Jan. 29, 1957 H. O. MOORE 2,779,096

AUTOMATIC CAN OPENER

Filed Aug. 3, 1955 2 Sheets-Sheet 1

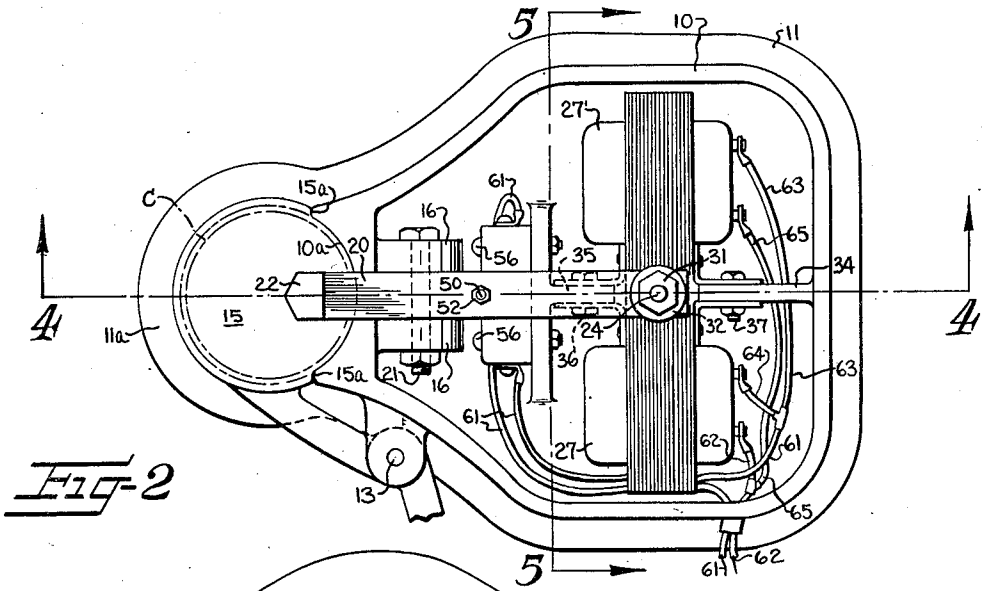


Fig-2

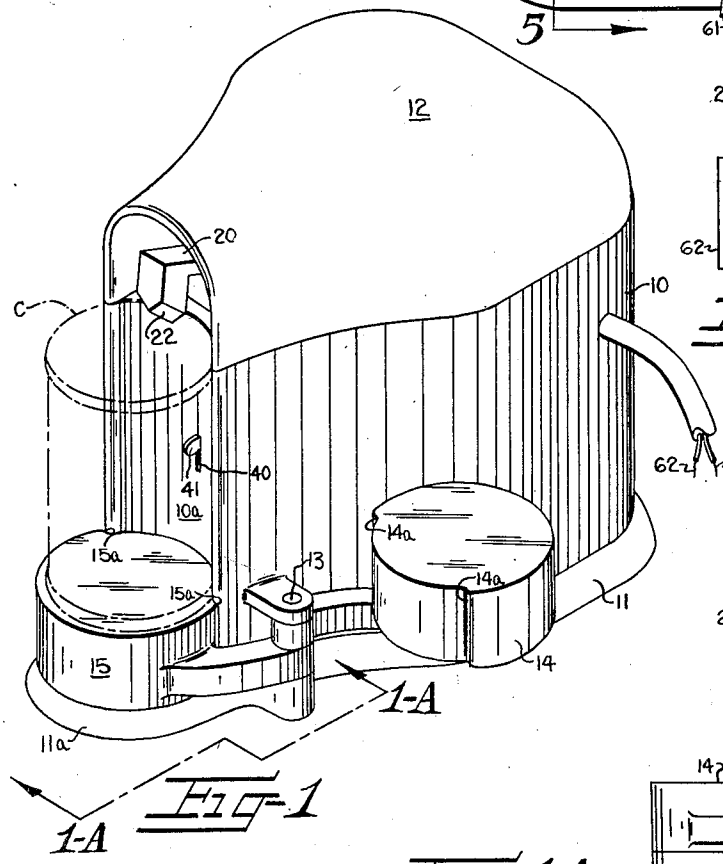


Fig-1

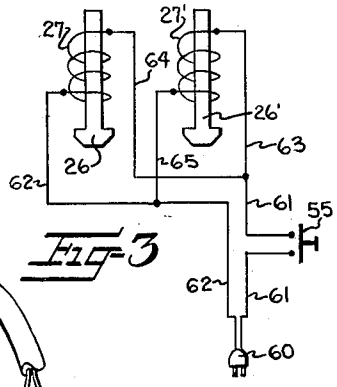


Fig-3

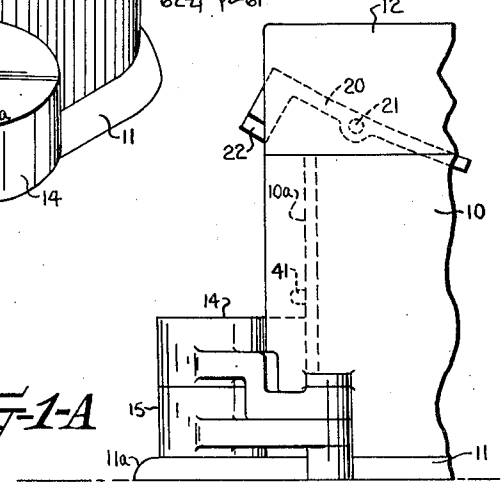


Fig-1-A

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AUTOMATIC CAN OPENER

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Fig-4

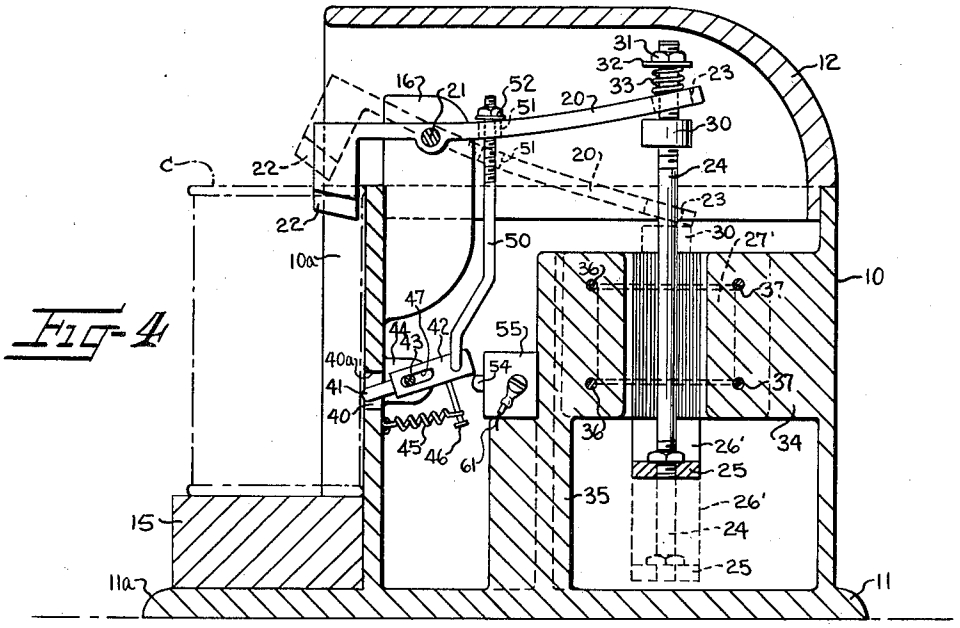


Fig-6

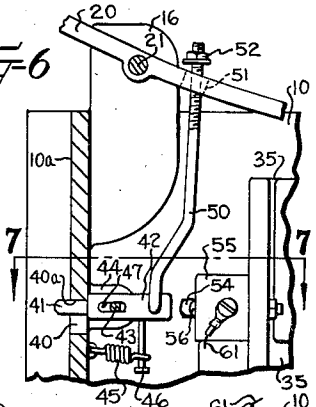


Fig-5

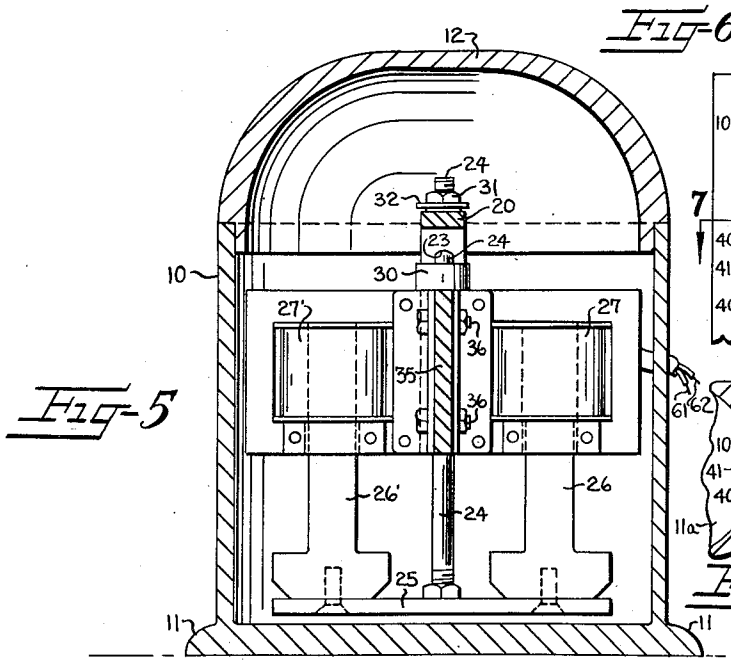
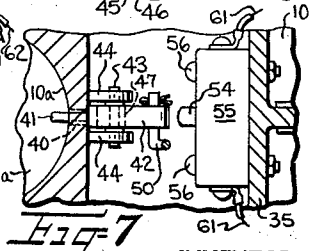


Fig-7



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AUTOMATIC CAN OPENER

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13 Claims. (Cl. 30—4)

This invention relates to sheet metal piercing devices and, more particularly, to an improved automatic can opener.

It is an object of this invention to provide an improved automatic can opener including an electrically operated cutting or punching means for cutting openings in sealed containers, which opener is compact and economically constructed and the operation of which requires a minimum of current.

Another object of my invention is to provide an opener device for puncturing the end of a can containing a liquid, such as a beverage or soup, and wherein the entire operation of puncturing the can is accomplished by the operator merely placing the can on a front base portion of the opener adapted to receive the same. The placing of the can on the front base portion of the opener device moves a switch plunger to close a switch to energize a pair of solenoids which, in turn, drive the can punch through an end wall of the can.

It is also an object of the invention to provide a plurality of auxiliary base plates for resting a can thereon, each of which base plates may be selectively moved into position to receive a can thereon dependent upon the height or length of the can so that the upper end wall of the can to be opened will be maintained a uniform distance from the end of the punch irrespective of the height of the can to be opened.

It is well known that a single solenoid must be wound with relatively large wire as compared to a pair of solenoids in order to produce a given amount of force and the initial in-rush of current in a single solenoid is excessive with a low power factor as compared to that of a pair of solenoids in producing a given "pull" or amount of force. Also, a solenoid of given size will produce a substantially greater force than an electomagnet of like size.

It is therefore another object of this invention to provide a can opener of the character described wherein the cutting or punching means thereof is actuated by a pair of solenoids which not only insure the compactness of the can opener, but which minimizes the current load initially placed on the electrical circuit each time the can opener is actuated.

It is a further object of the invention to provide novel means for closing the switch to energize the pair of solenoids to actuate the can punch and novel means for de-energizing the solenoids to disengage the can punch from the can.

Some of the objects of the invention having been stated, other objects will appear as the description proceeds when taken in connection with the accompanying drawings, in which—

Figure 1 is a perspective view of the opener device and showing, in phantom lines, an intermediate size can, such as the normal size can of beer, in position to be opened;

Figure 1-A is a fragmentary view similar to the left-hand portion of Figure 1 showing the upper auxiliary base plate in a different position, looking along line 1-A—1-A in Figure 1;

Figure 2 is a top plan view of Figure 1 with the housing cover removed;

Figure 3 is a schematic wiring diagram showing the circuit for operating the pair of solenoids which are shown connected in parallel;

Figure 4 is a longitudinal vertical sectional view taken substantially along line 4—4 of Figure 2 with the housing cover positioned on the housing;

Figure 5 is a transverse vertical section taken substantially along line 5—5 in Figure 2 showing the arrangement of the solenoids for operating the punch lever and also showing the cover on the housing;

Figure 6 is a fragmentary section looking in the same direction as Figure 4 and showing the switch actuating plunger in its normal non-operating position therein;

Figure 7 is a fragmentary sectional plan view taken along line 7—7 of Figure 6.

Referring more specifically to the drawings, the reference numeral **10** designates a housing for enclosing the operative parts of the opener device and being provided with a base portion **11** and a cover or top portion **12**. The base portion **11** is provided with a forwardly extending portion or can-supporting portion **11***a* which serves as a seat or rest for relatively tall cans to be opened by the device. The front wall portion of the housing **10** is concavely curved, as designated at **10***a*, to receive a can or container C therein and for positioning the same properly to be opened by the opener device.

Pivotally mounted at **13** to one side of the housing **10** adjacent the front thereof are upper and lower auxiliary can rests or auxiliary base plates **14** and **15**, respectively. As will be observed in Figure 1, the lower auxiliary base plate **15** is shown overlying the front base portion **11***a* for supporting an intermediate size can thereon in proper position to be opened by the opener device. When a shorter can than the one shown in Figure 1 is to be opened, the upper auxiliary base plate **14** will be pivoted from the position therein shown to overlie the base plate **11***a* in the same manner as the lower base plate **15**. It is apparent that both auxiliary base plates **14** and **15** may overlie the main base portion **11***a* simultaneously, if desired (Figure 1-A). A bifurcated flange or ear members **16** are secured to or formed integral with the inner surface of the front wall **10***a* of the housing **10** to support a plunger lever **20** which is pivotally mounted at **21** and carries a wedge-shaped punch or cutter **22** at the forward end thereof. An aperture **23** is provided in and adjacent the rear end of the plunger lever **20** for receiving an operating rod **24** therethrough. This rod is connected by a plate member or cross-bar **25** (Figure 5) to the lower ends of a pair of solenoid plungers **26**, **26'** which are moved upwardly upon energization of the coils of a pair of solenoids **27**, **27'**.

The operating rod **24** is provided with a lower adjustment nut **30** below the plunger lever **20** and an upper adjustment nut **31** provided with a washer **32** and a coil spring **33** for engaging the upper surface portion of the plunger lever **20**. The adjustment nuts **30** and **31** are provided for predetermining the lowermost position of the punch **22** when the same is opening or punching a hole in the can or container C. It is apparent that, when the operating lever **24** is moved upwardly by the solenoids **27**, **27'** the adjustment nut **30** engages the lower surface of the plunger lever **20** for pivoting the plunger lever **20**, at **21**, to lower the punch **22** to punch a hole in a can or container C.

As shown in Figures 2 and 4 a pair of vertically extending flanges **34** and **35** are provided for supporting

the pair of solenoids 27, 27' by any suitable means such as pairs of screws or bolts 36 and 37, respectively. The flange 35 is substantially T-shaped in plan, as will be observed in Figure 2. The flange 35 projects upwardly from the base 11 and flange 34 projects inwardly from the rear portion of the housing 10.

An aperture or opening 40 (Figures 4 and 6) is provided in a medial portion of the front housing wall 10*a*, through which extends the reduced end or nose 41 of a switch operating element or plunger 42 which is pivotally mounted on a pin 43 between a pair of spaced ears or abutments 44 projecting rearwardly from the front wall 10*a*. As will be observed upon a comparison of Figure 4 with Figure 6, the switch plunger 42 has a longitudinally extending slot or aperture 47 therein which is loosely penetrated by pin 43 and permits the switch plunger 42 to be moved horizontally upon the stationary pivot pin 43 and to also be pivoted on the same. A spring 45 has one end secured to the front housing wall 10*a* and the other end secured to a depending projection 46 which is secured to the switch plunger 42. This spring 45 serves to normally maintain the switch plunger 42 in the position shown in Figure 6 wherein the nose or reduced end portion 41 of the switch plunger 42 extends outwardly beyond the front housing wall 10*a* to be engaged by the can or container C when the same is placed in operating position to be opened.

The lower end of a switch plunger actuating link 50 is pivotally connected to the switch plunger 42 and its upper end loosely penetrates an aperture 51 in the plunger lever 20. The link 50 is provided for actuating or moving the switch plunger 42 to the position shown in Figure 4 upon the completion of a downward or active stroke of the punch 22 in punching a hole in the can. An upper adjustment nut 52 is provided on the switch plunger actuating lever 50 for engaging the upper surface of the plunger lever 20 for elevating or tilting the rear end of the switch plunger as shown in Figure 4 upon upward movement of the rear end of the plunger lever 20.

Such upward movement only occurs when the plunger 42 is moved inwardly as by a can C and when the plunger lever subsequently returns to lowered position and the can C is removed from against wall 10*a*, the spring 45 pulls the plunger 42 forwardly and swings its inner or rear end downwardly to the position shown in Figure 6. Downward movement of the rear end of plunger 42 is limited by engagement of the nose 41 with the upper wall 40*a* of slot 40.

A normally open switch 55, having a forwardly urged switch button 54, is provided adjacent the rear end of the switch plunger 42 and is suitably secured, as by bolts 56, to the T-shaped flange 35. The spring 45 and the switch button 54 will normally permit the switch plunger 42 to occupy its forward position as shown in Figure 6. However, when a can C is placed against the concave wall 10*a*, the can C will contact the nose 41 of the switch plunger 42 and move the same against the switch button 54 for closing the switch 55 to energize the coils of the solenoids 27, 27' and thereby actuate the plunger lever 20. This causes the adjustment nut 52 on the lever 50 to be contacted by the upper surface of the plunger lever 20 to tilt the rear end of the switch plunger 42 upwardly to permit the switch button 54 to move outwardly and open the switch 55 to de-energize the coils of the pair of solenoids 27, 27'. Upon de-energization of the solenoids 27, 27', the rear end of the plunger lever 20 will be carried downwardly by the downward fall of the plungers 26, 26' and operating rod 24. However, the link 50 may remain elevated until the can C is removed from adjacent the concave wall 10*a* of the housing 10. Of course, when the can C is removed, the switch plunger 42 is moved from the position shown in Figure 4 to the position shown in Figure 6, in the manner heretofore described, to complete an operation of the device and to reset the switch plunger 42 for the next can. It will be noted in Figures 4 and 6 that the shoulder formed by the reduced nose portion 41 on the body of the switch plunger 42 engages the inner surface of the front housing wall 10*a* to permit only the nose portion 41 to extend through the aperture 40 and to thus assist in maintaining the switch plunger 42 in its normal horizontal position as shown in Figure 6 to engage the switch button 54 upon being moved rearwardly by a can.

As shown in Figure 3, a conductor plug 60 is provided to be connected to an outside source of electrical energy, not shown, and has corresponding ends of main lead conductors 61, 62 connected thereto. The other end of the conductor 62 is connected to one end of the coil of solenoid 27' and the conductor 61 has its other end connected to one side of the normally open switch 55. The other side of switch 55 is connected, by a conductor 63, to one end of the coil of solenoid 27. Conductors 64 and 65 connect the other ends of the coils of the solenoids 27, 27' to the respective conductors 62, 63 for connecting the solenoids in parallel in the circuit. The solenoids 27, 27' may be connected in series, if desired.

In operating the device, the top wall or end of the can to be opened should be substantially in alinement with the top edge of the front housing wall 10*a* to permit the punch 22 to punch a hole in the end thereof. Therefore, if a can has a height of substantially the distance between the upper edge of the front wall 10*a* and the upper surface of the front base plate 11*a* none of the auxiliary base plates 14, 15 will be moved into operative position and the can will rest on plate 11*a*. If an intermediate size can is to be opened, the lower auxiliary base plate 15 will be pivoted to overlie the base plate 11*a* to provide a rest or support for the bottom wall or end of the can and, when a shorter can is to be opened, the upper auxiliary plate 14 will be moved into position to support the can.

It will be observed that, upon the positioning of the can or container C against the front wall 10*a*, the switch plunger 42 will be moved rearwardly by contact of the nose 41 with a side portion of the can to move the switch plunger 42 rearwardly in a horizontal path to close the switch 55 to energize the coils of the solenoids 27, 27' which will cause the operating rod 24 to be moved upwardly to pivot the plunger lever 20 and lower the punch 22 to punch a hole in the can. Upon the completion of the downward movement of the punch 22, the link 50 will be elevated by the adjustment nut 52 to such an extent that the switch plunger 42 will pivot at 43 to disengage the switch button 54 to open the circuit to de-energize the coils of the pair of solenoids 27, 27'. Upon de-energization of the solenoids, the solenoid plungers 26 fall, by gravity, to lower the rear end of the plunger lever 20 and lift the punch 22 free of the can. Upon removal of the can thus opened, the switch plunger 42 returns to the position shown in Figure 6 to complete one operation of the device. As previously stated, the stroke of the punch 22 and plunger lever 20 may be controlled by the adjustment nut 30 on the operating rod 24. Movement of the adjustment nut 30 to a lower position on the operating rod 24 reduces the stroke and movement to a higher position increases the stroke.

In the drawings and specification there has been set forth a preferred embodiment of the invention and, although specific terms are employed, they are used in a generic and descriptive sense only, and not for purposes of limitation, the scope of the invention being defined in the claims.

I claim:

1. An automatic can opener comprising a housing, a support for said housing, at least one solenoid positioned in said housing, can opening means pivotally mounted in said housing for punching a hole in a can, means operatively connecting said can opening means to said solenoid, a can operated switch for energizing said solenoid to actuate the can opening means, means for adjusting the

lowermost point of the stroke of the can opening means to vary the size of the hole punched in the can, and at least one auxiliary can support pivotally mounted on a vertical axis on one side of said housing for supporting the end wall of an intermediate size can thereon and for maintaining the top wall of the can in position to have a hole punched therein by said can opening means.

2. An automatic can opener comprising a housing, a support for said housing, at least one solenoid positioned in said housing, can opening means pivotally mounted in said housing for punching a hole in a can, means operatively connecting said can opening means to said solenoid, a can operated switch for energizing said solenoid to actuate the can opening means, means for adjusting the lowermost point of the stroke of the can opening means to vary the size of the hole punched in the can, and a plurality of auxiliary can supports pivotally mounted on a vertical axis on one side of said housing and each of which may be selectively pivoted to support intermediate size cans whereby the top wall of each can will be properly positioned below the can opening means to be engaged by the same in its path of travel.

3. An automatic can opener comprising a housing, a support for said housing, at least one solenoid positioned in said housing, can opening means pivotally mounted in said housing for punching a hole in a can, means operatively connecting said can opening means to said solenoid, a can operated switch for energizing said solenoid to actuate the can opening means, means for adjusting the lowermost point of the stroke of the can opening means to vary the size of the hole punched in the can, a switch plunger having a forwardly extending nose, said housing having an aperture positioned in the front wall thereof for receiving said nose portion of said switch plunger, means for pivotally and slidably mounting said switch plunger, resilient means for normally maintaining said switch plunger in a horizontal extended position wherein the nose portion extends through the aperture in the housing to be engaged by a can, said switch normally being open and interposed in an electrical circuit to said solenoid and positioned adjacent the rear end of said switch plunger to normally be engaged and closed upon rearward movement of the switch plunger by a can contacting the nose portion thereof, and means connecting said switch plunger to said pivotally mounted can opening means whereby upon completion of the punching operation, the switch plunger is pivoted out of engagement with said switch to de-energize said solenoid.

4. An automatic can opener comprising a housing, a base portion for said housing, at least one solenoid positioned in said housing, a normally inactive solenoid plunger depending from the solenoid, a switch for normally maintaining said solenoid de-energized, can operated switch actuating means for closing said switch to energize said solenoid, a pivotally mounted plunger lever having its rear portion positioned above said solenoid and operatively connected to said solenoid plunger, a punch provided on the forward end portion of said plunger lever on the opposite side of the pivot point thereof from said solenoid, whereby, upon a can imparting rearward movement to the switch actuating means to close the switch, said solenoid will elevate the rear portion of the plunger lever to lower the punch to cut a hole in the can, said can operated switch actuating means comprising a switch plunger having a reduced nose portion, said housing having an aperture in the front wall thereof for receiving the reduced nose portion of said switch plunger therethrough so the same may be contacted by a can placed in position to be opened, means pivotally and slidably mounting said switch plunger, resilient means for normally maintaining said switch plunger in a horizontal position in front of the switch, whereby upon rearward movement of the switch plunger, said switch will be moved to closed position, and means connecting said switch plunger to said plunger lever whereby upon completion of punching a hole in a can, said plunger lever will pivot said switch plunger out of engagement with said switch to open the circuit to de-energize the solenoid to thereby disengage the punch from the can.

5. A device according to claim 4, wherein means are provided for adjusting the distance that the plunger lever moves the switch plunger out of contact with the switch, and means are provided to reset the switch plunger upon movement of the punch away from the can.

6. A device according to claim 4, wherein the weight of the solenoid plunger insures the upward movement of the punch and the downward movement of the rear portion of the plunger lever upon de-energization of said solenoid, and means for automatically resetting the switch plunger in front of the switch.

7. An automatic can opener comprising a housing, a base portion for said housing, at least one solenoid positioned in said housing and having its plunger normally extending downwardly therefrom, a switch for normally maintaining said solenoid de-energized, can operated switch actuating means for closing said switch to energize said solenoid, a pivotally mounted plunger lever having its rear portion positioned above said solenoid and operatively connected to the plunger of the solenoid, a punch provided on the forward end portion of said plunger lever remote from said solenoid and on the opposite side of the pivot point of the lever from the solenoid, whereby, upon a can imparting rearward movement to the switch actuating means to close the switch, said solenoid will elevate the rear portion of the plunger lever to lower the punch to cut a hole in the can, said means for actuating said switch comprising a switch plunger having a reduced nose portion, said housing having an aperture in the front wall thereof for receiving the reduced nose portion of said switch plunger therethrough so the same may be contacted by a can placed in position to be opened, means pivotally and slidably mounting said switch plunger, resilient means for normally maintaining said switch plunger in a horizontal position in front of the switch whereby, upon rearward movement of the switch plunger, said switch will be moved to closed position, means pivotally connecting said switch plunger to said plunger lever whereby upon completion of punching a hole in a can, said plunger lever will pivot said switch plunger out of engagement with said switch to open the circuit to de-energize the solenoid to thereby disengage the punch from the can.

8. A device according to claim 7, comprising means for adjusting the distance that the plunger lever moves the switch plunger out of contact with the switch, and means for resetting the switch plunger when the can is moved out of engagement therewith.

9. An automatic can opener comprising a housing, a base portion for said housing, at least one solenoid positioned in said housing and having its plunger normally extending downwardly therefrom, switch means for normally maintaining said solenoid de-energized, can operated switch actuating means for closing said switch to energize said solenoid, a pivotally mounted plunger lever having its rear portion positioned above the solenoid and operatively connected to the plunger of the solenoid, a punch provided on the forward end portion of said plunger lever remote from said solenoid and on the opposite side of the pivot point of the lever from the solenoid, whereby, upon a can imparting rearward movement to the switch actuating means to close the switch, the solenoid will elevate the rear portion of the plunger lever to lower the punch to cut a hole in the can, and at least one auxiliary can support pivotally mounted on a vertical axis to the side of said housing for supporting the end wall of an intermediate size can thereon and for maintaining the top wall of the can in position to be engaged by the punch on said plunger lever.

10. An automatic can opener comprising a housing, a base portion for said housing, a pair of solenoids posi-

tioned in said housing, normally inactive solenoid plungers depending from said solenoids, switch means for normally maintaining said solenoids de-energized, a can operated switch plunger for closing said switch to energize said solenoids, a pivotally mounted plunger lever having its rear portion positioned above said solenoids and operatively connected to the lower ends of said solenoid plungers, a punch provided on the forward end portion of said plunger lever on the opposite side of the pivot point thereof from said solenoids, and means adjustably connecting said switch plunger to said plunger lever between its pivot point and rear end thereof, whereby, upon completion of punching a hole in a can, said plunger lever will pivot said switch plunger out of engagement with said switch to open the circuit to de-energize the solenoid to thereby disengage the punch from the can.

11. A can opening device comprising a housing, a support for said housing, a lever pivotally mounted in said housing, a punch provided on the front end of said lever for punching holes in cans, lever driving means positioned adjacent the rear end of the lever, means operatively connecting the lever driving means to the rear end of the lever on the opposite side of the pivot point of the lever from said punch for pivoting the same, switch means for energizing the lever driving means, and at least one can support pivotally mounted on a vertical axis on one side of said housing and adapted to be pivoted in position below said punch to support an intermediate size can whereby the top wall of the can will be positioned adjacent the punch to be engaged by

the same when the lever is pivoted to punch a hole in the can.

12. In an automatic can opener having a can-supporting surface, a normally inactive punch spaced above said surface and a pivoted lever carrying said punch adjacent one end of the lever, improved means to actuate said punch comprising a pair of closely spaced substantially parallel solenoids, means supporting the solenoids in fixed relation to said surface, plungers depending from the solenoids, a rod movably mounted between and in parallel relation to the solenoids, means mechanically connecting the lower end of the rod with the lower ends of the plungers, means connecting the upper end of the rod with said lever at a point spaced from the side of the pivot point of the lever opposite from the side of the pivot point adjacent the punch, and means engageable by a can placed on said surface for energizing said solenoids to actuate said punch.

13. A structure according to claim 12 having means operable automatically upon actuation of said punch for de-energizing said solenoids, and the weight of the plungers, the rod and the connecting means being such as to return said punch to its inactive position.

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