United States Patent [19]

Yamamoto

[11] **3,805,380**

[45] **Apr. 23, 1974**

[54] **ELECTRICALLY POWERED CAN OPENER**

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[73] Assignee: **Kabushiki Kaisha Aichidenkikosakusho,** Aichi-ken, Japan

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Feb. 22, 1972 Japan 47-18743

[52] **U.S. Cl.** ..... **30/4 R,** 30/9
[51] **Int. Cl.** **B67b 7/38**
[58] **Field of Search** ..... 30/4 R, 8.5, 9, 15, 15.5

[56] **References Cited**

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Primary Examiner—Othell M. Simpson
Assistant Examiner—Gary L. Smith

[57] **ABSTRACT**

An electrically powered can opener is provided with a holding roller mounted rotatably on a hand lever. This holding roller is adapted to be brought inside and depress an end seam of a can lid by operating the hand lever. Only the outer layer of the end seam held by the holding roller is severed by a circular cutter either actuated positively or rotatable freely.

5 Claims, 11 Drawing Figures

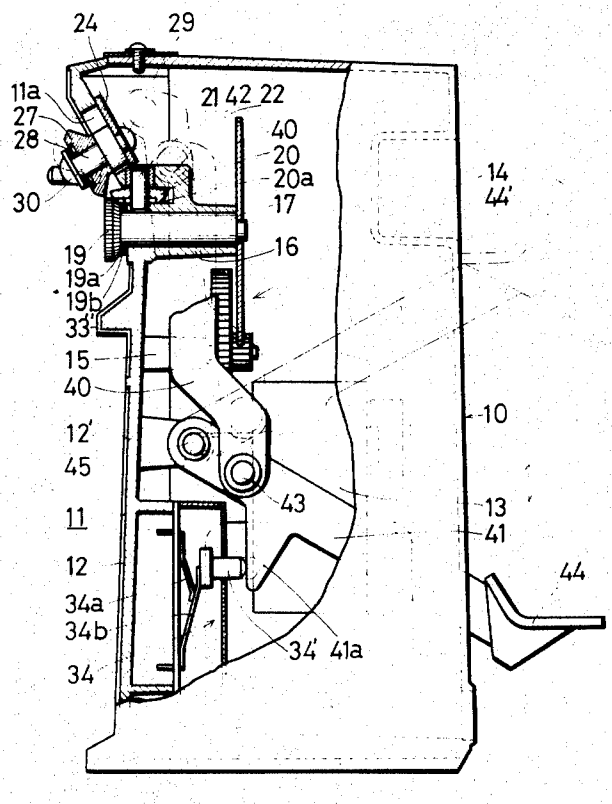
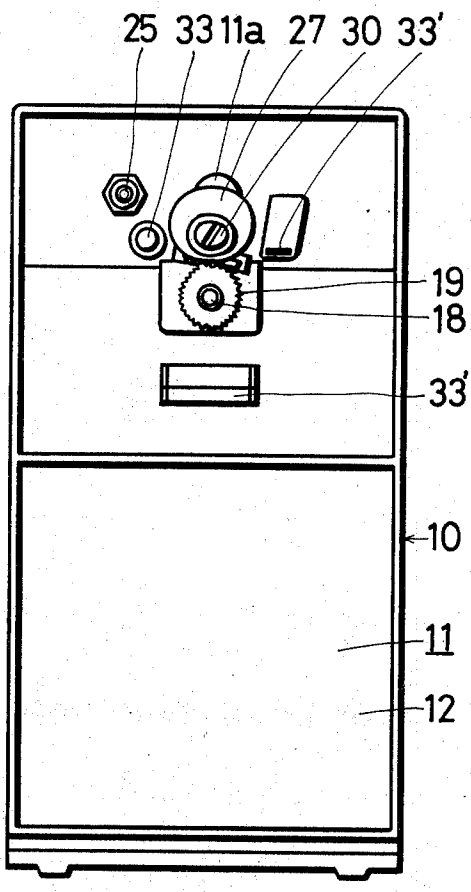


FIG. 1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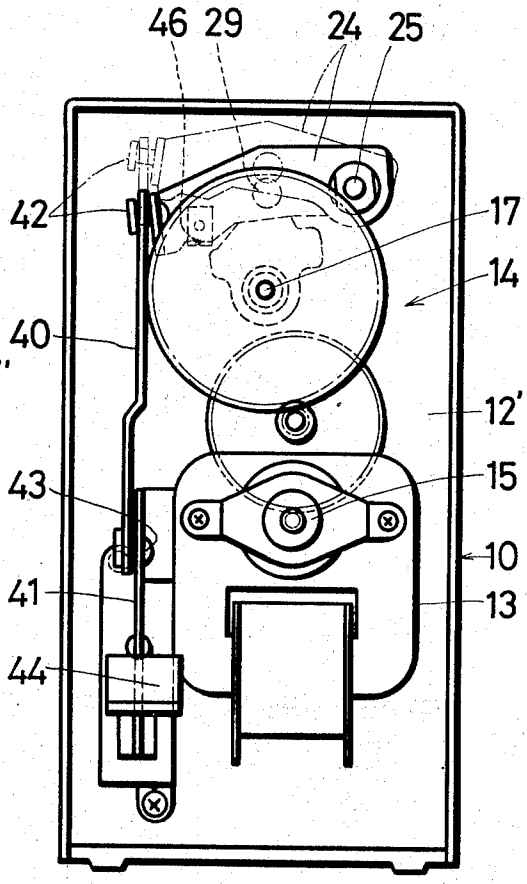
33
11a
27
30
33'
19
18
33''
10
11
12

FIG. 2


46
29
24
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42
17
14
40
12'
43
15
10
41
13
44

FIG. 3

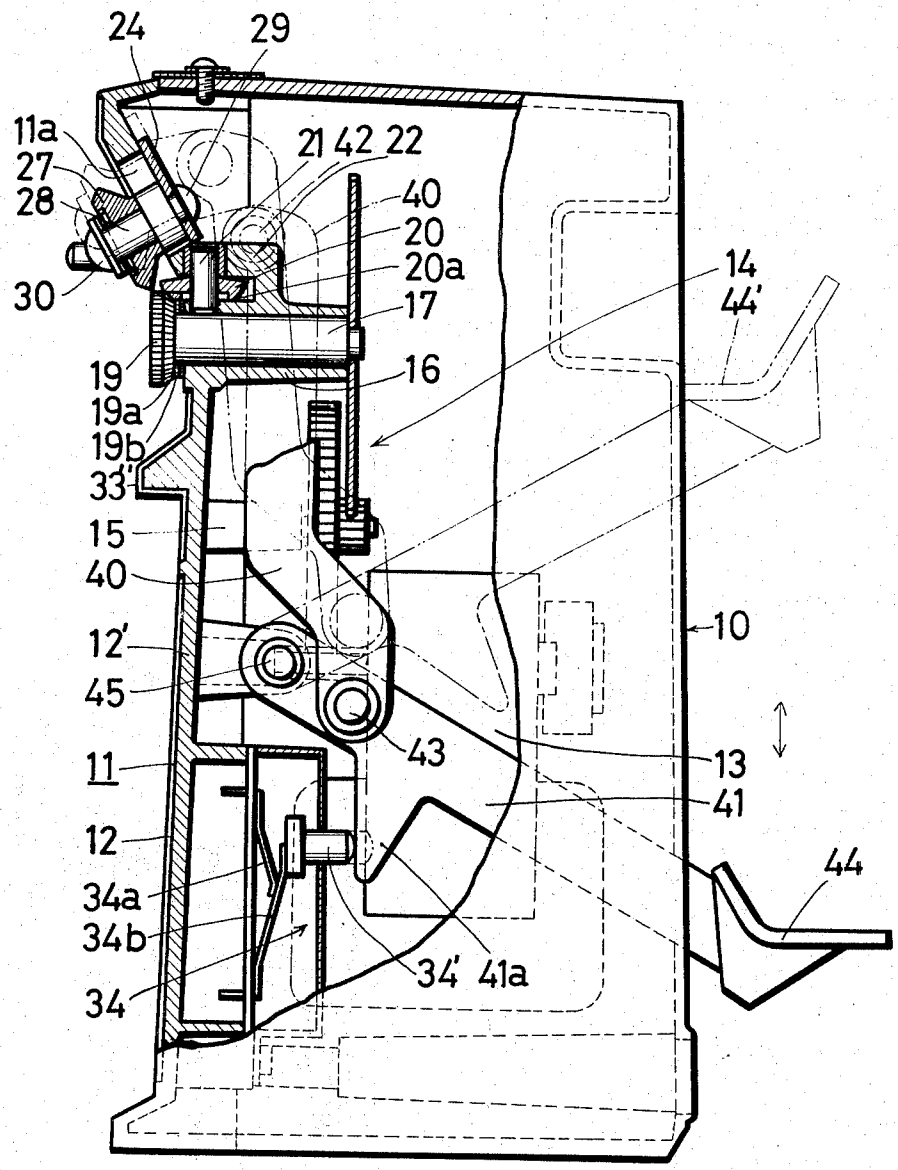

24
29
11a
27
28
30
21 42 22
40
20
20a
17
16
19
19a
19b
33'
15
40
12'
45
11
12
34a
34b
34
43
34' 41a
14
44'
10
13
41
44

FIG. 4

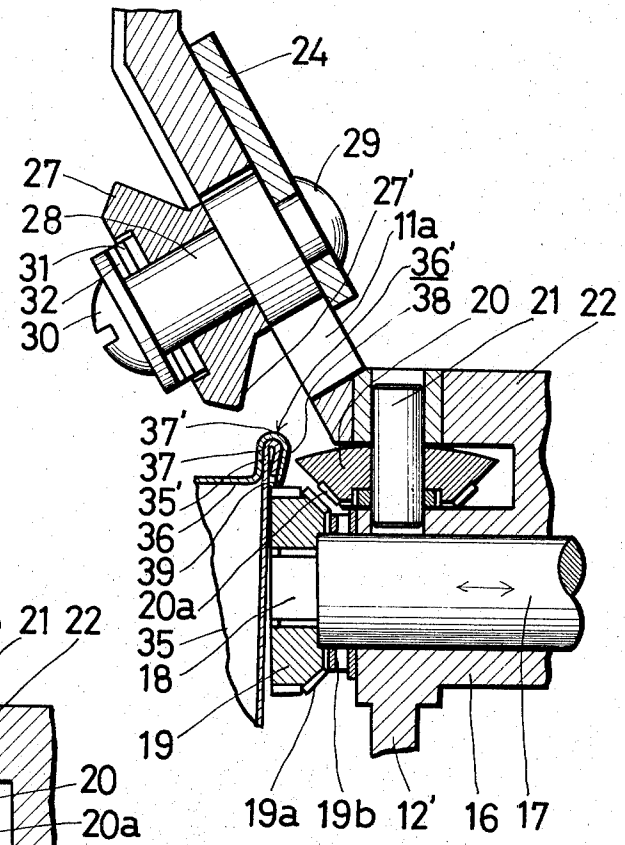

24
29
27
27'
28
11a
31
36'
32
38 20 21 22
30
37'
37
35'
36
39
20a
35
18
19
19a 19b 12' 16 17

FIG. 5

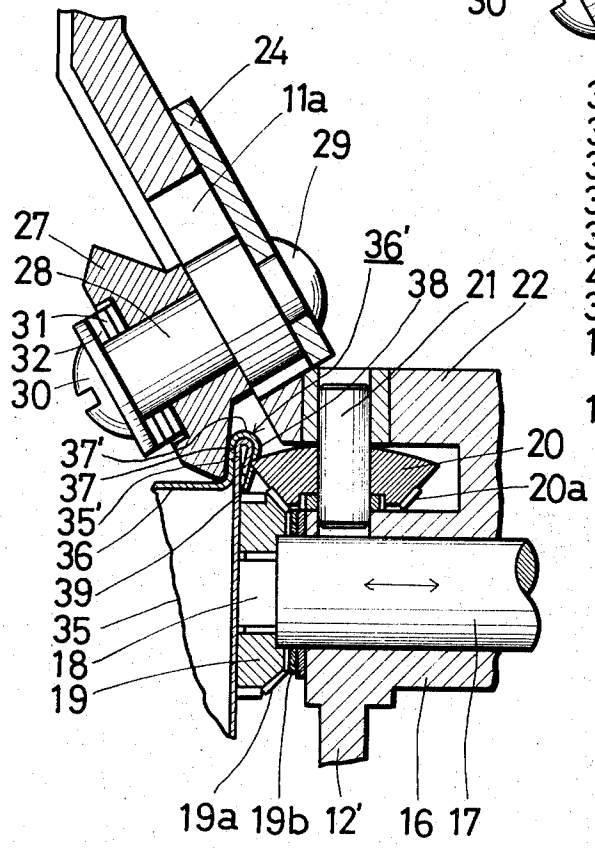

24
11a
29
27
36'
28
38 21 22
31
32
30
37'
20
37
20a
35'
36
39
35
18
19
19a 19b 12' 16 17

FIG. 6

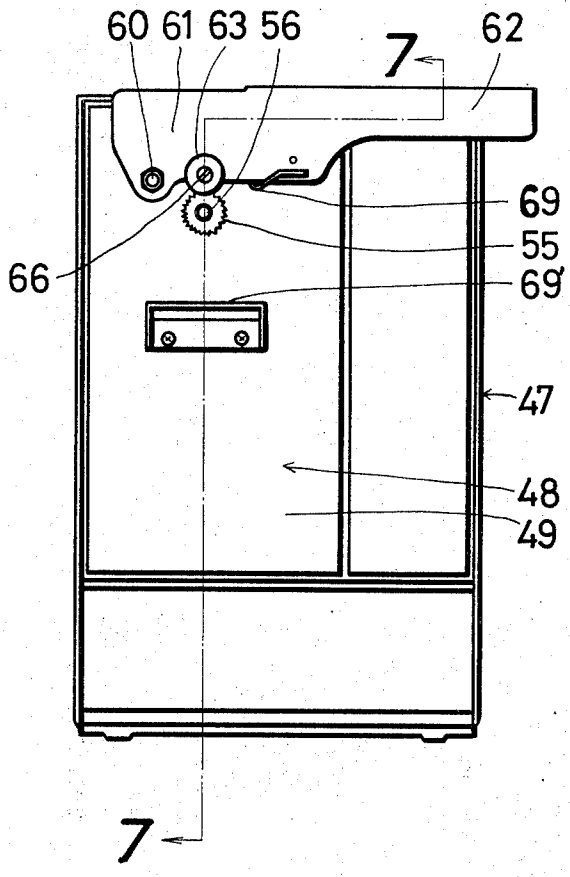

60
61
63
56
7
62
69
55
69'
66
47
48
49
7

FIG. 7

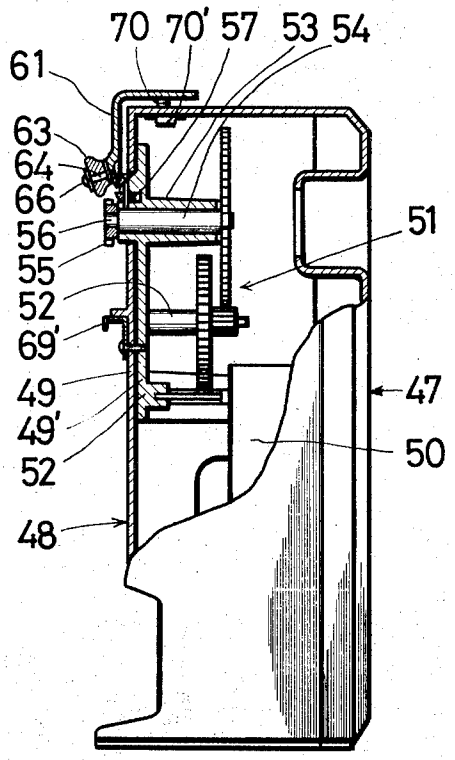

70
70'
57
53
54
61
63
64
66
56
55
52
69'
49
49'
52
48
51
47
50

FIG. 8

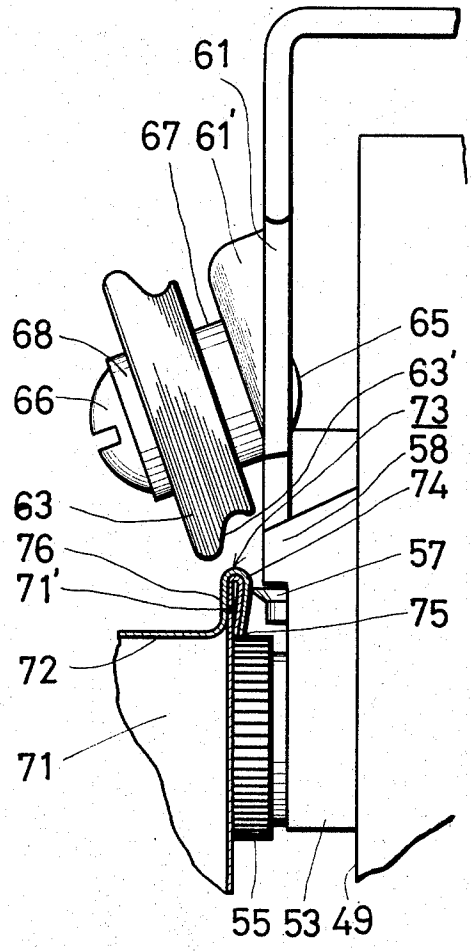


FIG. 9

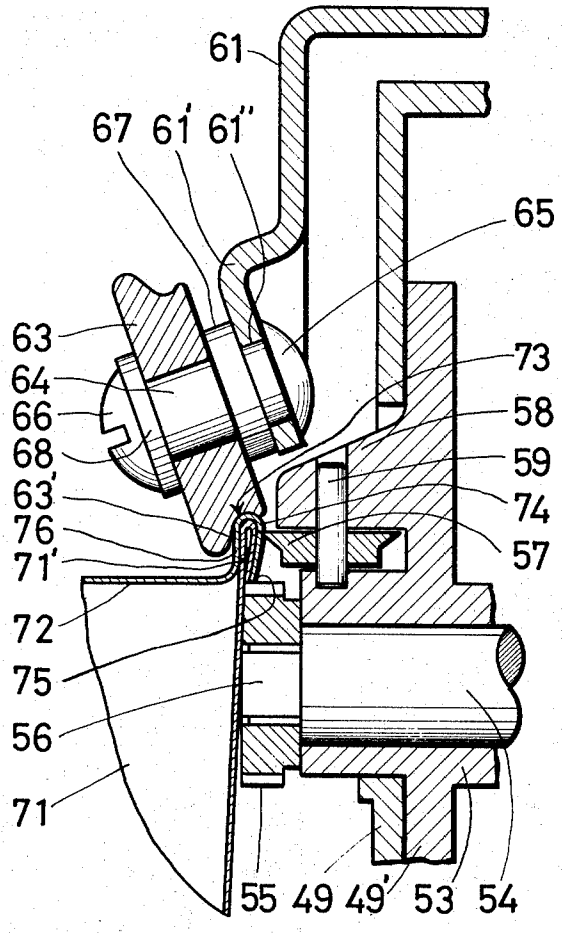


FIG. 10

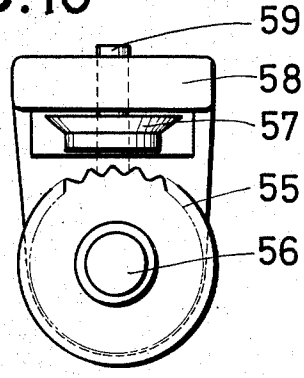
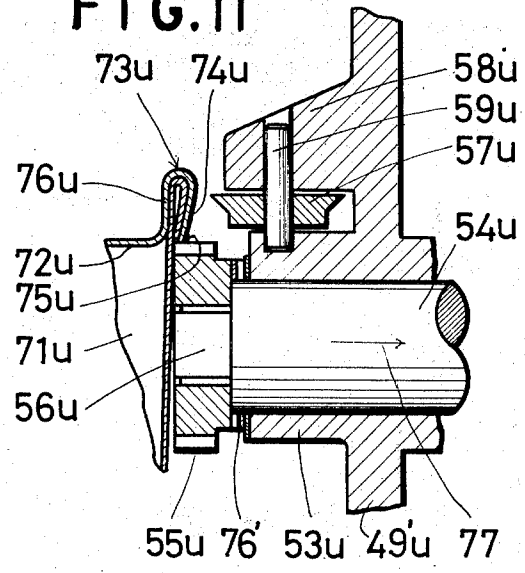


FIG. 11



ELECTRICALLY POWERED CAN OPENER

BACKGROUND OF THE INVENTION

This invention relates to an electrically powered can opener. A conventional can opener of this type has a can feed wheel extending rotatably through a frame and a lever carring a cutter and pivoted on the frame. As a can lid of a can, being driven by the feed wheel, is severed by the cutter closely inside of the end seam of the can lid, such a sanitarily undesirable situation is brought about that metal waste produced in a can opening operation drops into the can. Further, the conventional can opener has a fault in that the can lid drops into the can after being cut off. In order to eliminate this fault, an arm provided with a magnet at its free end is extended from the frame to attract the can lid cut off. The provision of such accessory means, however, not only increases the cost of a can opener but also causes a higher cost in packaging and transporting the can opener and a large space for storage as the result of the great bulk of the can opener due to the extending arm. As an alternative to eliminate this fault, a can opener is devised in which the positions of the feed wheel and the cutter are interchanged with the can feed wheel being in contact with the inner layer of the end seam to rotate the can and only the outer layer of the end seam is severed by the cutter. However, this kind of can opener has a fault in that the can lid cut off is distorted or injured at its periphery and is undesirable for reuse as a proper detachable lid.

SUMMARY OF THE INVENTION

The present invention eliminates the above mentioned faults of an electrically powered can opener. A can opener according to the present invention comprises a frame, a can feed wheel extending rotatably through the front member of the frame, a circular cutter mounted rotatably on the frame over the feed wheel and a lever having a holding roller and pivoted to the frame. An end seam of a can is put on the feed wheel and is depressed on its inner layer by the holding roller as the result of the operation of the lever. Thus the end seam is held by the feed wheel and the holding roller, while the outer layer of the end seam is pierced by the circular cutter on account of the depressing force of the roller. When the feed wheel is actuated, the can is rotated and only the outer layer is severed by the circular cutter. As the curved portion of the end seam still engages with the top of the side wall of the can even when the can is cut out, the can lid cut off does not fall into the can. The metal wastes then produced, of course, drop outside of the can. Because the end seam is supported fast at its inner layer by the holding roller, the end seam is not distorted during a can opening operation and it becomes possible to reuse the cut off can lid as a proper detachable can lid.

When the lever is operated, the holding roller can move either parallel with or obliquely to the vertical front member of the frame. In the latter case, the holding of the can lid by means of the holding roller is more secure.

Such a temporary retreat of the feed wheel in its axial direction as take place when a can is set to a can opener makes it easy to introduce the holding roller inside the end seam and suitable for holding of the can.

The cutter may be in mesh with the feed wheel to be driven positively but be rotated independently.

The salient relationships of the present invention have been described and it will be understood that an electrically powered can opener according to the present invention affords a proper and neat can opening operation and is desireable in the light of the possible reuse of the cut off can lid and for reasons of sanitation.

IN THE DRAWINGS

FIG. **1** is a front elevational view of a can opener;

FIG. **2** is a rear elevational view of the can opener of FIG. **1** with a rear member of a frame being taken away to show a mechanism therein contained;

FIG. **3** is an enlarged side elevational view in partial section of the can opener of FIG. **1**;

FIGS. **4** and **5** are further enlarged sectional views of can cutting main members for explaining the operation of the can opener of FIG. **1**;

FIG. **6** is a front elevational view of another can opener as another embodiment of the present invention;

FIG. **7** is a side elevational view in partial section of the can opener of FIG. **6**;

FIG. **8** is an enlarged side elevational view in partial section of the cutting portion of the can opener of FIG. **6** when mounting a can thereon;

FIG. **9** is a cross-sectional view of the cutting portion of the can opener of FIG. **6** as in use;

FIG. **10** is a front elevational view showing a cutter and a feed wheel of the can opener of FIG. **6**; and

FIG. **11** is a sectional view showing a modification of the members shown in FIGS. **8** and **9**.

Referring to FIGS. **1-5**, a frame **10** has a front member **11** which comprises a layer **12** for artistic design and another layer **12'** for reinforcement. In general, the layer shown by numeral **12** is made of materials such as plastics, whereas the layer shown by numeral **12'** is made of materials of high strength such as metals. Next, a driving electric motor **13** and a transmitting mechanism **14** are provided in the frame **10**, the latter being composed of plural reduction gears. Numeral **15** represents a bearing member of the shaft of the reduction gears. A bearing member **16** supports a driving shaft **17** for rotation and axial movement and is made integrally with the layer **12'** as well as the bearing member **15**. A feed wheel **19** to rotate a can is connected to a joint portion **18** formed on the end portion of the driving shaft **17** so that the feed wheel **19** may rotate with the driving shaft **17**. A bevel gear **19*a*** is formed integrally with the feed wheel **19** and is positioned therebehind and is used as a means to transmit a torque to a cutter **20** described hereafter from the feed wheel **19**. A wavy spring washer **19*b*** interposed between the bevel gear **19*a*** and the bearing member **16** is usually biasing the feed wheel **19** to the lefthand side of FIG. **3** and is compressed in its axial direction to facilitate the retreat of the feed wheel **19** towards the right hand side of FIG. **3** and to establish the engagement between gears **19*a*** and **20*a*** usually in disengagement when a depressing force is exerted on the feed wheel **19** through a can in the righthand direction of FIG. **3**.A circular cutter **20** is mounted rotatably on a supporting shaft **21** held by a supporting arm **22** extending from the layer **12'**. A bevel gear **20*a*** is formed integrally with the cutter **20**

and is positioned thereunder and is adapted to be in mesh with the gear 19*a*.

Next, the mechanism to operate a holding roller is described. A lever 24 is pivoted at its one end on the inner wall of the frame 10 by means of a pin 25. The upper portion of the front member 11 is inclined forwardly and through this portion is bored an opening 11*a*. A shaft 28 is secured on the lever 24 through this opening and a holding roller 27 is mounted rotatably on the shaft 28. On the both ends of the shaft 28 are formed heads 29 and 30 and a spacing ring 31 and a washer 32 are inserted between the head 30 and the holding roller 27. The other end of the lever 24 is connected to a button 44 by a connecting rod 40, an operating lever 41, a pivot pin 42 and a pivot pin 43. By the arcuate movement of the button 44, the operating lever 41 is rotated around a pivot pin 45 and the free end of the lever 24 is driven on an arc thereby moving the holding roller 27 slidably along the inclining portion of the front member 11. Numeral 46 represents a stop to limit the lowest position of the lever 24. On the front member 11, a projecting pin 33 for preventing the swing of a can and a projecting resilient plate 33′ are provided. In the frame 10, a switch 34 for the power supply circuit of the driving electric motor 13 is provided and a following piece 34′ of the switch 34 is adapted to be actuated as the result of the displacement of an operating piece 41*a* of the operating lever 41 thereby establishing the contact or the break between electrical contacts 34*a* and 34*b*. A can receiver 33″ is provided on the front member 11. Numeral 35 represents a can and numeral 35′ represents the top of the side wall of the can. Numeral 36 represents a can lid.

Can opening operations with use of the above can opener are now described. First of all, the can opener is set to the situation where the free end of the lever 24 is raised that is to the situation where the holding roller 27 is disposed at the position 27a shown by dotted lines in FIG. 3 or the holding roller 27 is a little more away from the feed wheel 19. The side wall of the can 35 is brought to be in contact with the can receiver 33″ and the lower edge 39 of the outer layer 38 of an end seam 36′ is placed on the feed wheel 19 as shown in FIG. 4. Then the lever 24 is lowered and the lower portion of the holding roller 27 is forced in inside the inner layer 37 of the end seam 36′. See FIG. 5. The outer layer 38 of the end seam 36′ is pushed by the lower depressing surface 27′ of the holding roller 27 towards the cutter 20 and the edge of the cutter 20 pierces into the outer layer 38. In this situation, the operating lever 41 is lowered to the position shown by solid lines in FIG. 3 and the operating piece 41*a* of the lever 41 pushes in the following piece 34′. Thus the electric motor 13 starts to rotate and the feed wheel 19 is actuated through the transmitting mechanism 14 and the driving shaft 17. The cutter 20 is driven from the feed wheel 19 through the gears 19*a* and 20*a*. On rotating, the cutter 20 severs only the outer layer 38 of the end seam 36′ progressively. Thus the can lid 36 is cut at the outer layer of the end seam and becomes separable from the top 35′ of the can side wall. After the can is cut out, the operating piece 41*a* moves in the returning direction due to the pushing up force of the following piece 34′ or a force of any other spring and the electric motor 13 is deenergized thereby ceasing the rotation of the feed wheel 19. In this situation with the relevant members at rest, the lower depressing surface 27′ of the holding roller 27 is still disposed inside the top 35′ of the side wall and the can 35 is held by the feed wheel 19 and the holding roller 27 in the situation where the can is just cut out. Then, the can 35 becomes removable from the can opener by raising the button 44 to the position 44′ shown by dotted lines. The cut off can lid is not subject to the distortion in the can opening operation because of the support by the holding roller 27 inside the end seam 36′ and can be engageable with the top 35′ of the can 35 at the uncut curved portion 37′. Thus, the cut off lid can be utilized as a detachable can lid. The can lid 36 as well as the curved portion 37′ is not injured and very neat. Further, the actuation of the cutter 20 in mesh with the feed wheel 19 makes the cutting power of the cutter 20 very sharp and so the severed end surface is very smooth.

Referring to FIGS. 6–10, the second embodiment is described. A frame 47 has a front member 48 which comprises a layer 49 for artistic design and another layer 49′ for reinforcement. In general, the layer shown by numeral 49 is made of materials such as plastics, whereas the layer shown by numeral 49′ is made of materials of high strength such as metals. Next, a driving electric motor 50 and a transmitting mechanism 51 are provided in the frame 47, the latter being composed of plural reduction gears. Numeral 52 represents a supporting shaft of the reduction gears. A bearing member 53 supports a driving shaft 54 for rotation and axial movement and is made integral with the layer 49′. A feed wheel 55 is connected to a joint portion 56 formed on the end portion of the driving shaft 54 so that it may rotate with the driving shaft 54. A circular cutter 57 is mounted rotatably on a supporting shaft 59 secured in a supporting arm 58 extending from the layer 49′. A lever 61 is pivoted on the front member 48 by means of a detachable fulcrum pin 60 and numeral 62 represents its grip. A holding roller 63 is mounted on a shaft 64 fixed in an opening 61″ bored through a roller sustaining portion 61′ of the lever 61. On the both ends of the shaft 64 are formed heads 65 and 66. A spacing ring 67 and a washer 68 are disposed between the heads and the holding roller 63. Further, a can holding projection 69 is attached to the lever 61 to the righthand side of the holding roller 63 in FIG. 6 and is adapted to hold horizontally the lid of a can with the lower edge of its end seam placed on the feed wheel 55 in cooperation with the forwardly extending portion of the fulcrum pin 60. On the front member 48 is provided a can receiver 69′ to maintain the can upright. Numeral 70 represents a movable member for operating a switch 70′ for the driving electric motor 50 and is extending through the top of the frame 47. This movable member is usually biased upwards but is adapted to be depressed by lowering the grip 62 of the lever 61. Thereby closing the switch 70′ to energize the electric motor 50. Numeral 71 represents a can, 72 a can lid and 73 the end seam of the can lid 72 for sealing the can 71 hermetically.

The can opening operations of the above can opener are described. First of all, the can opener is set to the situation where the lever 61 is raised that is to the situation where the holding roller 63 is disposed at the position shown in FIG. 8 or the holding roller 63 is a little more away from the feed wheel 55. The side wall of the can is brought to be in contact with the can receiver 69′ and the lower edge 75 of the outer layer 74 of the end seam 73 is placed on the feed wheel 55 as shown. Then

the lever **61** is lowered and the lower portion of the holding roller **63** is forced in inside the inner layer **76** of the end seam **73**. See FIG. **9**. The outer layer **74** of the end seam **73** is pushed by the lower depressing surface **63'** of the holding roller **63** towards the cutter **57** and the edge of the cutter **57** pierces into the outer layer **74**. In this situation, the grip **62** of the lever **61** is depressing the movable member **70** of the switch **70'**. Thus, the electric motor **50** rotates and the feed wheel **55** is actuated through the transmitting mechanism **51** and the driving shaft **54**, rotating the can. As the result of this rotation, the cutter **57** severs the outer layer **74** of the end seam and the can lid becomes separable from the can. After the can is cut out, the switch **70'** is opened due to the pushing up force of the movable member **70** by releasing the grip **62** and the electric motor **50** is deenergized thereby stop the rotation of the feed wheel **55**. In this situation with the relevant members at rest, the lower depressing surface **63'** of the holding roller **63** is still disposed inside the top **71'** of the side wall and the can **71** is held by the feed wheel **55** and the holding roller **63** in the situation where the can is just cut out. Then the can **71** becomes removable from the can opener by raising the grip **62**.

Next, the third embodiment is described with respect to FIG. **11**. In description, those members which are functionally equivalent to the corresponding members shown in the foregoing figures are assigned the same numerals as in the foregoing figures and the description associated with such members is not repeated. The difference among members corresponding to different embodiments is effectuated by providing the numerals with suffix "*u*" if necessary. FIG. **11** shows an embodiment where a wavy washer **76'** is interposed between a feed wheel **55***u* and an end portion of a bearing member **53***u*. In this embodiment, the front end portion, that is the lefthand side portion in FIG. **11**, of the feed wheel **55***u* is adapted to extend sufficiently beyond the front portion of a cutter **57***u*. When the lower edge **75***u* of the end seam of the can lid is brought on the feed wheel **55***u*, the cutter **57***u* does not obstruct the same and the operation of mounting a can on the can opener is easy. In a can opening operation when a holding roller (not shown) depresses the inner layer **76***u* of the end seam **73***u*, the feed wheel **55***u* together with the driving shaft **54***u* retreats against the resilient force of the wavy washer **76'** in the direction shown by an arrow **77** under the depressing force of the holding roller and so the edge of the cutter **57***u* pierces into the outer layer **74***u* of the end seam to cut the can lid off.

What I claim is:

1. An electrically powered can opener comprising a frame, a driving electric motor mounted in said frame, a can feed wheel extending rotatably through the front member of said frame and actuated from said electric motor, said feed wheel being provided with a cutter driving gear, a circular cutter mounted rotatably in said frame, said cutter being provided with a gear in mesh with said cutter driving gear and being positioned where the edge of said cutter can be in contact with an outer layer of an end seam of a can lid when the lower edge of said end seam is placed on said feed wheel, a lever means mounted operably to said fame, a holding roller connected rotatably to said lever means in such a manner that the lower portion of said holding roller can be brought inside and depress the inner layer of said end seam with the lower edge thereof placed on said feed wheel by operating said lever, only said outer layer being severed by said cutter.

2. An electrically powered can opener comprising a frame, a driving electric motor mounted in said frame, a driving shaft extending rotatably through the front member of said frame and actuated from said electric motor, said driving shaft being adapted for axial movement, a can feed wheel secured on the end portion of said driving shaft extending through said front member, said feed wheel being provided with a cutter driving gear, a circular cutter mounted rotatably in said frame, said cutter being provided with a gear in mesh with said cutter driving gear and being positioned where the edge of said cutter can be in contact with an outer layer of an end seam of a can lid when the lower edge of said end seam is placed on said feed wheel, a spring means disposed between said feed wheel and said front member for biasing said feed wheel forwardly of said front member, a stopper means provided in said frame for limiting the axial movement of said driving shaft, a lever means mounted operably to said frame, a holding roller connected rotatably to said lever means in such a manner that the lower portion of said holding roller can be brought inside and depress the inner layer of the end seam with the lower edge thereof placed on said feed wheel by operating said lever, only said outer layer being severed by said cutter.

3. An electrically powered can opener as described in claim **1** wherein said front member is provided with a forwardly inclining upper portion and said holding roller is guided by said upper portion to move obliquely with respect to said front member.

4. An electrically can opener as described in claim **1**, including a switch for the power supply circuit of said driving electric motor, said switch being operated by a suitable portion of said lever.

5. An electrically powered can opener comprising a frame, a driving electric motor mounted in said frame, a can feed wheel extending rotatably through the front member of said frame and actuated from said electric motor, a circular cutter mounted rotatably in said frame with its axis normal to the axis of said feed wheel, said cutter being positioned where the edge of said cutter can be in contact with an layer of an end seam of a lid when the lower edge of said seam is placed on said feed wheel, a lever pivoted on said frame, a holding roller mounted rotatably on said lever in such a manner that the lower portion of said holding roller can be brought inside and depress the inner layer of said end seam with the lower edge thereof placed on said feed wheel by operating said lever, only said outer layer being severed by said cutter.

* * * * *