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(71) Applicant: **SENTECH ENTERPRISES LIMITED**
Room 606-616 World Shipping Centre,
Harbour City, 7 Canton Road
Tsimshatsui, Kowloon(HK)

(72) Inventor: **Koo, Hong-Wah Room 606-616 World**
Shipping Centre
Harbour City 7, Canton Road Tsimshatsui
Kowloon(HK)

(74) Representative: **Findlay, Alice Rosemary**
Lloyd Wise, Tregear & Co. Norman House
105-109 Strand
London WC2R 0AE(GB)

(54) **Improvement in can openers.**

(57) A can opener for opening a can has a lid joined to a main body by a rim, in which the can is opened by cutting through an outer part of the rim joining the lid with the main body of the can, the can opener comprising a rotatably supported cutter wheel for engaging and cutting the said outer part of the rim, a rotatable drive wheel for engaging the inner part of the rim, means for gripping the rim between the cutter wheel and drive wheel so that, upon rotation of the drive wheel, the can opener orbits around the rim of the can and the cutter wheel can complete a cut around the outer part of the rim, and lever means driving a one-way clutch mechanism for rotating the drive wheel to advance the can opener around the can.

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This invention relates to can openers. In particular the invention relates to a can opener of the type which will remove the lid of a can by making a cut through the outer part of the join between the lid and the wall of the can.

Examples of such can openers are shown in United States Patent No 4734986 and Specification No WO90/05108 to which reference is directed. The can openers shown make a thin cut around the rim through the material of the lid itself where it is folded over and around the top of the upright wall of the can. The lid is then removed from the rest of the can by means of a gripping mechanism which levers the lid from the remainder of the can.

Such can openers have a number of advantages over existing can openers in that the remaining top edge of the opened can is not sharp. Thus what is in fact exposed is the turned over top edge of the side wall of the can and that is smooth and so unlikely to cut a user who may hold it or touch it. Also the top edge is still well reinforced by the remaining folded-over material of the can and so, when the can is gripped, it still retains its shape. Further, since the cut takes place only on the outside of the can wall and there is no penetration through into the interior of the can, no metal filings or the like will contaminate the contents of the can and the possibly unhygienic cutting knife does not contact the contents of the can.

A problem we have found with such can openers is that the effort involved in driving the can opener around the rim is quite high. Generally the users of such can openers are housewives and often therefore they find the effort involved is hard and this can make the can openers unattractive from this point of view.

It is an object of the invention therefore to provide an improved can opener where the effort of driving the can opener around the rim can be kept within reasonable limits.

According to the invention there is provided a can opener for opening a can having a lid joined to a main body by a rim, in which the can is opened by cutting through an outer part of the rim joining the lid with the main body of the can, the can opener comprising a rotatably supported cutter wheel for engaging and cutting the said outer part of the rim, a rotatable drive wheel for engaging the inner part of the rim, means for gripping the rim between the cutter wheel and drive wheel so that, upon rotation of the drive wheel, the can opener orbits around the rim of the can and the cutter wheel can complete a cut around the outer part of the rim, and lever means driving a one-way clutch mechanism for rotating the drive wheel to advance the can opener around the can.

We have found that with such a can opener one can, by applying a relatively modest force to

the lever means, progressively advance the cutter wheel. The lever means will be reciprocated so that during each movement in a the forward direction the cutter wheel will be turned by a relatively small amount to advance the can opener and during each movement in a return direction the one-way clutch mechanism will allow the return of the lever means without at the same time driving the cutter wheel in the reverse direction.

Preferably the means for gripping the rim between the cutter wheel and drive wheel include a pair of pivoted body members which have arms extending away from the point of pivoting. Then as the arms are brought together this will move the cutter wheel and drive wheel towards one another so as to grip the rim. Equally when the arms are moved apart then the cutter wheel and drive wheel are themselves moved apart so as to release the grip.

In a preferred embodiment of the invention the lever means comprise a third arm or lever which is pivoted about the axis of rotation of the drive wheel and which can be moved between closed and open positions, with the one-way clutch mechanism free wheeling and so not rotating the drive wheel as it is moved towards its open position and the clutch mechanism rotating the drive wheel as it is moved towards its closed position adjacent one of the arms of the body members.

Preferably the lever arm is resiliently urged towards its open position by spring means so as to present itself in a position ready for rotating the drive wheel. Also it is in a preferred embodiment, locking means are provided to lock the lever arm in its closed position adjacent to one of the said arms of the body members. Thus when the arms of the body members are opened and closed to cause the gripping or release of the rim of a can, the lever arm lies flush with the said one arm and is moved with it. This ensures that the lever arm does not make the overall can opener cumbersome to handle and use.

A simple one-way clutch mechanism includes a resiliently mounted ratchet driven by the lever means which engages with teeth formed on or attached to a spindle for the drive wheel, the ratchet engaging and locking with the teeth in one direction of relative rotation and free wheeling and sliding over the teeth in the reverse direction.

To further reduce the effort of rotating the drive wheel, it is preferred that the drive wheel be supported by a metal shaft which is rotatably journaled within a metal sleeve supported by the body of the can opener, the outer surface of the shaft and the inner surface of the sleeve mating at positions adjacent the ends of the sleeve so as to provide rotational support for the shaft and intermediate those positions a gap being provided between the

outer surface of the shaft and the inner surface of the sleeve to avoid contact between the shaft and sleeve so as to reduce frictional forces upon rotation of the shaft relative the sleeve.

With such an arrangement the frictional forces between the two parts of the metal shaft which engage the sleeve and the sleeve itself are kept quite small and unnecessary frictional forces are avoided by providing the gap between the central portion of the shaft and the sleeve. Thus, it is not necessary for that central portion to contact the sleeve to provide good rotational support provided the ends of the sleeve mate with the shaft. In addition, the resulting recess can be filled with a lubricant such as a grease to reduce frictional contact in the mating regions.

The interior surface of the sleeve and external surface of the shaft are preferably of hardened steel so as to ensure that frictional forces are kept to a minimum. For example, they should both be hardened and tempered to a specification according to Rockwell Hardness C scale (HRC) within the range of 45 to 56.

According to one simple embodiment of this aspect of the invention, the sleeve is of constant internal cross-sectional diameter whilst the shaft has a region of reduced diameter between the areas of intended contact with the sleeve so as to provide the said gap.

As explained in Specification No WO90/05108 it is desirable that the cutter wheel makes its cut at a substantially constant predetermined distance up the rim from its lower end. As explained in that Specification this can be achieved by providing resilient means for allowing the cutter wheel to move resiliently in an axial direction along its axis of rotation, and cam means joined to the cutter wheel and axially spaced from the cutter wheel by a predetermined amount, the cam means being arranged to engage the underside of the rim, the engagement underneath the rim moving the cam means and the cutter wheel against the resilient means to a position such that the cutter wheel makes its cut at a substantially constant predetermined distance up the rim from its lower end.

In this way a consistent good result can be achieved since, irrespective of the shape and size of the can or of the size and depth of the rim, a cut can be achieved in the best position for lid removal since the cam means will engage under the rim and if necessary move the cutter wheel against the resilient means to a set position above the lower edge of the rim. Further, if there is any variation in the rim depth as the opener orbits around the can, this will also be accommodated.

In one preferred embodiment the cam means comprise a circular flange having an upper face which is slightly inclined relative a plane radial to

the axis of the flange and is arranged to engage under the rim, the inclined upper face moving the circular flange and the associated cutter wheel against the resilient means as the flange is forced in beneath the rim when the rim is gripped between the cutter wheel and drive wheel and the cutting edge of the cutter wheel is forced to penetrate through the outer part of the rim. The circular flange has a larger diameter than the cutter wheel since it engages the upright wall of the main body of the can which is of necessity of smaller diameter than the rim. The difference in diameters can, however, be chosen to ensure that the cutting edge of the cutter wheel does not penetrate significantly beyond the material of the outer part of the rim.

The circular flange and cutter wheel can be formed from a single piece of material or could be made separately and then joined so that they will rotate together and move together longitudinally of their rotational axis. Conveniently, they are jointly mounted about a common axle on which they rotate.

The resilient means can comprise a resilient rubber washer mounted between the cam means and a stationary support. Thus, as the cam means move the cutter wheel down to fit the cam means beneath a rim, that washer will be compressed, and when a cutting operation is over then the compressed washer will restore the cutter wheel to its rest position along its rotational axis.

As explained in the above noted United States Patent, there are problems in providing the necessary close tolerances in the support of the cutting knife of the can opener and the Patent aims to provide one way of achieving this. As described in the above noted Specification No WO90/05108, however, it is preferred that the cutter wheel be rotatably supported on a shaft upstanding from one of the body members, a circular flange of diameter greater than the cutter wheel being provided on the said shaft, and an arcuate support wall upstanding from one body member be provided centered on the axis of rotation of the cutter wheel, the circular flange being arranged to bear against the support wall to assist in supporting the shaft and cutter wheel during cutting of the rim of a can.

We have also found that with such an arrangement the rotational axis of the cutter wheel can be maintained accurately even under high cutting loads. Generally the body members will be made of synthetic plastics material and so the axis of the shaft, which may be integrally formed with the said one body member or may be a separately member, will be liable to distort under load because the plastics material of the said body member will be incapable of resisting this distortion. It is undesirable for this to occur since then the required close cutting tolerances will be lost, but this distortion is

kept to a minimal level by the support given to the shaft. Thus, the arcuate support wall buttresses the circular flange mounted on the shaft and so helps to prevent bending of the shaft under load, particularly if the circular flange is mounted outwardly of the cutting edge.

We have found that it is of importance that there be close tolerances in the positioning of the cutting knife on a can to be opened. Therefore, it is preferred that one of the pair of body members pivoted to one another and having integral handles extending generally in a direction away from the axis of pivoting, have a substantially flat surface in the region of the nip between the cutter wheel and the drive wheel, and that the integral handle of the other body member have an undersurface which is substantially flat and also substantially in the same plane as the substantially flat surface on the said one body member, whereby when the body members and their integral handles are pivoted to allow the can opener to be fitted over the rim of a can, those two surfaces will rest on the top of the rim of a can and will align the axis of the cutter wheel so that at least in the plane containing them it is parallel with the upright axis to the can.

This has the advantage that the circular cutting edge on the cutting wheel will be accurately aligned in the direction of the cut to be made and ensures that, as the body members and their handles are pivoted together to bring the drive wheel and cutter wheel close together to grip the rim, the initial penetration of the rim by the cutting edge will be accurately aligned in the desired direction of the cut to be made. As a result an improved consistency of cutting from one can to another can be achieved.

It is preferred that the said one body member which supports the cutter wheel also have a further contact surface on the opposite side of the drive wheel from the cutter wheel. This contact surface should be spaced downwardly from the said substantially flat surface on the said one body member by an amount substantially equal to the inner depth of the rim, that is to say the height of the rim above the central top region of the lid. Thus, this further contact surface will rest on the top of the lid and ensure that the axis to the cutter wheel is also aligned so as to be parallel with the upright axis of the can in a direction transverse to a plane containing them. In effect with this additional contact surface there is a three point contact with the can when the body members are pivoted to their open position and the can opener placed over the rim of a can to be opened which guides the user so that, as the handles are closed, the cutter wheel is kept in correct alignment to penetrate the rim.

As described in the above noted Specification No WO90/05108 it is preferred that the drive wheel

has an outer cylindrical surface which is serrated to allow it to grip into the material of the rim to assist in driving the can opener around the can, and the lower edge, that is to say the edge adjacent to the lid of the can when in use, of the outer cylindrical surface of the drive wheel is bevelled.

By providing this bevel we have surprisingly found that a more reliable drive action is achieved even through the effect of the bevel is actually to reduce the area of contact between the drive wheel and the rim of the can. In particular it seems that in tight corners of a can, the rim is often distorted and not upright so that with a drive wheel having a completely cylindrical outer face only a line contact is achieved anyhow whereas with a can opener according to this aspect of the invention a much larger area of contact can be achieved between the drive wheel and the rim of the can in tight radius corners.

Additionally we have found that it is desirable to keep the tolerances of the depth of the cut made very close to the desired amount so that the cutter wheel does not penetrate into the rim significantly further than the outer layer of material. Further the gripping force between the cutter wheel and drive wheel should desirably not distort the rim of the can. The bevel also has the advantage of ensuring that the outer peripheral surface of the drive wheel can fit closely to the inner face of the rim without significantly distorting the rim.

The angle of the bevel is preferably about 45° but could, for example, range from 30 to 60° to the axis of the drive wheel. Preferably also the bevel extends radially inwardly at the lower edge of the drive wheel by an amount at least equal to the depth of the serrations.

We have also found that it is desirable that the serrations in the drive wheel be relatively shallow since if the serrations are too large they are liable to bite into the rim of the can and damage it and lock the layers of the rim together, with the result that it may not be easy to lever off the severed lid. Preferably therefore the maximum radial depth of the teeth or serrations is no more than 1.5 mm and most preferably the radial depth is no more than 1 mm. Generally speaking therefore there will be a relatively large number of shallow, closely spaced serrations.

After the cut has been made, the severed lid has to be removed from the rest of the can. According to another aspect of the invention this can opener has on one side thereof a point resiliently urged towards a fixed abutment, the point being capable of entering the cut and so lifting one side of the lid from the can when the body of the can opener is used to lever off the lid. The point is provided on a pivotally mounted member which is resiliently mounted to urge the point towards the

abutment, and an arm is provided which can be manually moved against the resilient force, to open up a gap between the point and the abutment to allow them to be initially fitted over the rim of a can.

An example of a can opener according to the invention will now be illustrated, with reference to the accompanying drawings, in which:

Figure 1 is a side elevation of the can opener;

Figure 2 is an underneath view;

Figure 3 is a plan view;

Figure 4 is an elevation from the other side;

Figure 5 is an enlarged cross-sectional detail taken along the line 5-5 of Figure 2;

Figure 6 is a side view showing the can opener in use on the first step of opening a can;

Figure 7 is an enlarged detail of the area circled in

Figure 6 and marked 7 in the case of one can;

Figure 8 is an enlarged detail similar to Figure 7 but showing the case of a different can;

Figure 9 is an enlarged sectional detail taken along the line 9-9 of Figure 4;

Figure 10 is an underneath view showing the can opener in the opened position;

Figure 11 is a plan view of the can opener showing the lever arm in its opened position;

Figure 12 is an enlarged cross-sectional detail showing the second step in the removal of the can lid; and

Figure 13 is an enlarged sectional detail taken along the line 13-13 of Figure 1.

The can opener 10 shown in the drawings comprises a pair of handles 12 and 14 which are integrally formed with body portions 8 and 6, respectively. The latter are pivoted to one another about a spigot 20 (Figure 5) which is integral with the body portion 16 and which extends into a corresponding opening 22 in the body portion 18.

A spindle 24 passes through the spigot 20, the spindle being formed at one side with a drive wheel 26. This has on its outer face, serrations, or teeth 27 to allow it to grip the inside of a can rim 29 so that, when it is rotated, it will drive the can opener 10 around a can 30 to be opened. The lower edge, that is to say the edge which is adjacent to the lid of the can when in use, of the drive wheel 26 has a chamfer or bevel 26a. This chamfer or bevel 26a is at an angle of about 45° and extends to a depth slightly greater than the serrations or teeth 27.

At its other side, the spindle 24 is joined to a ratchet gear 31 which is driven by a ratchet 32 in turn operated by the movement of a lever arm 33 as will be described.

The drive spindle 24 is rotatably journaled in a steel sleeve 28 embedded within the material of the spigot 20. At spaced regions 28a and 28b

adjacent the ends of the sleeve 28, the spindle 24 has a diameter such that the spindle is a good mating fit within the sleeve. In this way good rotational support is provided for the spindle. In a central region 28c, however, the spindle is of reduced diameter so as to leave a gap 28d between the spindle 24 and sleeve 28. This gap could be of a radial distance of around 0.4mm. Because there is therefore no contact between the spindle and sleeve in this central region, there is therefore no friction created from the region during rotation of the shaft. Also a lubricating grease can be provided within the gap 28d for lubrication of the sliding surfaces in the regions 28a and 28b. In these latter regions, however, there is a good mating fit between the interior of the sleeve and the exterior of the shaft so that good rotational support is given. Desirably the interior surface of the sleeve and exterior surface of the shaft have been hardened and tempered to HRC of 56 to reduce frictional forces.

As best seen in Figure 5, the axis 34 of the spindle 24 is offset from the axis 36 of the spigot 20. In this way, when the handles 12 and 14 are opened up to the position shown in Figure 10 by pivoting the portions 16 and 18 about the spigot 20, the drive wheel 26 is moved away from a cutter wheel 40 and so can be placed over the rim 29 of a can to be opened, and conversely, when the handles are brought together as shown in Figure 2 and grasped in the hand of a user, the drive wheel 26 is moved in closer to the cutter wheel 40 so that the rim 29 of the can is gripped between the two.

Pivotaly mounted about the spindle 24 and held in place by a head 24a on the spindle 24 is the lever arm 33. In the position shown in Figure 3 this lies flush and is approximately aligned with the arm 14. In that connection the arm 14 has a longitudinally extending recess 14a (Figure 11) in which the arm 33 nestles and is a close fit.

The arm 33 is urged away from the arm 14 by means of a spring (not shown) whose ends act between the lever arm 33 and the body portion 16. The lever arm 33 can however be restrained in the position shown in Figure 3 by means of a locking loop 34 pivotally joined to the end of the arm 14. The loop 34 therefore holds the handle 14 and arms 33 together in this position so that they move as one. When the loop 34 is unhooked from the arm 14, however, the arm 33 can spring out to an open position shown more clearly in Figure 11.

As described above joined to the end of the spindle 24 by means of a key way 31a is a ratchet gear 31. This is engaged by means of a ratchet 32 resiliently mounted a recess 33a in the arm 33. The ratchet has an end 32a engaging with teeth 31b on the ratchet gear and a spring 35 urges the ratchet 32 so that its end 32a is normally in en-

gagement with the teeth 31b. Therefore when the arm 33 is released from the arm 14 by freeing the loop 34 and the arm is then oscillated between the open position shown in the Figure 11 and the closed position shown in Figure 3, the ratchet 32 will engage the teeth and so drive the spindle 24 and therefore the drive wheel 26 into rotation as the lever arm is moved from the open position whilst the ratchet will slide over the teeth on the ratchet gear and so not rotate the drive wheel 26 when the arm is moved to the open position.

The degree of opening of the arm to drive the wheel 26 can be selected to suit the user. The user may for example grip the can opener in one hand only and simply move the lever arm by a small amount as shown for example by the arrow 36 in Figure 11. Alternatively he may use two hands, with one hand holding the handles 14 and 16 and the other moving the lever arm 33 to the fullest extent possible such as for example the 180° movement as shown by means of the arrow 37 in Figure 11.

Integrally formed with the body portion 18 is an upstanding shaft 44 (Figure 8) on which the cutter wheel 40 is idly and rotatably mounted. The cutter wheel comprises a circular cutting edge 46 and an integral circular flange 48. The outer cylindrical face 49 of this is of slightly larger diameter than the cutting edge 46 so that the face 49 can bear against an upright side wall 50 of the can 30. The flange also has a slightly inclined cam edge 51 formed on its upper face which is designed to engage below the rim 29 of a can. This edge 51 is angled at about 80° to the axis of rotation of the cutter wheel. It could however be angled say from 75° to 85° to the axis of rotation. It is, however important that the edge 51 penetrate under the rim 29 which will normally be 1 to 1.5 mm larger in diameter than the side wall 50 and move the cutter wheel 40 if required as explained below.

The cutter wheel 40 is held in place on the shaft 44 by an end cap 52 riveted or screwed to the shaft 44. However, between the end cap 52 and the wheel 40 is a resilient washer 54 of elastomeric material, and in turn between the washer 54 and the wheel 40 is a thin metal washer 55.

Referring to Figures 7 and 8, these show in detail the construction of the rim 29 of a can 30. The top of the side wall 50 of a can is bent over in the shape of a "U" whilst the edge of a lid 62 is bent up around the inside of the side wall, over the top of the bent-over side wall, down around the outside of that bent-over portion in a region 63 and finally its end is bent up inside and so trapped by the bent-over top of the side wall. It is the bent-over portion of the lid 62 in the region 63 which is cut by the cutting edge 46.

The surface 64 of the body portion 18 between

the cutter wheel 40 and drive wheel 26 is flat and transverse to the axis of the rotation of the two wheels. In addition and as best seen in Figures 1 and 4 the undersurface 65 of the handle 14 is in the same plane as that surface 64. Therefore when the body portions and their respective handles are pivoted open to enable a can rim 29 to enter between the drive wheel 26 and cutter wheel 40, the top of the rim 29 can rest on the surface 64. Because this is flat right across the width of the body portion 16 the resting of the surface on the rim will align the axis 45 with the upright axis of the can. In addition with the handles 12 and 14 opened up as in Figure 10 or even further than that, the surface 65 can additionally rest on the rim 29 (shown diagrammatically by the broken line 29 in Figure 10) and assist in ensuring this alignment.

At the outer end of the body member as formed an integral downwardly extending lug 76 having a lower flat contact surface 78. This extends downwardly by an amount approximately equal to the height of the rim 28 above the top surface of the lid 62. In this way, by resting the contact surface 76 on the lid 62 when the can opener is placed over the rim 29 of a can to be opened, one can ensure that the axis 45 of rotation of the cutter wheel 40 is accurately parallel to the upright axis of the can.

In the removal of the lid 62, the handles 12 and 14 are first of all opened up by pivoting them apart in the direction of the arrows 70 (Figure 2) to the position shown in Figure 10. The arm 33 is restrained by the loop 34 and moves with the arm 14. This opens up a gap between the drive wheel 26 and the cutter wheel 40 as has been described. The can opener can then be placed over the top of a can 30 with the rim 29 between the wheels 26 and 40. The handles are then brought to their closed position as shown in Figure 2. This causes the rim 29 to be gripped between the wheels 26 and 40 and the teeth or serrations 27 of the drive wheel engage tightly with the inside of the rim 29. At the same time, the cutting edge 46 is forced through the material of the lid in the region 63.

As has been explained above the surface 64 and 65 ensure that the cutting edge 46 is accurately aligned in the direction around the rim 29 in which the circular cut is to be made. Also, the contact of the contact surface 78 with the top of the lid 62 ensures that the cutting edge 46 enters the material of the lid precisely in a direction at right angles to the upright side wall 60 of a can.

Next the drive wheel 26 is rotated to orbit the can opener around the can and make a complete circular cut through the material of the lid in the region 63. This is achieved by unhooking the loop 34 from the lever arm 33 and allowing the arm to open as shown in Figure 11. Then the arm is

repeatedly moved from its open position as shown in Figure 11 to the closed position shown in Figure 3. As explained above, as the arm moves towards its closed position, the drive wheel 26 will rotate whilst the arm is allowed to spring outwardly under the effect of the spring, it does not cause the drive wheel to turn in the reverse direction.

In addition it will be seen best from Figure 5 that, when the handles are fully closed, the edge 51 of the flange 48 has engaged under the lower edge of the rim 29, the cylindrical outer face 49 of the flange 48 contacting the outer face of the side wall 50 of the can. The depth d of a rim 29 varies widely from can to can and may even vary around an individual can. This can lead to inconsistent cutting and so as to avoid this it will be seen that, if the depth d is greater than the minimum envisaged in Figure 7, i.e. the situation in Figure 8, then the cam surface 51 still engages under the lower edge of the rim 29 but draws the cutter wheel 40 downwards, so compressing the washer 54. The spacing a between the cutting edge 46 and the lower edge of the rim 29 remains constant and is of course fixed by the relative positions of the flange 48 and cutting edge 46. Consistent cutting results can therefore be achieved.

Once a complete circular cut has been made, the arm 33 is brought to its closed position as shown in Figure 3 and held there by the loop 34. Then the handles 12 and 14 are opened up and the can released. At the same time, the washer 54 will restore the cutter wheel 40 to its position shown in Figure 7 if it was moved away from this in the sense shown in Figure 8.

Integrally formed with the body member 18 is an upstanding arcuate wall 66. Its axis is centered on the axis of the shaft 44, and it extends angularly for approximately 180° , half and half on either side of a line A (see Figure 2) which is an extension of a line joining the axes of the cutter wheel 40 and drive wheel 26 when the can opener is in the position shown in Figure 2. The wall 66 could extend angularly for more or less, e.g. from about 45° to about 220° , half and half on either side of the line A. In practice if it extends for more than 180° this can lead to difficulties in assembling the can opener whereas 180° is a preferred extent so that the wall not only supports the shaft to prevent bending away in the sense of a direct line between the axes of the cutter wheel and drive wheel but also supports the shaft to prevent sideways bending as the can opener makes a cut.

As best shown in Figures 7 and 8, the inside face 68 of the wall has a diameter approximately the same as that of the outer cylindrical face 49 of the flange 48. That face 49, therefore, abuts the face 68 and in this way the wall can buttress the shaft 44 during a cutting operation, so preventing

substantial distortion of the shaft 44 and consequent misalignment of the cutting edge 46 with the rim 28. This is despite the fact that the body member 18 and its integral shaft 44 are moulded from synthetic plastics material.

Upon removal of the can opener 10 the lid 62 will still appear to be intact on the can. It can be removed by levering it off using a mechanism 80, which is provided on one side of the can opener 18.

As best shown in Figure 13, the mechanism 80 includes a stationery abutment member 82 and a resiliently mounted gripping member 84. The abutment member 82 is fixed to the body portion 18 and includes an upright abutment wall 86. The member 84 is by contrast mounted so as to be pivotable about a small upstanding spigot 90 formed in a recess 92 in the body portion 16. It also includes a lever arm 94 and a forwardly projecting point 96. A spring 98 urges the member 84 so that the point 96 is urged towards the wall 86.

When the mechanism 80 is placed over the rim of a can as shown in Figure 12 the user depresses the arm 94 so as to open up the gap between the point 96 and the wall 86. This is the position shown in full lines in Figure 12. The upper end of the rim of the can can therefore enter between the two. The user then releases the arm 94 and so the spring 98 urges the point 96 towards the wall 86 so that the point snaps into the cut made in the material of the lid 62 in the region 64. This is the position shown in broken lines in Figure 12. The resilient force of the spring 98 urges the point and wall together and ensures that the point enters and is held in this cut.

Next the handles 12 and 14 of the can opener are levered upwardly and the point 96, which is engaged beneath the cut, forces the severed portion of the lid off from the rest of the can to open it.

Claims

1. A can opener for opening a can has a lid joined to a main body by a rim, in which the can is opened by cutting through an outer part of the rim joining the lid with the main body of the can, the can opener comprising a rotatably supported cutter wheel for engaging and cutting the said outer part of the rim, a rotatable drive wheel for engaging the inner part of the rim, means for gripping the rim between the cutter wheel and drive wheel so that, upon rotation of the drive wheel, the can opener orbits around the rim of the can and the cutter wheel can complete a cut around the outer part of the rim, and lever means driving a one-way clutch mechanism for rotating the drive wheel to advance the can opener around the

can.

2. A can opener as claimed in Claim 1 wherein the gripping means include a pair of pivoted body members which have arms extending away from the point of pivoting. 5
3. A can opener as claimed in either Claim 1 or 2 wherein the lever means comprises a third arm or lever which is pivoted about the axis of rotation of the drive wheel and which can be moved between closed and open positions, with the one-way clutch mechanism free wheeling and so not rotating the drive wheel as it is moved towards its open position and the clutch mechanism rotating the drive wheel as it is moved towards its closed position adjacent one of the arms of the body members. 10 15
4. A can opener as claimed in Claim 3 wherein the lever arm is resiliently urged towards its open position by spring means so as to present itself in a position ready for rotating the drive wheel. 20 25
5. A can opener as claimed in either Claim 3 or 4 as dependent or Claim 2 wherein locking means are provided to lock the lever arm in its closed position adjacent to one of the said arms of the body members. 30
6. A can opener as claimed in any preceding claim wherein the one-way clutch mechanism includes a resiliently mounted ratchet driven by the lever means which engages with teeth formed on or attached to a spindle for the drive wheel, the ratchet engaging and locking with the teeth in one direction of relative rotation and free wheeling and sliding over the teeth in the reverse direction. 35 40
7. A can opener as claimed in any preceding claim wherein the drive wheel is supported by a metal shaft which is rotatably journaled within a metal sleeve supported by the body of the can opener, the outer surface of the shaft and the inner surface of the sleeve mating at positions adjacent the ends of the sleeve so as to provide rotational support for the shaft and intermediate those positions a gap being provided between the outer surface of the shaft and the inner surface of the sleeve to avoid contact between the shaft and sleeve. 45 50
8. A can opener as claimed in Claim 7 wherein the interior surface of the sleeve and external surface of the shaft are of hardened steel. 55
9. A can opener as claimed in Claim 8 wherein the interior surface of the sleeve and external surface of the shaft are hardened and tempered to a specification according to Rockwell Hardness C scale (HRC) within the range of 45 to 56.
10. A can opener as claimed in any one of claims 7 to 9 wherein the sleeve is of constant internal cross-sectional diameter whilst the shaft has a region of reduced diameter between the areas of intended contact with the sleeve so as to provide the said gap.
11. A can opener as claimed in any preceding claim wherein resilient means are provided for allowing the cutter wheel to move resiliently in an axial direction along its axis of rotation, and cam means joined to the cutter wheel and axially spaced from the cutter wheel by a predetermined amount, the cam means being arranged to engage the underside of the rim, the engagement underneath the rim moving the cam means and the cutter wheel against the resilient means to a position such that the cutter wheel makes its cut at a substantially constant predetermined distance up the rim from its lower end.
12. A can opener as claimed in Claim 11 wherein the cam means comprise a circular flange having an upper face which is slightly inclined relative a plane radial to the axis of the flange and is arranged to engage under the rim, the inclined upper face moving the circular flange and the associated cutter wheel against the resilient means as the flange is forced in beneath the rim when the rim is gripped between the cutter wheel and drive wheel and the cutting edge of the cutter wheel is forced to penetrate through the outer part of the rim.
13. A can opener as claimed in Claim 12 wherein the circular flange and cutter wheel are formed from a single piece of material.
14. A can opener as claimed in Claim 12 wherein the circular flange and cutter wheel are made separately and then joined so that they rotate together and move together longitudinally of their rotational axis.
15. A can opener as claimed in any one of claims 12 to 14 wherein the circular flange and cutter wheel are jointly mounted about a common axle on which they rotate.
16. A can opener as claimed in any one of claims

11 to 15 wherein the resilient means comprises a resilient rubber washer mounted between the cam means and a stationary support.

17. A can opener as claimed in any preceding claim wherein the cutter wheel is rotatably supported on a shaft upstanding from the gripping means, a circular flange of diameter greater than the cutter wheel being provided on the said shaft, and an arcuate support wall upstanding from the gripping means and being centered on the axis of rotation of the cutter wheel, the circular flange being arranged to bear against the support wall to assist in supporting the shaft and cutter wheel during cutting of the rim of a can.
18. A can opener as claimed in any preceding claim wherein the gripping means is made of synthetic plastics material.
19. A can opener as claimed in either Claim 17 or 18 wherein the axis of the shaft is made of synthetic plastics and is integrally formed with the gripping means.
20. A can opener as claimed in either Claim 17 or 18 wherein the axis of the shaft is separate of the gripping means.
21. A can opener as claimed in any one of claims 17 to 20 wherein the circular flange is mounted outwardly of the cutting edge.
22. A can opener as claimed in any preceding claim wherein the gripping means comprises a pair of body members pivoted to one another and having integral handles extending generally in a direction away from the axis of pivoting, one of the pair of body members having a substantially flat surface in the region of the nip between the cutter wheel and the drive wheel, and the integral handle of the other body member having an undersurface which is substantially flat and also substantially in the same plane as the substantially flat surface on the said one body member, whereby when the body members and their integral handles are pivoted to allow the can opener to be fitted over the rim of a can, those two surfaces will rest on the top of the rim of a can and will align the axis of the cutter wheel so that at least in the plane containing them it is parallel with the upright axis to the can.
23. A can opener as claimed in Claim 22 wherein the said one body member which supports the

cutter wheel has a further contact surface on the opposite side of the drive wheel from the cutter wheel.

24. A can opener as claimed in Claim 23 wherein the contact surface is spaced downwardly from the said substantially flat surface on the said one body member by an amount substantially equal to the height of the rim above the central top region of the lid.
25. A can opener as claimed in any preceding claim wherein the drive wheel has an outer cylindrical surface which is serrated to allow it to grip into the material of the rim to assist in driving the can opener around the can, and the lower edge, adjacent to the lid of the can when in use, of the outer cylindrical surface of the drive wheel is bevelled.
26. A can opener as claimed in Claim 25 wherein the angle of the bevel is in the range from 30 to 60° to the axis of the drive wheel.
27. A can opener as claimed in either Claim 25 or 26 wherein the bevel extends radially inwardly at the lower edge of the drive wheel by an amount at least equal to the depth of the serrations.
28. A can opener as claimed in Claim 27 wherein the maximum radial depth of the serrations is no more than 1.5 mm.
29. A can opener which has on one side thereof a point resiliently urged towards a fixed abutment, the point being capable of entering the cut and so lifting one side of the lid from the can when the body of the can opener is used to lever off the lid.
30. A can opener as claimed in Claim 29 wherein the point is provided on a pivotally mounted member which is resiliently mounted to urge the point towards the abutment, and an arm is provided which can be manually moved against the resilient force, to open up a gap between the point and the abutment to allow them to be initially fitted over the rim of a can.

FIG. 1

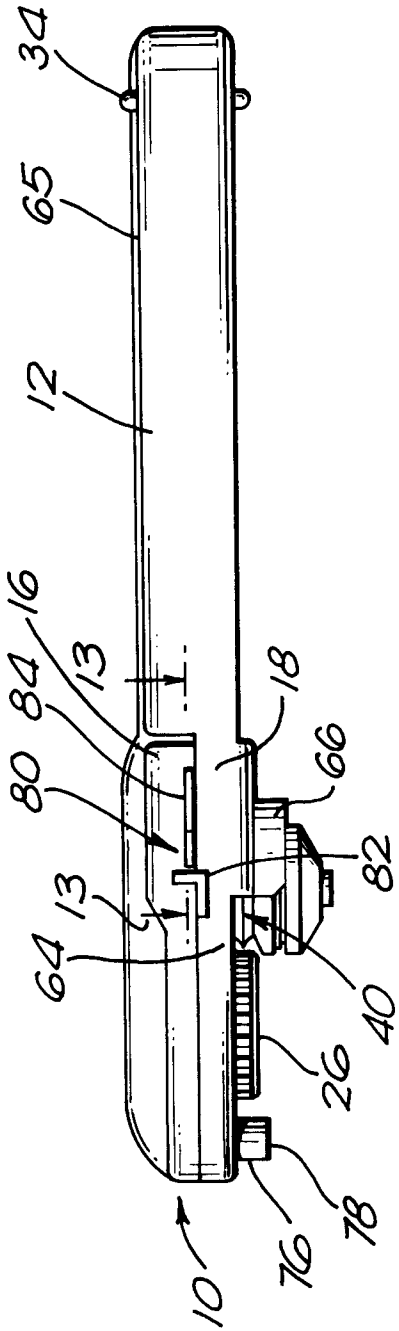


FIG. 2

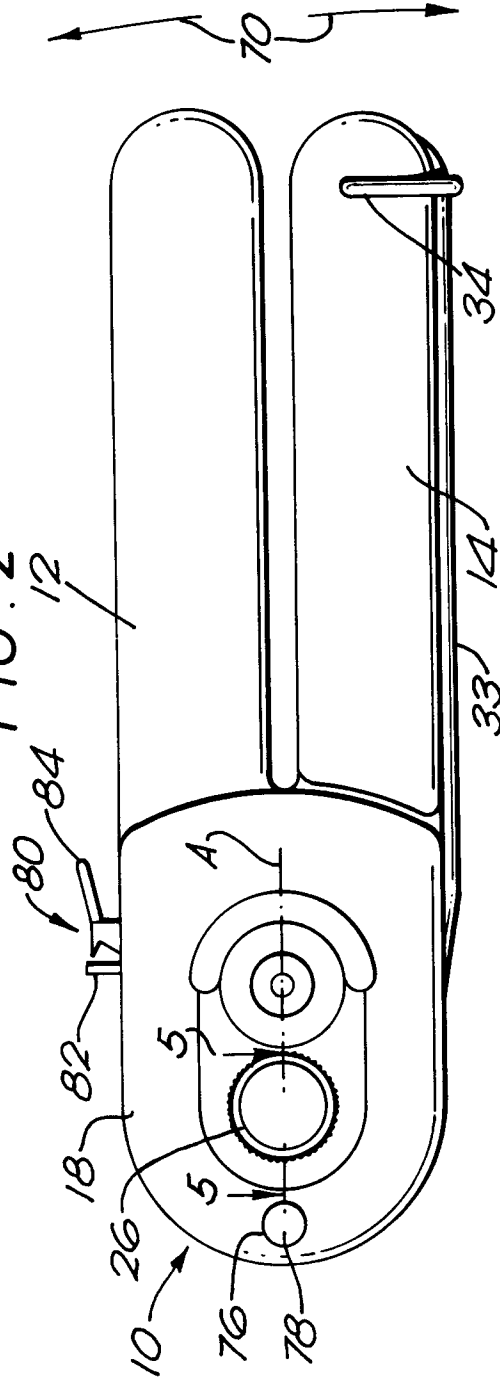


FIG. 3

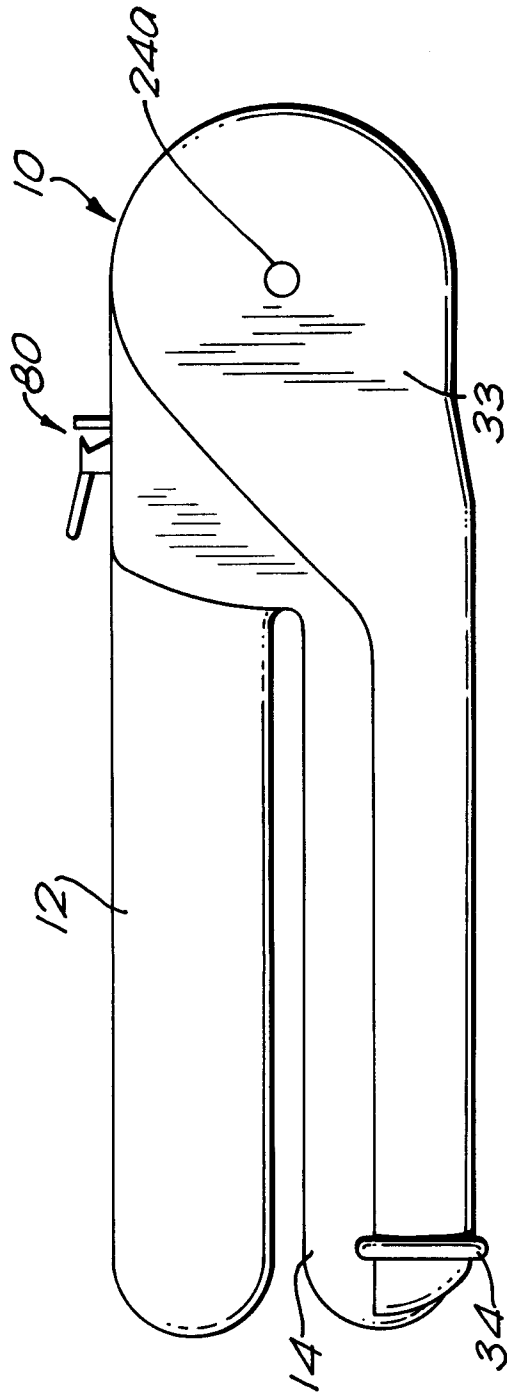
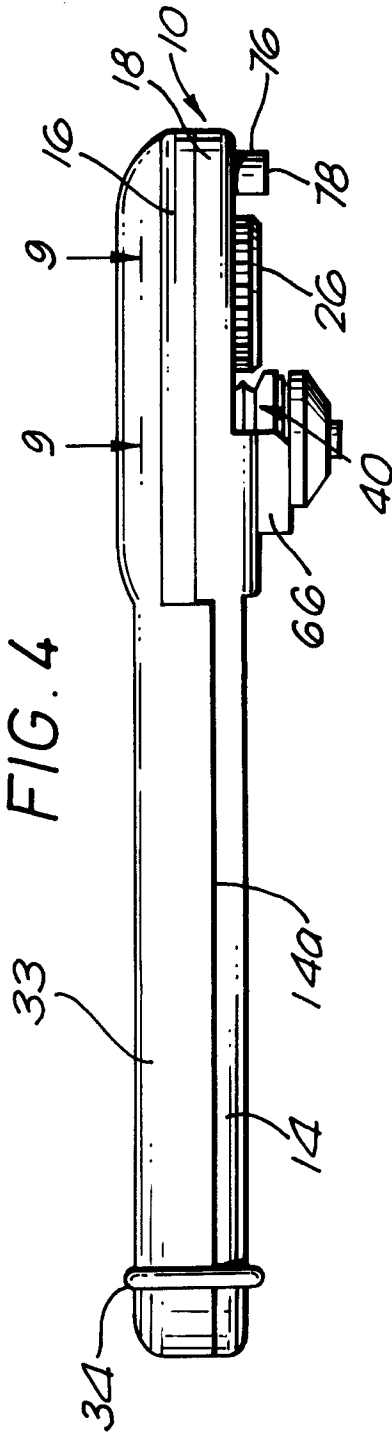
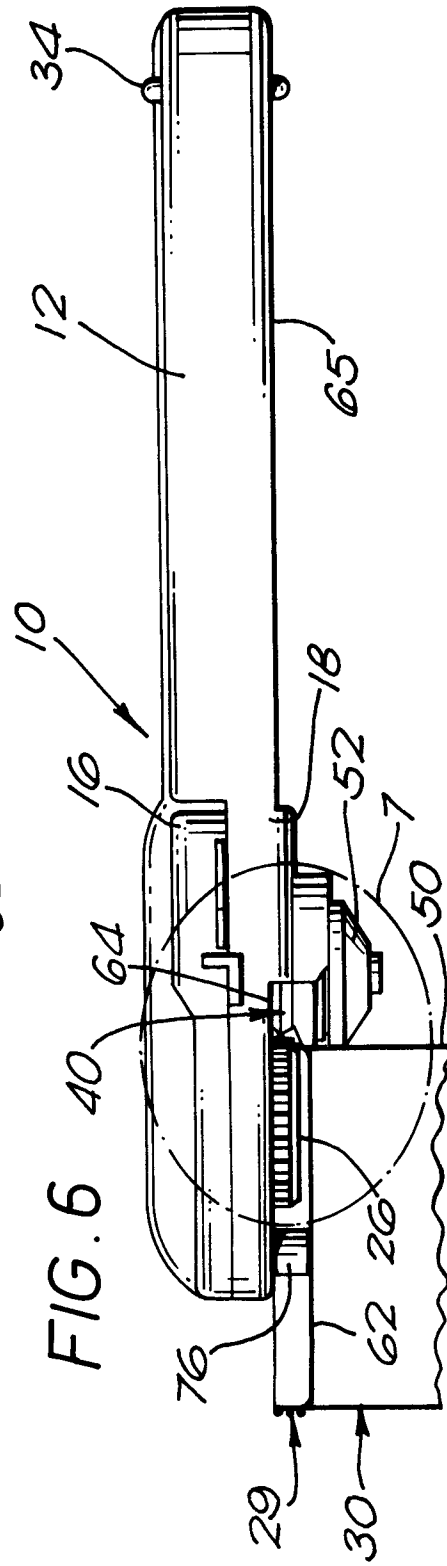
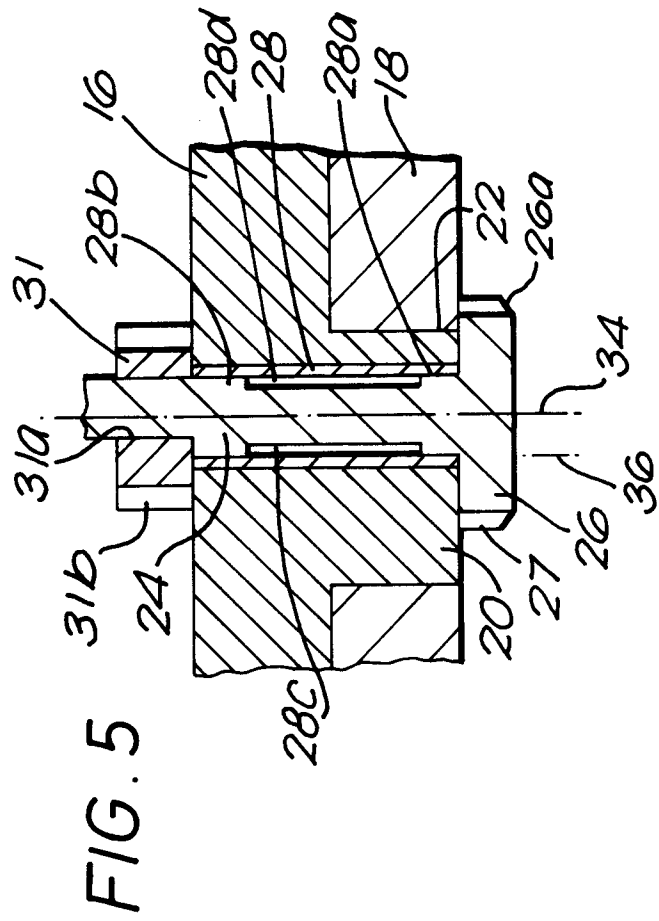
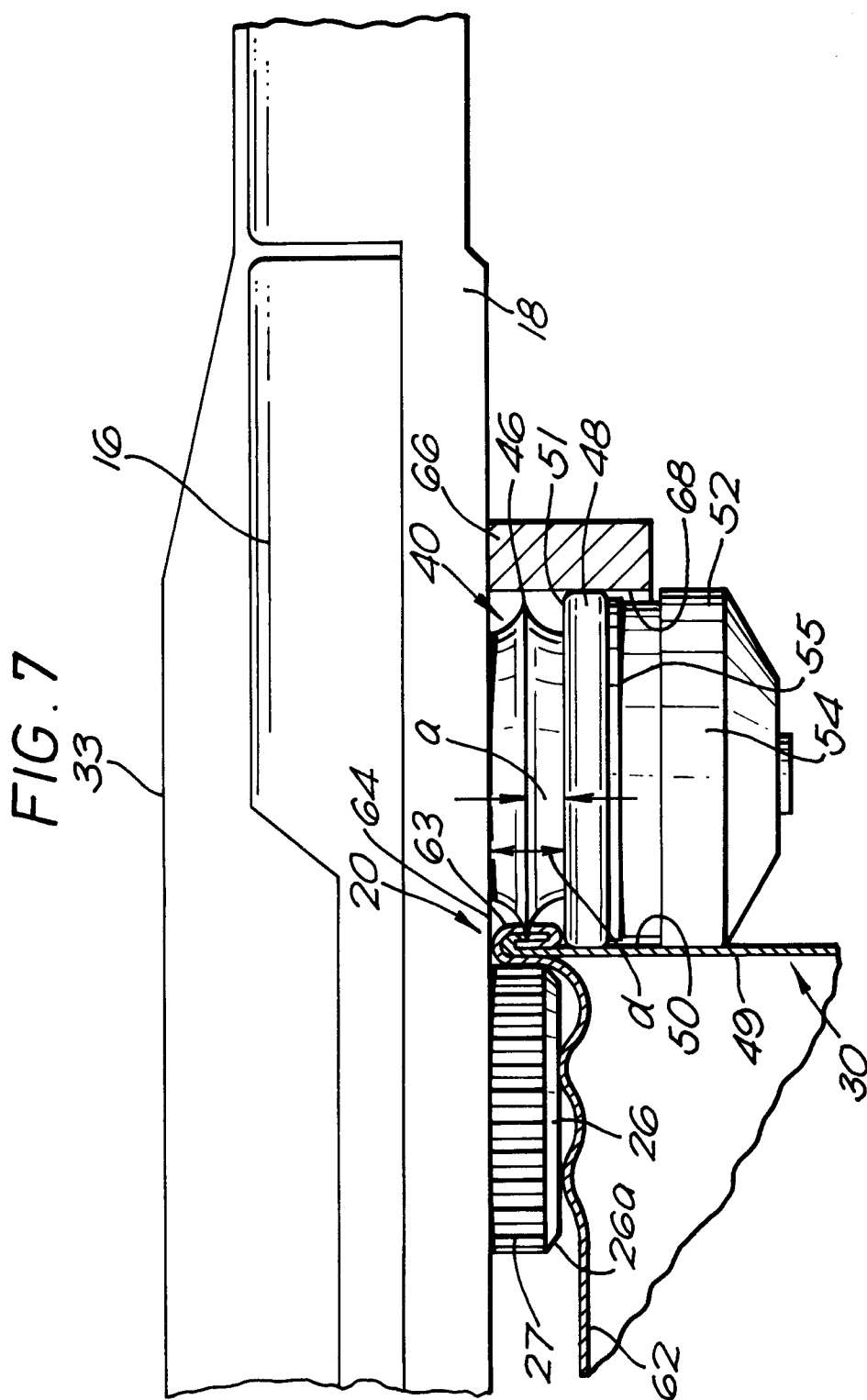
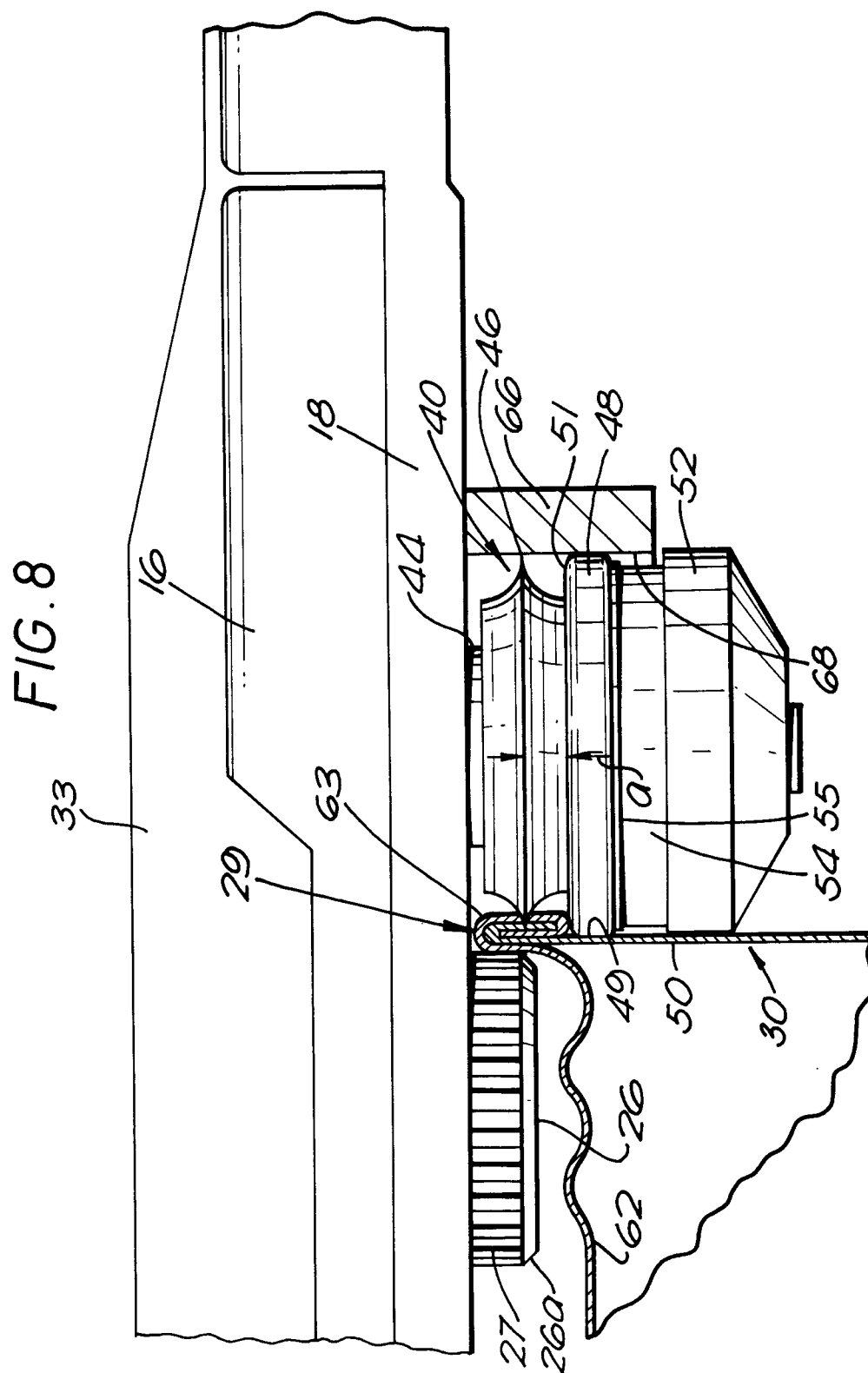


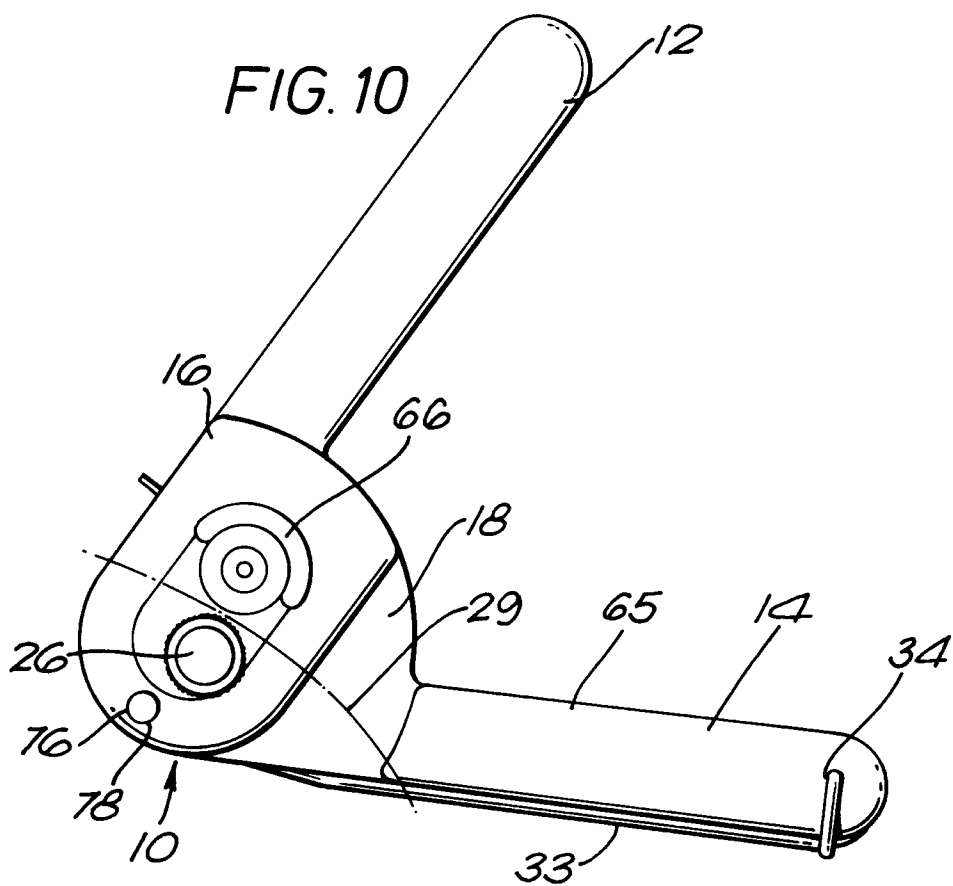
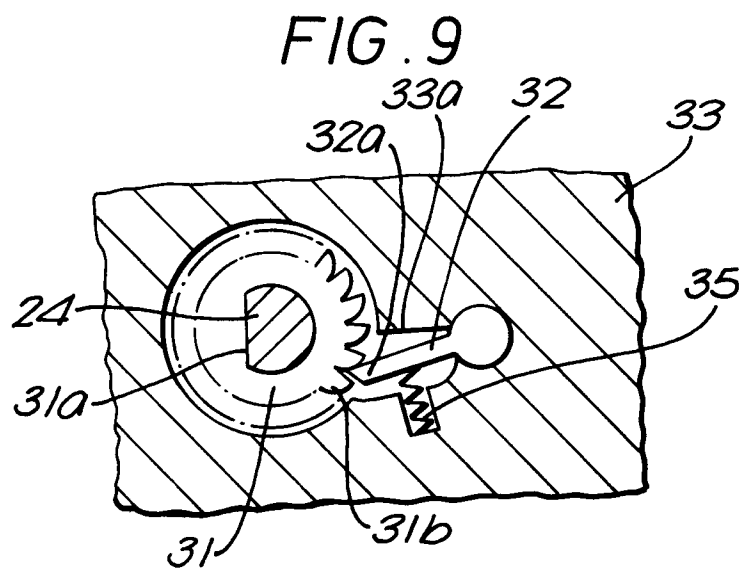
FIG. 4











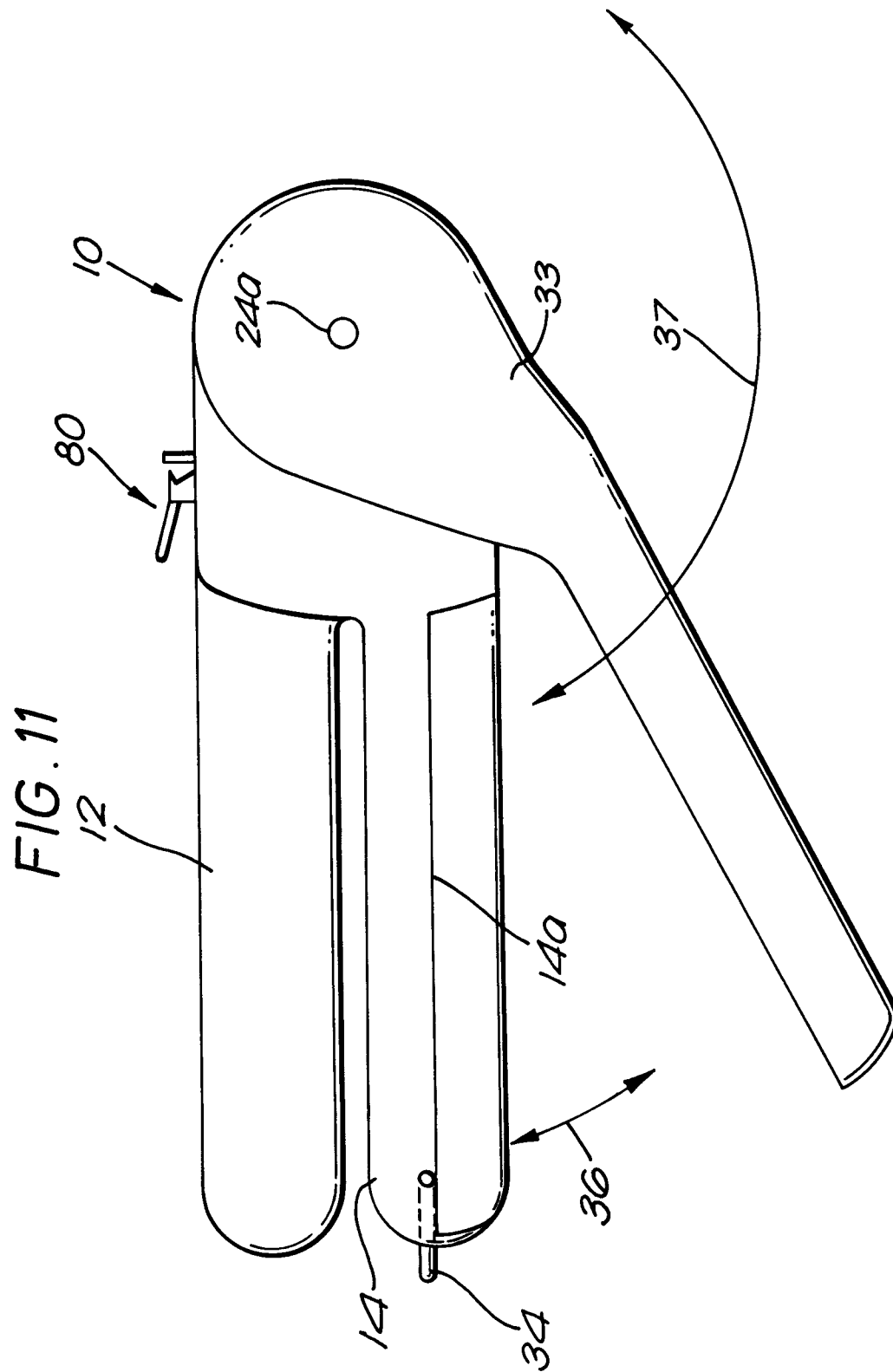


FIG. 12

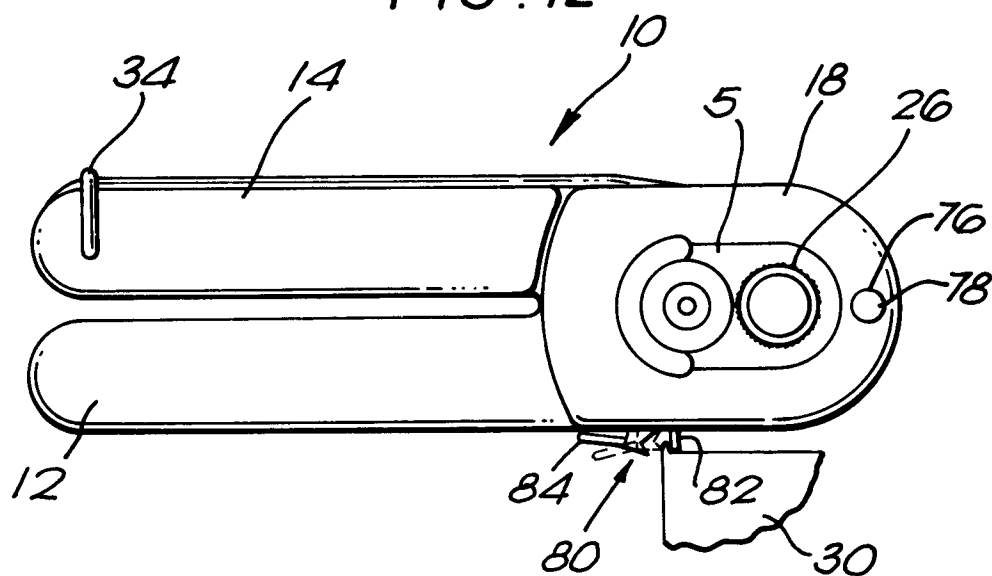


FIG. 13

