# United States Patent [19]

**Ponczek et al.**

[11] **3,765,085**

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[54] **CAN OPENER**


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[73] Assignee: **Sunbeam Corporation,** Chicago, Ill.



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[21] Appl. No.: **161,002**

[52] **U.S. Cl.** ..... **30/4 R,** 30/15

[51] **Int. Cl.** ..... **B67b 7/38**

[58] **Field of Search** ..... 30/4 R, 8, 8.5, 14, 30/15, 3, 345



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[57] **ABSTRACT**

A can opener having a readily detachable cutting mechanism which includes a lever supporting a cutter which cutter serves as a latching means to retain the cutting mechanism assembled to the can opener. The lever and cutter are both supported for rotational movement on a stub shaft detachably supporting the cutting mechanism with respect to the can opener. A simplified drive mechanism between the motor and can rotating wheel is provided. The motor and the shaft for supporting the can rotating wheel are supported on a flexible plate which deforms to compensate for variations in can dimensions.


**15 Claims, 11 Drawing Figures**

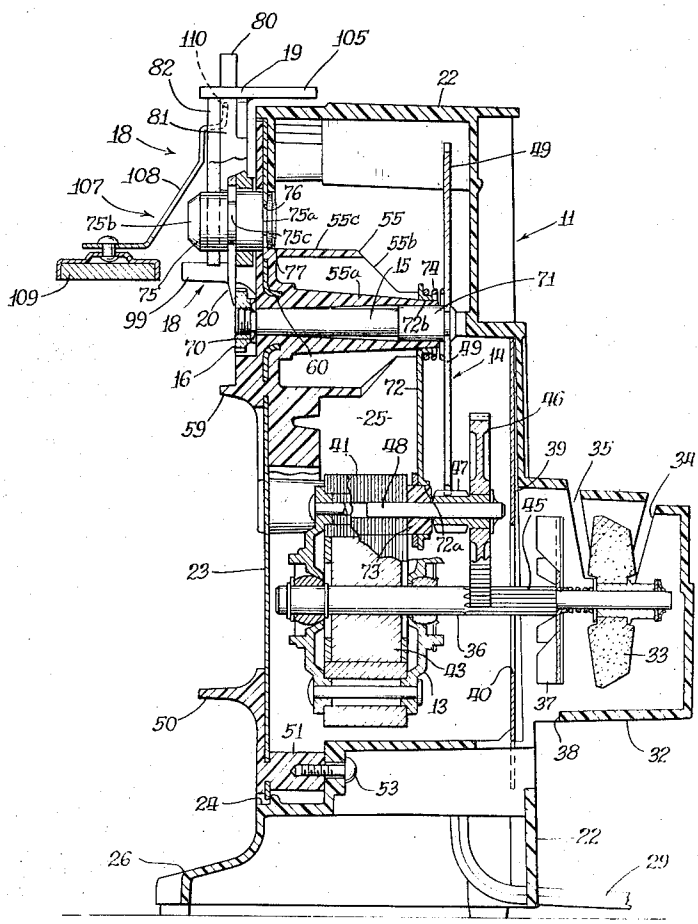

Fig. 1.

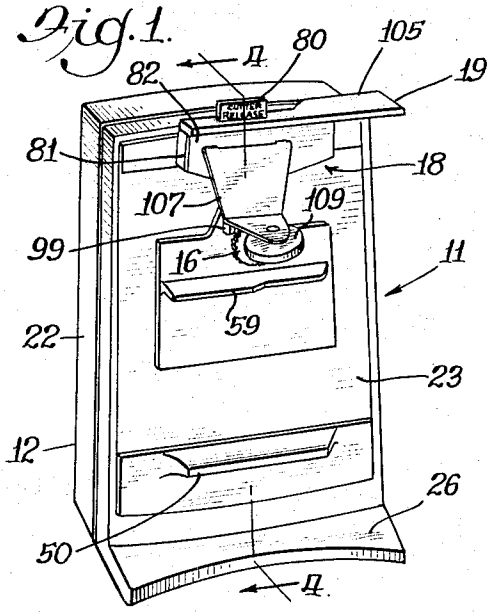


Fig. 3.

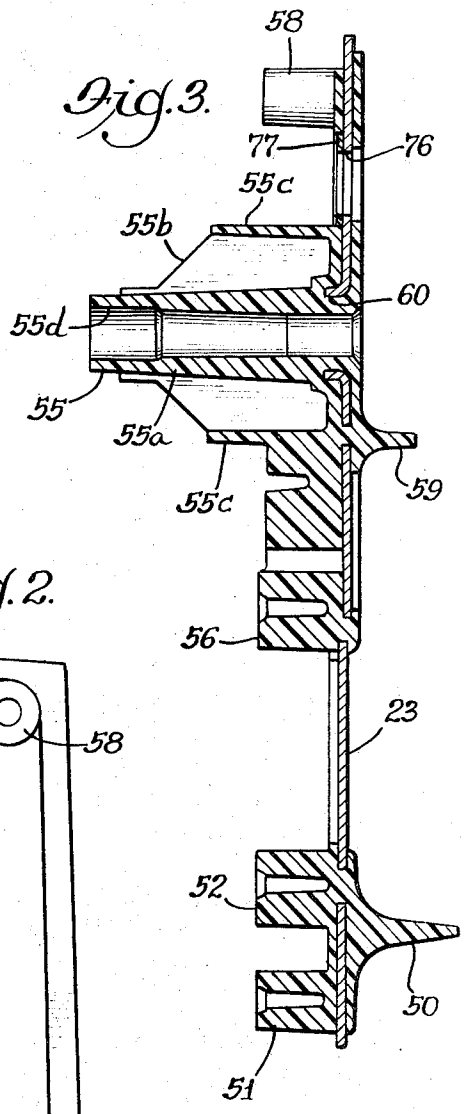


Fig. 2.

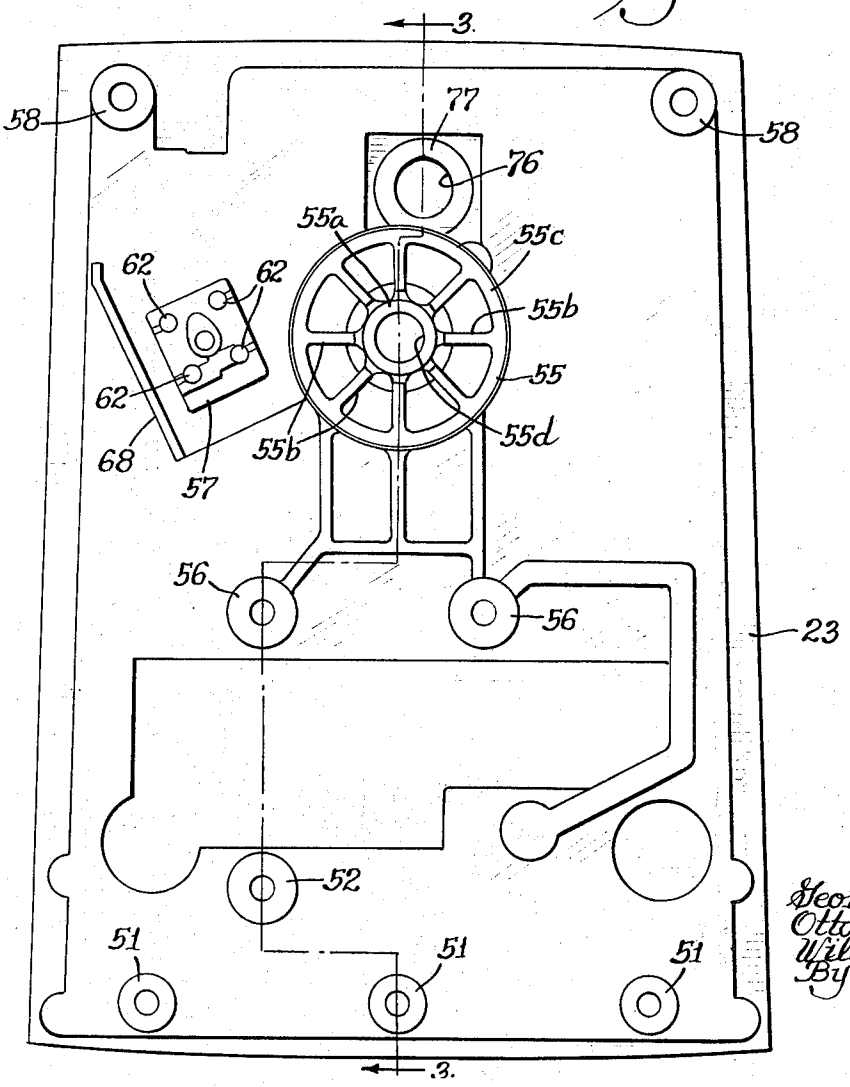


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Fig. 4.

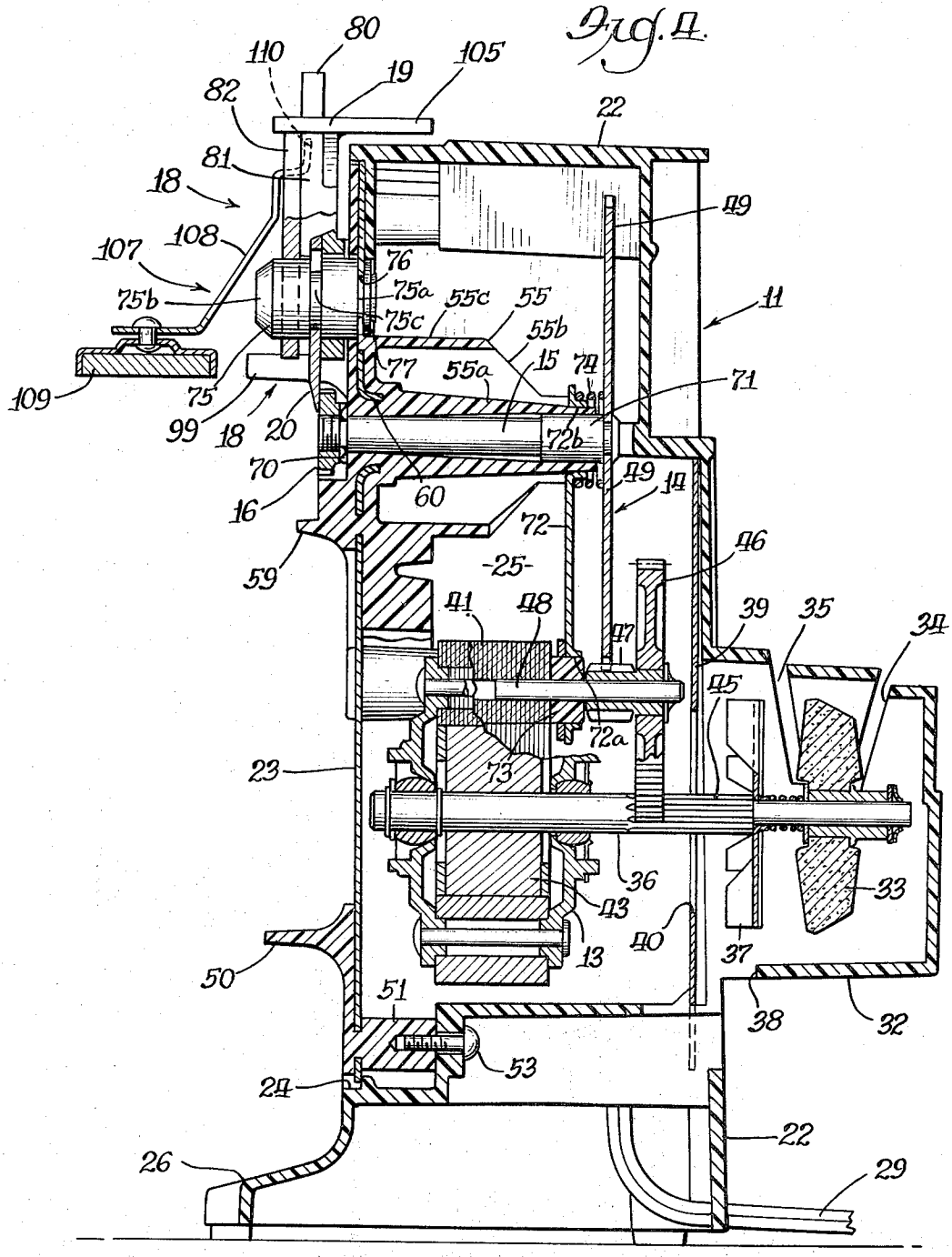


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Fig. 5.

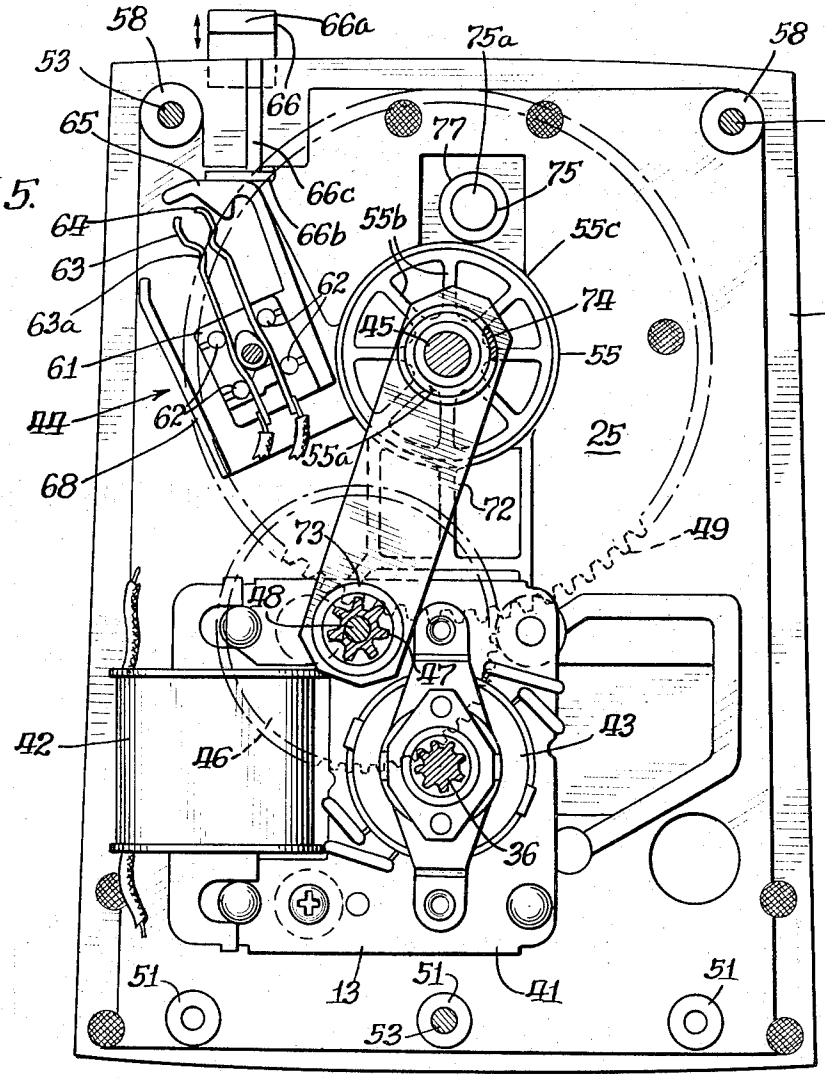


Fig. 6.

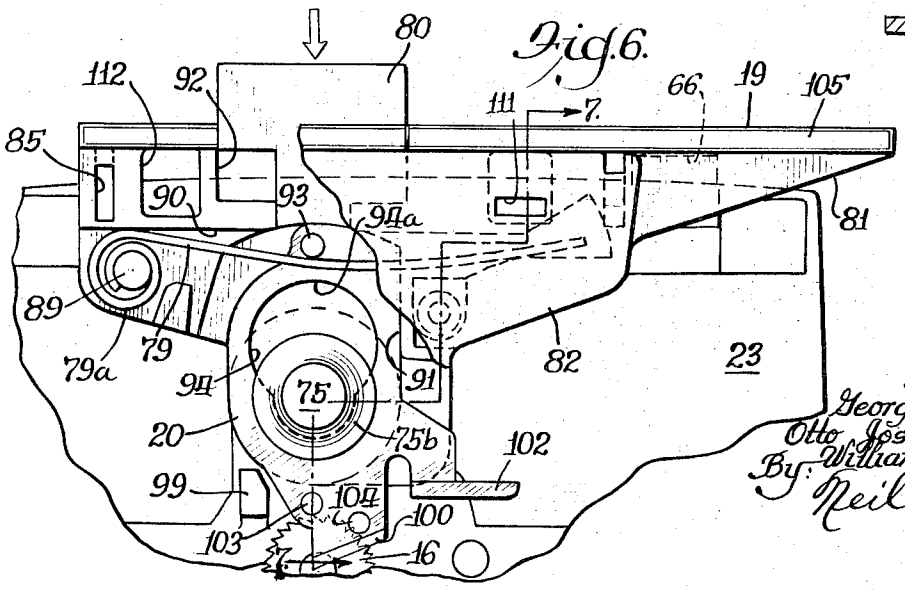


Fig. 7.

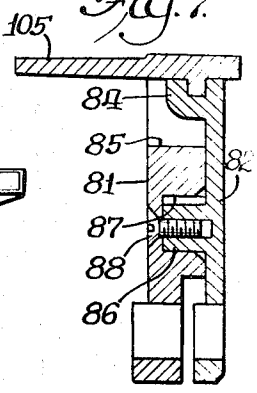


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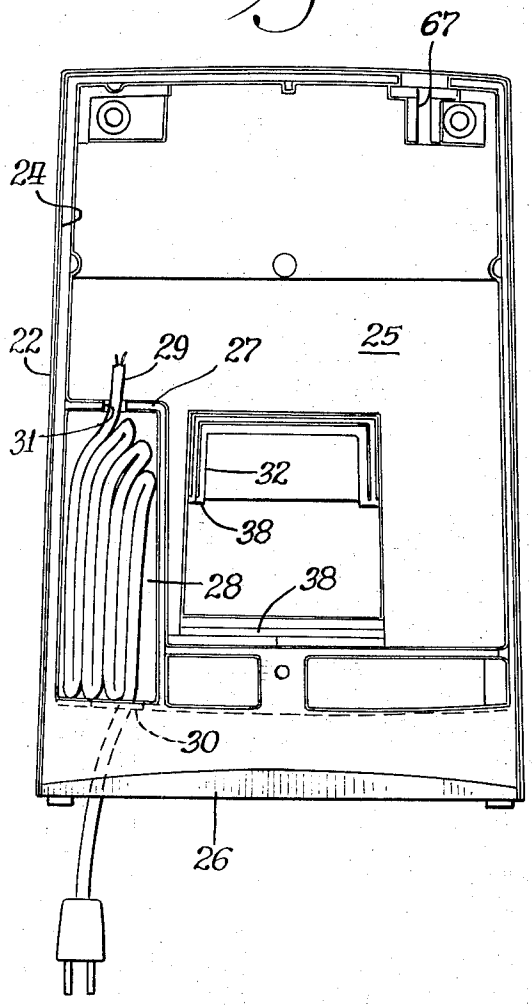
Fig. 9.



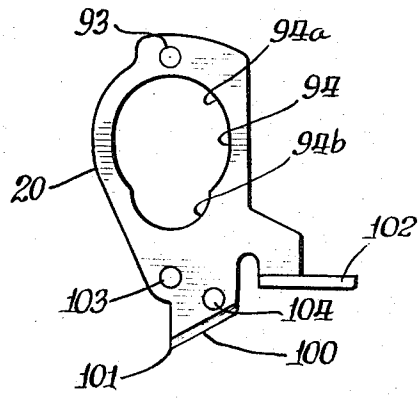




Fig. 8.

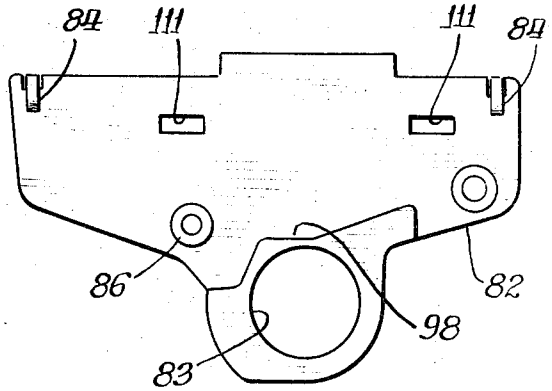
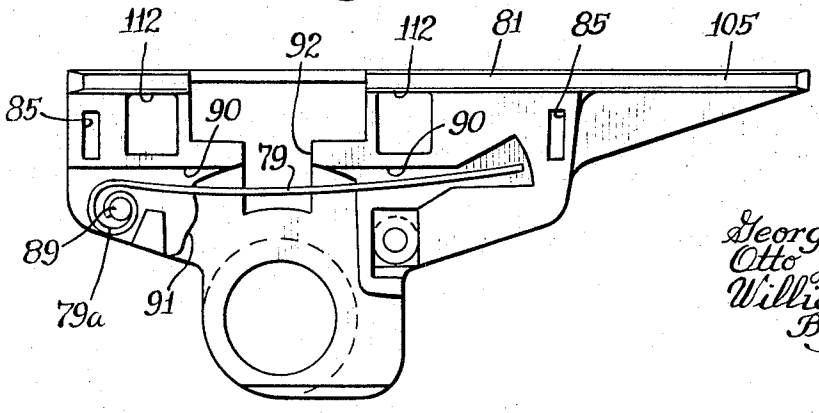



Fig. 10.

Fig. 11.

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# CAN OPENER

## BACKGROUND OF THE INVENTION

In recent years the motor operated electric can opener has become one of the most popular and commercially important, small electric appliances. Since it is a relatively simple appliance, it is relatively easy for small manufacturers to design and tool to manufacture an electric can opener. Accordingly, the field has become very competitive with a large number of manufacturers sharing the four or five million unit a year can opener market in the United States. Because of the vigorous competition in the field, pricing and consequently the cost of manufacture have become very important. In addition to the severe price competition there have also been improvements in quality and features incorporated in the current can openers.

While at one time only the most expensive can openers were automatic to the extent that the can opener would, once it had been started, continue to open the can while unattended and terminate the operation when the lid or cover had been severed from the can. Competition has been such that now even the low cost can openers include this automatic feature.

Another important feature is the provision for detaching the cutter assembly from the can opener so that it may be easily washed to remove accumulations of food. While the cutter removal may be accomplished in many different ways, it is important that the means for detaching and reassembling the cutter mechanism be simple and easily operated by the housewife without the need for tools. Experience has shown that the early can openers which included screws and small clips for retaining the cutter wheel or plow type cutter were easily lost and discouraged the housewife from removing the cutter for cleaning purposes. The present preferred approach involves some type of push button mechanism, which permits removal of the cutter mechanism without providing or necessitating separate screws, clips or other assembly means. The push button type of release for the cutter mechanism must, however, be inexpensive from a manufacturing cost standpoint or else the can opener will be overpriced and unsalable.

Another basic design problem in electric can openers is that of providing means in the can opening mechanism to compensate for the differences in can dimensions which normally are encountered. The conventional can opening mechanism includes a rotating feed wheel which engages the under edge of the upper lip of the can. The can is held in position against the serrated feed wheel by the cutter, which during the cutting operation is moved into overlapping relationship with the feed wheel. In this overlapping position the cutter extends through the can cover adjacent the inner surface of the lip at a point adjacent the engagement of the feed wheel with the outer portion of the lip. As the can is rotated by the serrated feed wheel the cutter makes a continuous cut on the cover or lid until it is severed from the can.

The dimensions of the can lip determine the optimum relative distance between the end of the feed wheel and the overlapping cutter during the can opening operation. In order to compensate for the differences between thick and thin lips many of the higher quality prior art can openers have included spring biasing means on either the cutter or the feed wheel to compensate for these dimensional variations in the cans.



Such spring biasing means have been expensive and added significantly to the cost of such can openers. However, when the means for compensating for such can dimensional variations have been omitted, there is a considerable sacrifice in the performance of the can opener. The can opener tends to stall in some instances when the can lip is too thick resulting in stripped gears or burned out motors. If the spacing between the feed wheel and the cutter is too great there is a tendency for the cutter to make an uneven cut resulting in slivers cut from the can which may drop into the food or the cutter may leave sharp slivers or protuberances on the can which may injure the person handling the opened can. Accordingly, it is of great commercial importance to provide an inexpensive means to compensate for the variations in can dimensions.

## SUMMARY OF THE INVENTION

The present invention provides an improved can opener which is simple to manufacture and at the same time includes quality features which have heretofore been available only in more complicated and expensive can openers. The invention involves a simplified drive connection between the shaded pole electric motor and the shaft which supports the can rotating wheel. A two stage gear reduction is employed with the intermediate gear supported on a stub shaft carried by the motor field. The distance between the stub shaft and the feed wheel supporting shaft is controlled by separate bracket which is located close to the plane of the reduction gear train.

The cutting mechanism and the can rotating wheel as well as the motor are mounted on a flexible plate which forms the front wall of the housing for the can opener. The flexure in this plate permits the cutter to deflect with respect to the can rotating wheel so that variations in the can lip dimensions are accommodated with no sacrifice in the performance of the can opener. The supporting plate deflects within its elastic limit allowing the distance between the cutter and the feed wheel to vary depending on the thickness of the can lip while at the same time maintaining the cutter positioned closely adjacent the interior wall of the can even in connection with cans having relatively thin lips. By utilizing the flexibility of the supporting plate to accommodate this dimensional variation, it is possibe to mount the cutting mechanism and the can rotating wheel in a simple and inexpensive manner with respect to the plate.

The various elements of the drive for the feed wheel including the motor, the reduction gearing and the feed wheel shaft itself are supported on the above described metal plate utilizing plastic bosses, projections and the like which have been molded integrally with the support plate. In addition, the outer or front side of the support plate is provided with molded pins and abutments which engage and support the can during its rotary movement. The resulting plate, with its associated molded parts forms a decorative portion of the housing as well as performing the many functions outlined above.

The cutter mechanism comprises a very simple part which is readily detachable from a supporting pin or stub shaft carried by the plate described above. The cutter mechanism includes a lever which is pivotally received on the stub shaft with a simple plow type cutter being supported with respect to the lever by the same stub shaft. The cutter is spring biased against rotational

and slidable movement by a single spring. A push button is provided to deflect the cutter which also serves as a latch to retain the cutting assembly on the stub shaft and assembled to the can opener housing. The spring in exerting a rotational bias on the can cutter contributes to the power driven entry of the cutter into the can lid when the motor is actuated by the cutting mechanism lever. The continued rotation of the can at this point causes the reaction force against the cutter to maintain the lever in engagement with the motor switch thereby continuing the operation of the can opener until the cover has been severed from the can.

It is an object of the present invention to provide a functionally improved and mechanically simplified can opener.

It is a further object of the present invention to provide an improved can opener having the motor and can opening mechanism mounted on a flexible supporting plate.

It is another object of the present invention to provide an improved can opener wherein a flexible metal supporting plate with plastic bearings and support means from thereon carries the motor and the can opening mechanism as well as the associated reduction gear.

It is still a further object of the present invention to provide an improved can opener having a simplified drive mechanism wherein there is a single gear reduction between the motor frame and the can rotating wheel supporting shaft with a separate frame member to control the distance between the gear supporting shafts.

Another object of the present invention is to provide a simple and readily removable cutting mechanism for a can opener.

Another object of the present invention is to provide an improved cutting mechanism in which a cutter is movably supported with respect to the operating lever with the cutter serving as a latch means to detachably connect the cutting mechanism with respect to the can opener housing.

Another object of the present invention is to provide an improved cutting mechanism wherein the cutter and operating lever are supported for pivotal movement together but the pivotal support mounts the cutter directly so that the substantial forces produced in the cutter during the opening of a can are not transmitted through the lever.

Still a further object of the present invention is to provide an improved cutting mechanism which is carried by stub shaft with the lever and cutter being pivotally mounted on the stub shaft and removable as an assembly with the cutter serving as a latch to retain the assembly in position on the shaft.

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

## BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a can opener embodying my invention;

FIG. 2 is an enlarged rear plan view of the front housing member or support plate of the can opener of FIG. 1;

FIG. 3 is a sectional view taken on line 3—3 of FIG. 2;

FIG. 4 is an enlarged vertical sectional view taken substantially along line 4—4 of FIG. 1;

FIG. 5 is a rear view of the front housing member or support plate of FIG. 2 shown with the motor and gearing assembled thereto;

FIG. 6 is an enlarged fragmentary view of the top portion of the can opener of FIG. 1 viewed from the front with portions thereof cut away to expose the cutter;

FIG. 7 is a sectional view of the cutter mechanism taken along line 7—7 of FIG. 6 with the cutter removed;

FIG. 8 is an elevational view of the cutter shown removed from the cutting mechanism;

FIG. 9 is a front elevational view of the rear housing portion;

FIG. 10 is a rear elevational view of the front cover plate of the cutting mechanism; and

FIG. 11 is a front elevational view of the lever portion of the cutting mechanism.

## DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings, there is shown in FIG. 1 a combined can opener and knife sharpener designated generally by reference numeral **11.** The can opener **11** is conventional insofar as it includes a housing **12** which encloses a motor **13** which drives through a gear reduction **14** a feed wheel shaft **15** which supports on its outer end a serrated can rotating or feed wheel **16.**

Cooperating with the feed wheel **16** to open or cut the lid of a can is a cutting mechanism **18.** The cutting mechanism **18** includes a pivotally mounted, manually operated lever **19** which supports a plow type cutter **20.** The cutter **20** is movable between the retracted or load position with the lever **19** in a generally vertical position and a cutting position as shown in FIG. **4** in which it overlaps the feed wheel **16** and the lever **19** extends generally horizontally.

The housing **12** is made up of two basic parts, one being a box like portion **22** and a front plate **23.** The front plate **23** may be designated the support plate since it carries all the mechanism of the can opener including the motor **13,** the feed wheel shaft **15** and the cutting mechanism **18.** In addition, the front plate serves as a closure for a front opening **24** formed in the box like housing portion **22.** Thus the front plate **23** and the box like portion **22** cooperate to form an enclosure **25** within which the motor and reduction gearing are received.

The box like housing portion **22** which is best shown in FIG. **9** is made of an inexpensive styrene plastic material since it performs little function except to enclose the mechanism carried by the front plate **23.** The portion **22** is also formed with a forwardly projecting base **26** which provides the necessary stability for the can opener when a can is received between the cutter **20** and the feed wheel **16** and force is being applied by the operator downwardly against the lever **19.** Although the interior of the housing forming the enclosure **25** is generally rectangular, there is provided an interior somewhat L shaped wall **27** which provides a forwardly facing box like cord receiving pocket **28.** Thus a power cord **29** enters the pocket **28** through an opening **30**

where the excess cord is coiled as shown in FIG. 9. The front opening in the pocket 28 is closed by the front plate 23 and an opening 31 in wall 27 is provided for the cord 29 to extend from pocket 28 into the chamber 25 for connection to the motor 13. The opening 30 is of such size that surplus cord length may be pushed up into the pocket 28 and stored there if it is not needed to reach the nearest electrical outlet.

The portion 22 is also formed with a rearwardly projecting appendage 32 which serves to enclose a knife sharpener or grinding wheel 33. The appendage 32 is merely of suitable size to enclose the wheel 33 and includes angles slots 34 and 35 which are adapted to receive knife blades and guide them into proper engagement with the opposite faces of the grinding wheel 33.

The grinding wheel 33 is supported on the rearwardly extending end of motor shaft 36. Also supported on the shaft 36 and inwardly of the grinding wheel 33 is a fan 37 which circulates air across the motor 13 and outwardly through a downwardly facing opening 38 as best shown in FIG. 4. A fiber baffle wall 39 is mounted within the enclosure 25 along back wall of housing portion 22 in order to prevent the debris from the knife sharpening in the appendage 32 from being deposited in the motor 13 and the other mechanism enclosed within the enclosure 25. The baffle 39 is provided with an opening 40 through which the motor cooling air is circulated. The motor 13 is a shaded pole motor having a generally square laminated field 41 on which a coil 42 is supported. An armature 43 is carried by the motor shaft 36. Suitable electrical connections are not shown but are made from the cord 29 through a switch 44 to the coil 42, thus when the switch 44 is closed the motor 13 will be energized to drive the feed wheel 16 through the reduction gearing 14.

The reduction gearing includes two reduction stages having a pinion 45 formed on the motor shaft 36 which pinion engages a gear 46. The gear 46 is secured integrally to a pinion 47 which is supported on a stub shaft 48 which is press fitted into an opening in field 41 as best shown in FIG. 4. The pinion 47 drives a large stamped gear 49 which is secured to the rearwardly projecting end of the shaft 15. Accordingly, the motor 13 drives through pinion 45, gear 46, pinion 47 and gear 49 to rotate the feed wheel 16 at a relatively low speed.

The front plate or supporting plate 23 is a generally rectangular, flat plate formed of a resilient steel material and having openings stamped therein through which nylon material molded integrally thereto extends outwardly from either side of the plate. At the bottom of the plate 23 there is a forwardly extending ledge or abutment 50 which is intended to engage the lower edge of heavy cans and support them as they are rotated by the can opener mechanism. Positioned inwardly on the other side of the plate 22 from the abutment 50 are lower bosses 51 and an upper boss 52. One of the lower bosses 51 is positioned to receive an assembly screw 53 which secures the housing portion 22 and the front plate 23 together as is best shown in FIG. 4. The upper portion of plate 23 is formed with an additional series of molded nylon portions including a bearing support 55, motor support bosses 56, a switch support block 57, upper assembly bosses 58 and forwardly projecting can support portions 59 as are best shown in FIGS. 2 and 3. The boss 52 and two motor support bosses 56 receive assembly screws which extend through the field 41 into threaded engagement with the bosses. This provides a simple and effective means for mounting the motor 13 with respect to the housing 12.

The feed wheel shaft 15 is supported for rotation on the bearing support 55. The bearing support 55 as viewed axially as in FIG. 2 includes a central cylindrical hub 55*a* within which the shaft 15 is journaled. In addition, there are outwardly radiating spokes 55*b* and an outer cylindrical flange 55*c*. The spokes 55*b* and flange 55*c* are all molded integrally and provide rigidity for the bearing support 55 while utilizing a minimum amount of material. It should also be noted that the plate 23 is formed with an inwardly turned flange 60 as best shown in FIG. 3 to provide additional rigidity between the bearing support 55 and the plate 23. The upper bosses 58 correspond to the lower bosses 51 and receive assembly screws which extend through the housing portion 22 in order to retain the two housing members in assembled relation.

The switch 44 is supported on the front plate 23 in the upper left hand corner as shown in FIG. 5. The switch 44 is made with most of its supporting portions formed as part of the plastic molded to the plate 23. This supporting portion consists of a base block 61 having five outwardly extending projections 62 as shown in FIG. 5. Received between and supported by the projections 62 are two flexible switch members 63 and 64. The lower ends of the switch members 63 and 64 are connected to suitable leads which connect the motor field coil 42 and the switch 44 in series across the two conductors of cord 29. The switch members 63 and 64 are formed at their outer ends with channel shaped bends 63*a* and 64*a* which form contact portions of the switch members 63 and 64 respectively. The upper end of the switch member 64 is bent over and positioned to be engaged by a flexible contact actuating member 65. The contact actuating member 65 is formed of a flexible plastic material anchored at its lower end to the base block 61 with the portion extending from the base block being free to flex as the outer end is deflected against the switch member 64 causing the contacts 63*a* and 64*a* to close.

For the purpose of operating the switch 44 there is provided a button 66 which is slidably supported in the top wall of housing 12 having an outer portion 66*a* positioned outside of the housing 12 and an interior portion 66*b* lying within the enclosure 25. Interconnecting the portions 66*a* and 66*b* of the button 66 is a flat shank portion 66*c* which is slidably received in a slot 67 formed in the upper wall of the housing portion 22 as is best shown in FIG. 9. The slot 67 is open toward the front of the appliance 11 with this open side of the slot 67 being closed by the plate 23 to retain the button 66 trapped in assembled relationship to the housing 12. As mounted in the slot 67 the button 66 is mounted for limited vertical sliding movement and is biased to its uppermost position by the resilience of the contact actuating member 65. When the motor 13 is to be energized, the button 66 is depressed causing the interior portion 66*b* to deflect the contact actuating member 65 which in turn moves the switch member 64 into engagement with the switch member 63.

To provide double insulation for the appliance 11 and reduce the possibility of any electric part within the enclosure 25 from being shorted against the metallic portion of the front plate 23 the plastic molded to the interior of the plate extends completely behind the

switch 44 and the coil 43 as shown in FIG. 5. In addition, the switch 44 is provided with an integrally formed wall 68 which provides additional shielding between the switch members 63 and 64 and the outside wall of the housing portion 22.

The feed wheel shaft 15 has been described above as journaled in the bearing support 55 which is molded integrally to the front plate 23. The shaft 15 is threaded at its outer end to receive the feed wheel 16 which has a serrated outer periphery to engage the lip of a can and rotate it. Positioned adjacent to the rear face of the feed wheel 16 is a thrust washer 70 which bears against the plastic portion of the front plate 23 providing a bearing surface against which the axial force on the feed wheel 16 is directed.

The rearwardly extending end of the shaft 15 is formed with an enlarged diameter bearing portion 71 which is journaled at 55*d* in the bearing support 55 as best shown in FIG. 3. The end of the shaft 15 adjacent the bearing portion 71 extends through an opening in the gear 49 with the end of the shaft being staked into retaining engagement with the rear face of the gear 49. The opening in the gear 49 and themating portion of the shaft 15 extending therethrough are circular with flatted edges to key the gear to the shaft and prevent relative rotation.

In order to insure the proper spacing between the stub shaft 48 and the feed wheel shaft 15 so that the pinion 47 and the gear 49 are in good driving engagement, a bracket 72 is provided, which bracket has flanged openings 72*a* and 72*b* which are received on supports concentric with the shafts 48 and 15 respectively. The shaft 48 is provided with a plastic bushing 73 which is press fitted on the shaft 48 and is received within the flanged opening 72*a* as shown in FIG. 4. The other end of the bracket 72 is received on the rearwardly directed end of the cylindrical portion 55*a* of the bearing support 55. The bracket 72 thus assures that the shafts 48 and 15 will remain properly spaced and parallel even though there might be some tendency otherwise for the front plate 23 to flex thereby changing the distance between the axis of the shafts 48 and 15. A helical spring 74 is positioned at the upper end of the bracket 72 as shown in FIG. 4. The spring 74 is compressed between the bracket 72 and the gear 49 whereby it exerts a force axially on the shaft 15 thereby taking up any play in the shaft 15 with respect to its mounting in the bearing support 55. The spring 74 is held co-axially with the shaft 15 by the integral flange forming the opening 72*b* on the bracket 72.

The cutting mechanism 18 with its associated lever 19 and cutter 20 is supported on the housing 12 by means of a horizontally projecting boss on stub shaft 75 which is secured to the upper end of the front plate 23 as best shown in FIG. 4. The stub shaft 75 has a reduced diameter mounting portion 75*a* which extends through opening 76 in the front plate 23. The mounting portion 75*a* also extends through a hardened steel washer 77 and is staked over to secure the mounting shaft 75 securely to the front plate 23. The washer 77 is necessary to distribute the load to the plate 23 so that the shaft 75 would not be torn loose by the force acting on the cutter 20.

The cutting mechanism 18 is an extremely simple device including only the lever 19, the cutter 20 and a biasing spring 79 and release button 80. The few number of parts is possible because of the manner in which the parts are supported relative to the appliance 11 and the manner in which the cutter 20 serves a dual function as cutter and latch to releasably retain the cutting mechanism 18 with respect to the housing 12.

The lever 19 consists of a handle portion 81 and a cover portion 82. The cover portion is shown separately in FIG. 10 and consists basically of a plastic plate which over overlies the handle portion 81 and retains the cutter 20 and the biasing spring 79 trapped within the pockets formed in the handle portion 81.

As shown in FIG. 10 the cover portion 82 is formed with an opening 83 through which the mounting shaft 75 extends. In addition, there are a pair of hook shaped assembly lugs 84 in upper corners as shown in FIG. 10. The hook shaped lugs 84 extend through corresponding slots 85 in the handle portion 81 as is shown in the sectional view of FIG. 7. In order to assemble the cover portion to the handle portion 81 the lugs 84 are engaged as shown in FIG. 7 and the bottom of the cover portion 82 is swung into engagement with the handle portion 81 at which time a locating and assembly boss 86 on the cover portion 82 extends into an opening 87 in the handle portion 81 and a screw 88 secures the portions 81 and 82 in assembled relation.

As is best shown in FIG. 11 the handle portion 81 is formed with a series of shaped recesses or pockets which receive and support the biasing spring 79, the release button 80 and the cutter 20. To simplify the showing of FIG. 11 the cutter 20 which is shown in FIG. 6 has been eliminated therefrom. The spring 79 is formed at one end with a coil 79*a* which surrounds a post 89 formed in a transversely extending slot 90 in which the spring 79 is free to flex. It should be understood that the slot 90 extends generally transversely parallel to the length of the handle portion 81 but is interrupted at its center by a shallow depression 91 within which the cutter 20 is received and also a deeper recess 92 within which the release button 80 is received. With the cover portion 82 assembled to the handle portion 81, the release button 80 is received in the slot 92 wherein it is permitted limited vertical sliding movement with its bottom end in engagement with the cutter 20. The cutter 20 in turn is received within the shallow pocket 91 wherein it may rotate approximately 25° and in addition may slide vertically under the influence of the release button 80. The spring 79 on the other hand is mounted so that it is engaged under a forwardly projecting lug 93 formed integrally with the cutter 20. The spring 79 thus urges the cutter 20 to its uppermost position and in addition tends to deflect the cutter 20 clockwise about the mounting shaft 75 as shown in FIG. 6 wherein it assumes the vertical position shown therein.

Considering now the cutter 20 as shown in FIG. 8, it includes a central keyhole shaped opening 94 which has an upper portion 94*a* and a narrow lower portion 94*b*. The oval portion 94*a* is of such a dimension that the mounting shaft 75 may easily extend therethrough. The shaft 75, however, has a front beveled portion 75*b* and an annular groove 75*c* which is adapted to receive the latching means which retains the cutting mechanism 18 assembled to the housing 12. This latching means comprises the cutter 20. When the cutting mechanism is applied to the mounting shaft 75, the end of the shaft 75 is first inserted into an opening 95 on the handle portion 81 of the lever 19. Further insertion of the shaft 75 causes the bevel 75*b* to engage in the open-

ing 94 thus deflecting the cutter 20 downwardly until the oval portion 94*a* is sufficiently in registery with the shaft 75 so that it may progress through the cutter 20 and through the opening 83 in the cover portion 82. As the cutter assembly moves against the housing 12, the cutter 20 under the influence of spring 79 is biased upwardly into the slot 75*c* which is of suitable diameter to receive the portion 94*b* of the cutter 20. As so assembled to the mounting shaft 75, the cutting mechanism 18 is retained thereon against axial detachment by the cutter 20 which serves as a latch. Upon depressing the release button 80, the cutter 20 is deflected downwardly thereby permitting removal of the cutting mechanism 18 from the mounting shaft 75.

In order to prevent deformation of the spring 79 beyond its elastic limit, the cover portion 82 is formed with a ledge or abutment 98 as is best shown in FIG. 10. This ledge 98 prevents the middle of spring 79 from being deflected downwardly too far in instances when the lever 81 is raised at the same time when the cutter 20 is stuck in the top of a can.

When the cutting mechanism 18 is assembled to the mounting shaft 75, it is rotatable thereon through an angle of approximately 90°, i.e., from the can cutting position as shown in FIGS. 1, 4 and 6 to a loading position in which the lever 19 extends substantially vertical and the cutter 20 is well spaced from the feed wheel 16. Although the cutting mechanism 18 pivots as a unit on the shaft 75, the cutter 20 is also permitted limited rotational movement with respect to the lever 19. As indicated above, the shallow depression or recess 91 is of such an extent that the cutter 20 can rotate approximately 25° counterclockwise from the position shown in FIG. 6.

The cutter 20 has a cutting edge 100 which is beveled on its outer edge and terminates in a point 101 which is designed to pierce the cover of the can at the start of the can opening operation. Positioned adjacent to the cutting edge 100 is a guide 102 which rides along the upper edge of the can lip and controls the penetration of the cutter into the cover of the can. For the purpose of further stabilizing the can as it is rotated and opened the front plate 23 is provided with a forwardly projecting guide post 99 which is disposed slightly above and to the left of the feed wheel 16 as shown in FIG. 6. As is evident from FIG. 4 the post 99 extends outwardly sufficiently to overlie the top edge of the can. The post 99 and the guide 102 in the cutter 20 cooperate to hold the can in an upright position restrained from rocking about the feed wheel 16 as the can is opened. The cutter is also formed with stops 103 and 104 as best shown in FIG. 8 which engage the adjacent portions of the lip of the can being opened to limit the sliding and rotational movement of the cutter 20 with respect to the can. The stop 103 engages the top of the can lip and thus limits penetration of the cutter into the can cover. The stop 104 rides against the inside of the can lip to maintain the cutting edge 100 spaced from the lip to provide a continuous even cut of the cover with no slivers or jagged portions.

The lever 19 is formed with a handle 105 which provides a flat surface against which the operator of the appliance 11 may apply a downward force when rotating the lever 19 from the loading to the can cutting position. The handle 105 on its underside engages the button 66 which through switch 44 causes energization of the motor 13. In operating the appliance for opening cans, the lever 19 is rotated counterclockwise. As viewed in FIG. 1, a can is inserted in a vertical position with the upper lip of the can overhanging the feed wheel 16 and the lever 19 is then rotated clockwise causing the cutter 20 to be brought downwardly against the cover of the can. As is evident from FIG. 6 the point 101 of the cutter 20 would engage the cover of the can well before the lever 19 arrived at the position shown therein. In order to prevent operator from having to completely pierce the cover of the can with cutter 20 manually without the aid of the motor 13, the cutter 20 is mounted for about 25° of movement relative to the lever 19 as described above. Thus as the cutter engages the cover of the can, the cutter 20 remains restrained from rotating while the lever 19 rotates through the 25° angle at which time the handle 105 engages the button 66 and upon further actuation causes the switch 44 to close and the motor 13 to operate. As the motor rotates the feed wheel 16, a jamming action occurs between point 101 of the cutter 20 and the cover of the can. This jamming action results as the rotation of the can tends to force the cutting edge 100 through the cover and at the same time rotate the cutter to the position shown in FIG. 6. This action occurs since the upper edge of the feed wheel 16 is moving from right to left as shown in FIG. 6. At this point the rotation of the can with the cover driven into cutting engagement with cutter 20 produces a rotational force on the cutting mechanism 18 about the shaft 75 thus permitting the operator to release any manual force on the handle 105 while the reaction force on the cutter 20 maintains the switch 44 closed until the cutting of the cover has been completed. Although in some instances the dimensional variations in a can cover will result in the motor not being actuated until the cutter 20 has pierced the can, the completion of the piercing will be accomplished as the motor begins rotating the can.

One of the novel features of the present invention is the manner in which the feed wheel 16 and the cutter 20 are mounted in such a way as to accommodate the dimensional variations which are normally encountered in cans opened on domestic can openers. Although the mounting shaft 75 and the feed wheel shaft 15 are mounted relatively rigidly with respect to the front plate 23, the plate 23 itself is formed of a relatively flexible material which will deflect to accommodate the different can dimensions. In one constructed embodiment of the invention the plate 23 was fabricated of cold rolled steel of 0.050 inches thickness with a hardness of Rockwell B 65 which resulted in a deflection of 0.025 inches in the shaft 75 under normal can opening conditions. This flexure of the front plate 23 is designed to be within the elastic limit of the material and, therefore, provides a simple and effective means of permitting the spacing between the cutter 20 and the feed wheel 16 to vary to accommodate different can dimensions. At the same time the inherent flexibility of the front plate 23 necessitated the inclusion of the bracket 22 which assures proper axial spacing of the shafts 48 and 15. It should be appreciated that the front plate 23 could be constructed entirely of plastic if such plastic is flexible enough to produce controlled flexure to accommodate variations in can dimensions.

Also supported on the lever 19 and forming a part of the cutting mechanism 18 is the lid retainer 107. The lid retainer includes a somewhat channel shaped plate 108 which carries at its lower end a magnet assembly

109 which is adapted to engage and grip the cover of a can being opened. The upper end of the plate **108** is formed with two spaced somewhat S shaped projections **110** which extend through openings **111** in the cover portion **82** into pockets **112** formed in the handle portion **81** as is best shown in FIG. **6.** The lid retainer **107** may be readily removed from the lever by simply lifting the outer end and withdrawing the projections **110** from the openings **111.**

One of the more significant advantages flowing from the simple design of the cutting mechanism **18** is not readily obvious until one considers the forces operating on the cutter **20.** During the can opening operation a substantial amount of pressure must be exerted between the cutter **20** and the feed wheel **16** to retain the lip of a can of varying thickness therebetween. This force tends to push the bottom of the cutter **20** outwardly thus applying a moment to the stub shaft **75.** It is important, however, that this force transmitted by the cutter **20** to the stub shaft **75** is applied directly to the shaft **75** with no involvement of the lever **81.** The annular groove **75***c* which engages in the keyhole shaped slot **94** provides a rigid connection for transmitting this moment from the cutter **20** to the shaft **75.** As a consequence the lever **81** need only transmit a minimal force to the cutter **20** sufficient to at least initiate the piercing of the can by the point **101.** Because of this limited demand placed on the lever **82,** it is possible to further reduce the cost of the cutting mechanism **18** by making the lever **81** of an inexpensive plastic material.

While there has been shown and described a single embodiment of the present invention, it will be apparent to those skilled in the art that numerous changes and modifications may occur, and it is intended in the appended claims to cover all such changes and modifications which 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.** A motor driven can opener of the type having a housing enclosing an electric motor which is drivingly connected to a can rotating means and cutting means movably mounted on said housing for engagement with the top of a can being opened, the improvement comprising pivot means projecting from said housing, a manually operable lever mounted on said pivot means for rotation thereon, a cutter supported on said lever and rotatable therewith into and out of engagement with the cover of a can, said cutter being mounted for slidable and rotatable movement with respect to said lever, said cutter engaging said pivot means to retain said lever against axial movement with respect to said pivot means and being slidable to disengage said cutter from said pivot means and release said lever for axial movement with respect to and for disengagement from said pivot means to removably support said lever and cutter with respect to said housing.

**2.** The can opener of claim **1** wherein said lever comprises a pair of spaced plates with said cutter being received in a recess therebetween, manually operable release means supported for slidable movement between said plates in engagement with said cutter, spring means biasing said cutter and said release into latching engagement with said pivot means.

**3.** The can opener of claim **1** wherein said cutter is formed with a keyhole-shaped slot, the width of the wide portion of said slot being larger than the diameter of said pivot means, a peripheral groove formed in said pivot means, the diameter of said pivot means at said groove being less than the width of the narrow portion of said slot, said cutter being movable between a latching position in retaining engagement with said pivot means and a release position in which said lever and said cutter may be removed from said pivot means, said cutter in said latching position being received in said groove with said pivot means at the narrow portion of said keyhole-shaped slot.

**4.** The can opener of claim **2** wherein said spring means comprises an elongated spring restrained at its opposite ends between said plates, means on said cutter engaging the midpoint of said spring, said spring urging said cutter into latching engagement with said pivot means.

**5.** The can opener of claim **4** wherein said lever is formed with spaced abutments which permit limited pivotal movement of said cutter with respect to said lever about said pivot means, said spring being deflected by said means on said cutter as said cutter is rotated in a direction opposite to the direction in which it is rotated by the cutting action on the cover of a can.

**6.** A can opener comprising support means mounting a motor operated can rotating wheel and a movable cutting mechanism in juxtaposition to grip a can and to sever the cover as it is rotated, said cutting mechanism including a lever mounted for pivotal movement about a fixed axis on said support means, a cutter carried by said lever and movable by said lever between a retracted position in which it is radially spaced from said wheel to a cutting position in which it overlaps said wheel, said cutter being supported for limited pivotal movement with respect to said lever about said fixed axis, motor actuating means to drive said wheel when said lever is rotated to the cutting position for said cutter, during the opening of a can said can engages said cutter to rotate said lever to continuously operate said motor actuating means until said cover is severed from said can, spring means biasing said cutter to said overlapping position with respect to said wheel when said lever is in engagement with said motor actuating means, said cutter being rotatable in opposition to said spring means by the engagement with said can cover so that said lever may operate said actuating means prior to said cutter piercing said cover or moving to said overlapping position.

**7.** The can opener of claim **6** wherein said cutting mechanism is readily detachable from said support means, said cutter being mounted on said lever for movement radially of said fixed axis to releasably latch said mechanism with respect to said support means.

**8.** The can opener of claim **7** wherein said spring means biases said cutter into latching engagement with bearing means extending from said support means, manually operable means on said lever for displacing said cutter radially of said fixed axis against the biasing force of said spring means to unlatch said cutter from said bearing means permitting said mechanism to be detached from said support means by moving it axially with respect to said bearing means.

**9.** The can opener of claim **7** wherein said cutter comprises a plate supported on said lever for rotatable and slidable movement in a plane perpendicular to said fixed axis, said bearing means being a boss projecting from said support means through an opening in said cutter, said boss having an annular groove within which

said cutter is received to latch said mechanism against detachment from said support means.

10. The can opener of claim 6 wherein said cutting mechanism comprises a pair of spaced plate members clamped together in abutting relation with a space formed therebetween to support said cutter for slidable movement, said bearing means comprising a boss extending through said lever and said cutter, said lever and cutter pivoting on said boss and said cutter being movable radially of said boss to detachably retain said mechanism with respect to said support means.

11. A motor operated can opener of the type having a power operated can rotating wheel for turning a can the top of which is engaged by a fixed cutter to sever the top from the can, the improvement comprising a vertical frame plate supporting a can cutting mechanism and a can rotating wheel in vertically spaced relation, said wheel being mounted on the end of a first shaft journaled on said frame plate, a second shaft positioned above said first shaft and secured rigidly to said plate, said second shaft supporting said cutting mechanism including a cutter which overlaps with said wheel to grip the side wall of a can therebetween, said first and second shafts being parallel and on a fixed axial spacing, said frame plate being flexible between said first and second shafts to vary the spacing of said cutter and said wheel only through the flexure of said plate between said first and second shafts to accommodate cans of various dimensions therebetween.

12. The can opener of claim 11 wherein said frame plate is formed of a flexible metallic sheet, plastic portions molded integrally to said metallic sheet to form can guides and supports for said first shaft and for a motor mounted to said plate in driving connection with said first shaft.

13. The can opener of claim 11 including a motor supported on said frame plate, reduction gearing drivingly interconnecting said motor and said first shaft, a rigid bracket extending between said motor and said first shaft to prevent variation in the spacing between said first shaft and said motor.

14. The can opener of claim 11 wherein said reduction gearing includes a double reduction having an intermediate shaft between said first shaft and the output shaft of said motor, said intermediate shaft being supported on said motor field and journaling a gear and pinion which drivingly interconnect said output shaft and said first shaft, said bracket extending between said intermediate shaft and said first shaft.

15. The can opener of claim 11 wherein said can cutting mechanism includes a lever journaled on said second shaft separately from said cutter whereby the force exerted outwardly on said cutter by said can is transmitted directly from said cutter to said second shaft and not transmitted through said lever.

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