating efficiency of the can opener in other respects. As we have seen, the pin 66 becomes a pivot for the cutter mounting plate 57, while the end is being cut from the can. The low frictional resistance to movement of plate 57 enables the spring 85 to resiliently, but yieldably, firmly maintain the rim or flange of the can seated on the toothed periphery of the can feed wheel 51, thus assuring good traction of the teeth of the feed wheel with the under edge of the rim. Also, the minimizing of friction permits the free end of the cutter mounting plate to move upwardly, against the tension of spring 85,

with a minimum of resistance (other than that offered by spring 85) when necessary, as is especially desirable when the side seam portion of the can is passing between the can feed wheel 51 and the overlying cutter wheel 67.

During operation, the left hand guide 73 maintains the can in such position that the axis thereof is substantially vertical while engaged in the can opener and the end is being cut therefrom. The right can guide 52 maintains the can in the proper position to provide the most efficient cutting of the end from the can. The can guard 91 maintains the side wall of the can at the predetermined angle in relation to the outer face of the can feed wheel 51.

It should be observed that should the mechanism involved for effecting automatic operation of this form of the can opener ever fail, the can opener would still be serviceable and useable as a non-automatic or manual electric can opener. In other words, should the operating lever 26 ever fail to remain in the downward position while the end is being cut from the can, the operator could manually maintain it in such position. Conversely, should the operating lever ever fail to automatically return to the intermediate position upon completion of cutting, the motor can be stopped by simply manually raising the lever.

Important to the safety of operation is the fact that unless there is a can in position between the feed wheel and cutter wheel, swinging of lever 26 to any position between its limits of movement, including the limit positions, will not result in closing the switch S. In other words, it is necessary that a can be engaged in the can opener before the plate 57 will be lifted sufficiently to displace control rod 98 upwardly to the switch closing position.

Manually Controlled Embodiment

The construction of the manually controlled or non-automatic form of the power operated can opener is essentially the same as that of the preceding embodiment with, however, the following changes.

The brake spring 93 is not on the manual form of the can opener, and, as shown in FIGS. 13 and 14, the angle of the straight line extending through the axes of stud 53 and pin 66 is approximately 52° from the vertical, as is the slot 77*a* in the operating lever 26*a*. In other words, when the lever 26*a* is in its full down position, the angle between the mounting for pivot pin 66 connecting the link with the mounting plate, and the axis of stud (which is the same as the center of screw 76) is 52° rather than the 36° of the preceding embodiment.

Basically, the principal difference between the manual form shown in FIGS. 13 and 14 and that of the preceding embodiment is that in the manual can opener the toggle-like construction is such that the resistance to cutting, combined with other operating forces, does not operate to hold the cutter mounting plate in the can cutting position. While we have selected an angle of 52° as above described, other angles will also serve, depending upon the dimensions of the parts and their connected relationship with one another.

During operation of the manual form, there is always present a force acting against the link 56 and its associated lever 26*a*, tending to turn the link in a direction to raise the lever. Therefore, unless some external force, such as hand pressure, is continually applied to the lever 26*a*, the link will be returned to a position like the intermediate position for the automatic unit shown in FIG. 8. While the can is still held in the can cutting mechanism at this position, the motor is off. The can may be removed then by further lifting of the lever 26*a* to separate the cutter wheel from the feed wheel.

It will be apparent that in the manual form of can opener all of the advantages obtained by the mounting and support structure for the cutter mounting plate 57 present in the automatic form are enjoyed in the manual form also.

From the foregoing it will be seen that this invention is one well adapted to attain all of the ends and objects hereinabove set forth together with other advantages which are obvious and which are inherent to the structure.

It will be understood that certain features and subcombinations are of utility and may be employed without reference to other features and subcombinations. This is contemplated by and is within the scope of the claims.

As many possible embodiments may be made of the invention without departing from the scope thereof, it is to be understood that all matter herein set forth or shown in the accompanying drawings is to be interpreted as illustrative and not in a limiting sense.

Having thus described our invention, we claim:

1. In a power operated can opener, the combination of a feed wheel rotatable about a substantially fixed feed wheel axis, a motor drivingly connected with said feed wheel, switch means connected with said motor and having a motor energizing condition and a motor de-energizing condition, a cutter member, a carrier member for said cutter member extending generally transversely with respect to and above the axis of said feed wheel and having opposite end portions located respectively on opposite sides of said feed wheel axis, said carrier member supported for movement between a first position in which said cutter member is sufficiently spaced from said feed wheel to permit insertion and removal of a can flange therebetween and a second position in which said cutter member is in cutting relationship with said feed wheel with said cutter member supported from the rim of the can, switch control means connected with said carrier member and operable to maintain said switch means in motor energizing condition while said carrier member is in said second position and cutting is taking place, an operating lever mounted for movement about a pivot axis spaced from but parallel with said feed wheel axis, link means connecting said lever with one end portion of said carrier member whereby movement of said lever about its pivot axis effects movement of said carrier member between said first and second positions, means connected with the other end portion of said carrier member and operable, at times when a can is being subjected to cutting by said cutter member, to urge said carrier member toward said first position, said link means so constructed that the resistance to cutting imposes a force on said carrier member urging said carrier member toward said second position and which, acting through said link means, overcomes said last named means until cutting is completed.

2. In a power operated can opener, the combination of a feed wheel rotatable about a substantially fixed feed wheel axis, a motor drivingly connected with said feed wheel, switch means connected with said motor and having a motor energizing condition and a motor de-energizing condition, a cutter member, a movable carrier member for said cutter member spaced above said feed wheel axis, a pivotal link member pivoted about a second fixed axis spaced laterally from said feed wheel axis, means pivotally connecting the distal portion of said link member with said carrier member about a third, intermediate movable axis, operating means operable to pivot said link member whereby to shift said carrier member from a first position in which said cutter member is separated from said feed wheel toward a second position in which the cutter member is in cutting relationship with said feed wheel, switch control means connected with said carrier member and operable, as said cutter member is advanced from said first position toward said second position and contacts and pierces a can end to shift said switch to its motor energizing condition and maintain such condition while cutting of the end of the can continues, said movable axis, when said carrier member is in said second position, being so located that the resistance to cutting causes said link member to be urged in

one direction, and resilient means connected with said carrier and operable to urge said link member in the other direction, said resilient means having insufficient strength to shift said link member in said other direction against the resistance to cutting whereby said carrier member remains in said second position until cutting is completed.

3. In a power operated can opener having a rotatable feed wheel and an electric motor drivingly connected with said feed wheel, the combination therewith of a cutter member having a portion adapted to seat on the can flange when the cutter is in cutting relationship with the can and the feed wheel, a cutter carrier member for said cutter member having end portions extending on the opposite sides of the feed wheel when said cutter member portion is seated on said flange and rockable about an axis parallel with the feed wheel axis and passing through the point of seating of the cutter member portion on said flange, link means including said carrier member and operable to translate the resistance to cutting to a force urging said carrier member to rock in one direction, resilient means connected with said carrier member and urging said carrier member to rock in the opposite direction, said resilient means having insufficient strength to rock said carrier member with respect to the can while cutting continues, switch means connected with said motor, and switch control means connected with said carrier member and operable, in response to rocking of said carrier member by said resilient means when cutting is completed, to de-energize said motor.

4. The combination as in claim 3 wherein said link means includes also a lever operable to raise and lower said one end of said carrier member with respect to said feed wheel.

5. In a power operated can opener, the combination of a frame having an upstanding front closure plate, an electric motor behind said plate, a feed wheel in front of said plate supported thereby for rotation about a fixed axis, means drivingly connecting said motor with said feed wheel, a cutter carrier member disposed behind said plate, cutter means mounted on said carrier member and extending forwardly from said member through an oversized aperture in said plate, means supporting said carrier member from the rear side of said plate for up and down movement of said cutter means relative to said feed wheel, lever means connected with said carrier and operable to move same, and motor control means connected with said carrier member and actuated responsive to reaction forces applied to said cutter means by engagement of said cutter means with an unopened can in can feeding position on said feed wheel to energize said motor and maintain it energized during cutting of the end from the can.

6. The combination as in claim 5 wherein said cutter means is so constructed that it serves as a fulcrum for said carrier member when a can end is being cut and in which said motor control means includes resilient means operable to shift said carrier member about said fulcrum to a motor shut-off position at the completion of cutting.

7. In a power operated can opener, the combination of a frame having an upstanding front plate, a feed wheel in front of said plate, a feed wheel drive shaft extending through said plate and connected with said feed wheel, a stud secured to and extending rearwardly from said plate at a location remote from said feed wheel, a link member pivotally mounted on said stud, a cutter carrier member disposed in back of said plate, said carrier member spaced above and extending across said drive shaft with its opposite end portions located respectively on opposite sides of a vertical plane through said drive shaft, means pivotally connecting the distal portion of said link member with the nearest end portion of said carrier member, an operating lever connected with said link member and operable to pivot said link member whereby to raise and lower the end of said carrier member connected with said link member in an arcuate path, stop means at the other end of said carrier member operable to permit limited up and down movement of said other end, resilient means connecting said other end with said frame and urging said other end downwardly, cutter means secured to said carrier member intermediate its ends and extending forwardly through an oversized aperture in said front plate, said cutter means including a cutter member adapted to cooperate with said feed wheel and pierce a can end as that end of the carrier member connected with said link member is shifted downwardly in response to movement of said operating lever, an electric motor drivingly connected with said feed wheel drive shaft, switch means operable to start and stop said motor, switch control means connecting said carrier member with said switch means and operable to start said motor on upward movement of said other end of said carrier member against the resistance of said resilient means as said cutter member engages the end of said can.

8. The combination as in claim 7 wherein said link member and the means connecting said carrier member therewith are constructed to hold said carrier member in substantially fixed fore and aft relationship with said front plate.

9. The combination as in claim 8 wherein said link member is of U-shape, with the legs spaced from one another axially of said stud and pivotally journaled on said stud, and said last named means includes a pivot pin secured to and extending from said carrier member and journaled in aligned apertures in said legs.

10. The combination as in claim 7 including guide ribs interposed between said plate member and said carrier member and operable to maintain the major portion of said carrier member from frictional contact with said plate.

11. The combination as in claim 7 including resiliently yieldable braking means operable to resist the free swinging of said link member in a direction to raise the end of said carrier member connected therewith.

12. The combination as in claim 7 wherein said means pivotally connecting said link member with said carrier member is so constructed that when the cutter member has pierced the can lid, the pivot axis between the link member and carrier member is spaced below a line drawn through the top of the feed wheel and the axis of said stud.

13. The combination as in claim 12 wherein the spacing of said pivot axis below said line is sufficient that the force on said carrier created by resistance to cutting is enough to maintain said other end of said carrier raised against the resistance of said resilient means.

References Cited in the file of this patent

UNITED STATES PATENTS

2,893,116	Aberer et al.	July 7, 1959
2,979,815	Rohde et al.	Apr. 18, 1961