

Nov. 24, 1942.

H. E. HALLMAN

2,302,855

CUTTING APPARATUS

Filed Dec. 6, 1939

2 Sheets-Sheet 1

Fig. 5

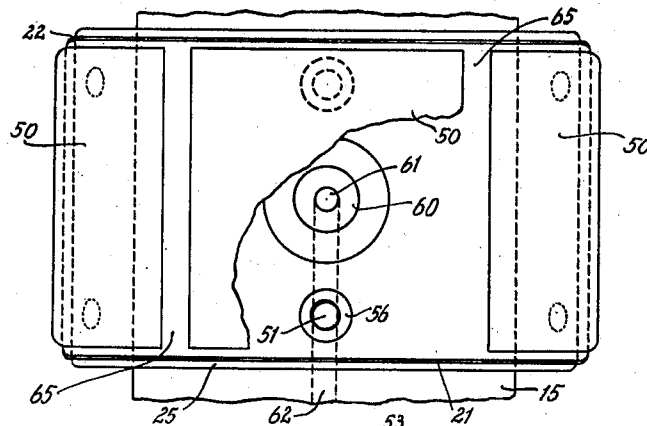


Fig. 6

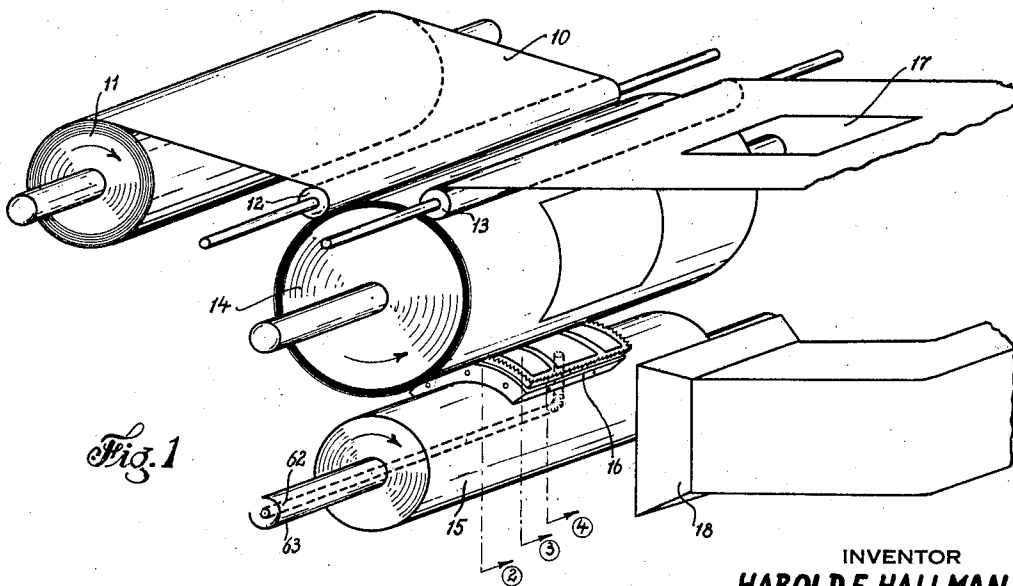
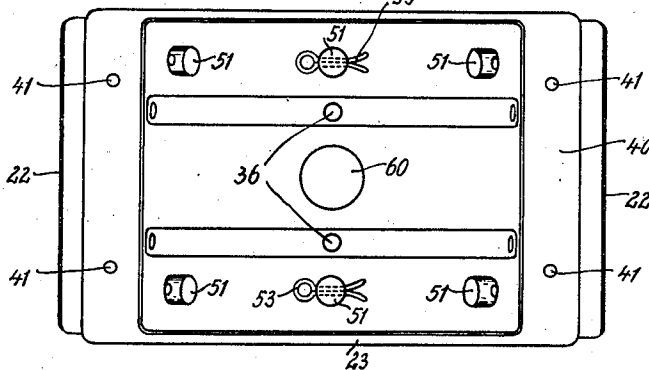


Fig. 1

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2 Sheets-Sheet 2

Fig. 2

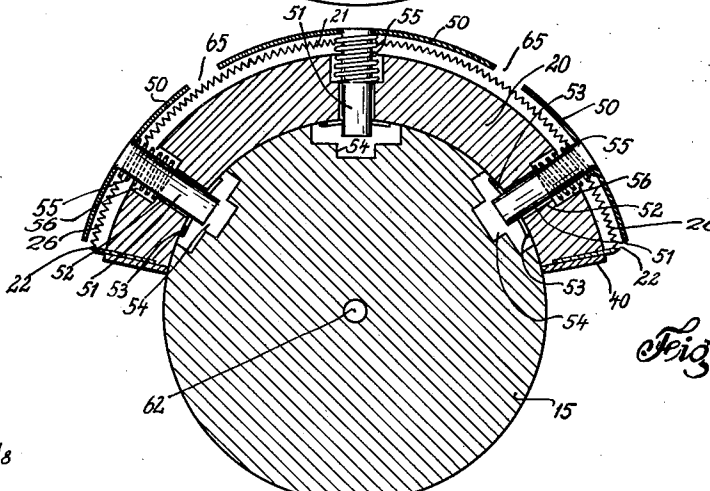
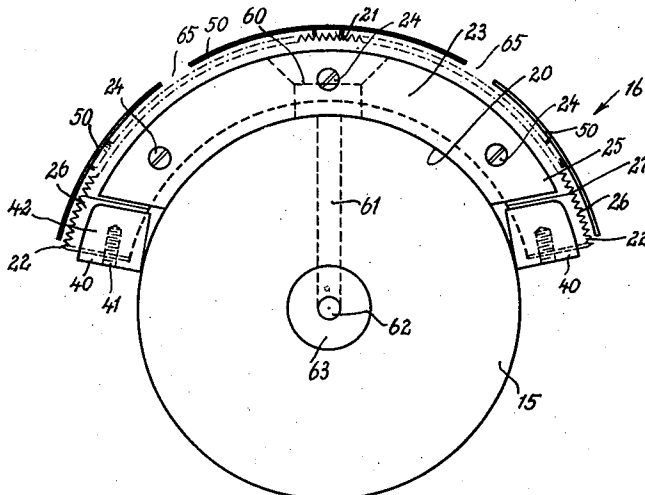


Fig. 3

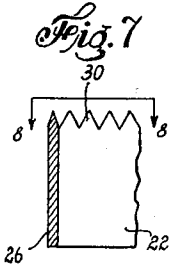


Fig. 8

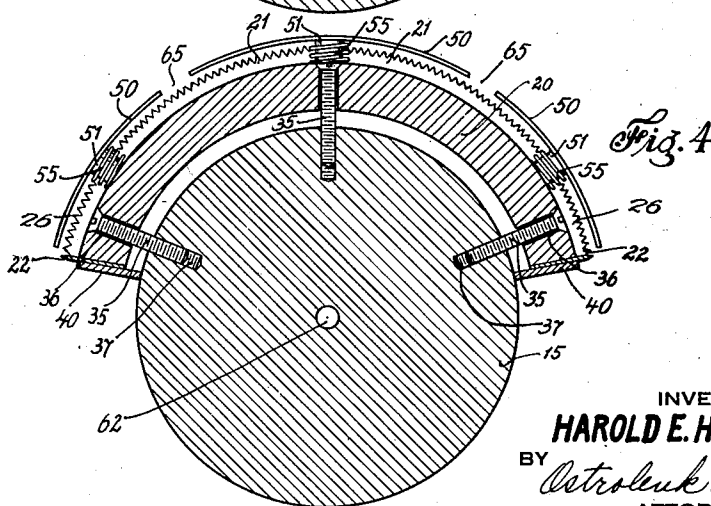


Fig. 4

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UNITED STATES PATENT OFFICE

2,302,855

CUTTING APPARATUS

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Application December 6, 1939, Serial No. 307,793

3 Claims. (Cl. 164—28)

This invention relates to cutting apparatus and more particularly to a rotary type of cutting apparatus designed to excise sections of material from a moving web. This apparatus and method has particular application and use as a part of a bag machine.

In the manufacture of windowed or apertured containers of various kinds including envelopes and bags, it is customary first to form in a continuous web a series of apertures corresponding exactly to the windows or apertures which are to appear in the finished article and spaced at regular intervals to permit cutting operations which will divide the sheet into individual members for formation into the container envelope or bag.

Various complicated and costly mechanisms have been devised for creating the aperture or window in a continuous web. These mechanisms include a series of rotating transverse and longitudinal knives and various punch mechanisms, all of which are costly in manufacture, relatively difficult in operation and by reason of the complexity of the device, easily disabled.

The present invention has therefore for its object a simplified excising or aperture forming apparatus for use in connection with sheet material, which apparatus will effect a series of linearly arranged regularly spaced perforations in a moving web of continuous sheet material.

Another and important object of this invention is to provide a simple apparatus for excising a portion of the body of a continuously moving web of sheet material and ejecting or removing the excised portion without interfering with or slowing down the operation of the device.

Still another object of the present invention is to provide a simplified means for the formation of apertures in a moving web which does not involve complicated and costly dies and which requires a single cutting edge to cooperate with a yielding female member.

There are many other objects and uses of this invention, part of which will become apparent and the rest be pointed out in the following description taken in connection with the drawings in which:

Figure 1 is a general view in perspective of the aperture forming apparatus of the present invention.

Figure 2 is a cross sectional view taken on line 2—2 of Figure 1.

Figure 3 is a cross sectional view taken on line 3—3 of Figure 1.

Figure 4 is a cross sectional view taken on line 4—4 of Figure 1.

Figure 5 is a top plan view of the cutting mechanism.

Figure 6 is a bottom view of the cutting mechanism.

Figure 7 is a detail of the cutter and

Figure 8 is a view taken from line 8—8 of Figure 7 looking in the direction of the arrows.

Referring now to Figure 1, the continuous web 10 is unwound from the roll 11 and by means of the guide rolls 12 and 13 is caused to pass closely around the roll 14 in the manner shown. Rotating simultaneously with the roll 14 and in the direction indicated by the arrows, roll 15 carries the cutting member 16, the circumferential speed of the blades of which is the same as that of the roll 14.

During each revolution of the rolls 14 and 15 the blades of the cutter 16 cut into the material of the continuous web 10, excise a portion thereof to produce the aperture 17, eject the excised portion by projecting it away from the face of the cutter 16 so that a suction pump connected to the conduit 18 will draw the excised strip away to permit the apparatus to automatically be reset for the next cutting operation.

It will thus be seen that a single window is formed for each revolution of the roll 15. Where a plurality of windows are to be formed in a single transverse row, obviously a plurality of members 16 may be mounted on the roll 15.

As seen in Figures 1 and 2, the cutting mechanism 16 comprises a base plate 20 carrying a series of knives 21 and 22. The knives 21 which correspond to and are concentric with the curve of the roll 15, preferably are fastened to the base plate 20 by means of the clamp 23. For this purpose, the base plate 20 has a series of perforations in the sides thereof with which the screws 24 register.

The knife blade 21 likewise has a corresponding series of perforations. The knife blade 21 is mounted, as seen in Fig. 2 at the side of the member 20 and a clamping plate 25 is mounted thereover and the screws are passed through perforations in the clamping plate 25 and in the knife 21 to enter the perforations in the sides of the base plate. The knife 22 as seen in the cross sectional views of Figures 2, 3 and 4 comprise members which extend in a plane which is an extension of a radius of the roll 15 at right angles to the surface thereof but each of the knives 22 has a bent portion 26 which extends upon the curved side of the plate 20 of the cutting member to meet the knife 21 at the joint 27. In other words, the knife 22 and its angu-

lar extensions 26 will in the case of a rectangular window forming device form or occupy three sides of a rectangle, the two opposed members 22 having wings 26 extending towards each other and the opposed members 21 connecting the wings on each side.

Obviously adjustability of the size of the cut to be made may be obtained by making the mounting of the knives adjustable.

As is seen in Figure 7, each of the knives as, for instance, knife 22 having the extension 26 comprises an angular surface adapted readily to cut into the sheet material. The angular surfaces 30 may be so formed as to insure the effectuation of a clean cut. Thus, for instance, as seen in Figure 8 each of the angular portions 30 of the knife edge may be pyramidal in form with each of the edges of the pyramid being sharp. Obviously, of course, in particularly cases, each of the angular members may be tetrahedral in shape or have any other shape presenting a plurality of edges in a confined area.

It will also be clear that the clamp 40 which may be screwed into the side of the plate by means of screws 41 will also be of a form corresponding to the shape of the knife 22 and will also have extensions 42 so that the knife 22 will be clamped thereby and held in true position.

The surface of the roll 14 around which the moving web 10 is pressed and guided is preferably of a rubber or other yieldable material composition which will permit the knives 21 and 22 to be pressed therein without destroying the surface of the roll. Therefore during each cutting operation, the knives press into the moving web and thence into the roll itself and by means of the angular edges 30 of the knife excise evenly the portion forming the aperture. Obviously, therefore, the points of the knives enter entirely into the opposing roll of yieldable material in order that the clean cut may be obtained.

It will be noted however that ordinarily by reason of the projection of the knife edges above their base, the excised portion of the web may tend to adhere to or stick within the blades. Accordingly, there are provided extrusion plates 50—50 for the purpose of insuring that the excised portion of the web will not remain upon the cutter and also for the purpose of insuring that the continuous web will be held smooth and even during the cutting operation.

The extrusion plates, as seen in Figure 3, are mounted upon pins 51 which extend through perforations 52 in the plate 20, the pins being held by cotter pins 53 beneath the plate 20 (cf. also Fig. 6), suitably shaped orifice 54 being provided in the roll 15 to permit the pins 51 to oscillate sufficiently to permit the extrusion member to operate.

Compression springs 55 are mounted between the extrusion plate 50 and the rabbet 56 in the perforation 52. These compression springs normally tend to cause the plates 50 to rise above the teeth of the knives.

During the course of the rotation of the roll 15 as the extrusion plates come in contact with the web 10 on the roll 14, they press the web even more firmly against the roll and, by reason of the area of the extrusion plates they are prevented from entering into the web or the roll. However, as the knife edges 21 and 22 extend through the web 10 and into the roll, the extrusion plates 50 thus are depressed beneath the knife edges and pressed firmly against the sheet

material, pressing it against the roll during the cutting operation.

When the cutting operation is completed and the knife edges no longer project into the roll 14, and the extrusion plates are no longer in contact with the roll 14, then the springs 55 force the plates upwardly beyond the edges of the knives thus pushing the excised blank out of engagement with the knife blades.

This occurs immediately before the face of the cutter approaches the opening of the suction conduit 18 which will remove the excised sheet from the cutter by suction.

In order to insure that there is sufficient pressure behind the excised sheet to permit the suction apparatus to operate, a perforation 60 (see Figures 1 and 2) is provided in the plate 20. This perforation communicates with the tube 61 in the roll 15 which in turn communicates with the tube 62 in the shaft 63 of the roll 15. Ordinary atmospheric pressure through the conduits 62, 61 to the perforation 60 will permit the suction through the conduit 18 to be sufficient to draw off the excised sheet.

Where there is extremely rapid operation then in order to insure removal, additional pressure may be applied through the tubes 62, 61 and the perforation 60 in order to assist in blowing the excised sheet off the cutter for the suction conduit to remove the same. For this purpose, gaps 65 are provided between adjacent plates in order to permit the atmospheric pressure or additional pressure to be effective when in cooperation with the removal conduit 18.

The plate 20 (see Figure 4) may be fastened or keyed to the roll 15 in any suitable manner as, for instance, by the adjustable screws 35 which may be mounted in countersunk recesses 36 in the plate 20 and which may enter threaded perforations 37 in the roll, the screws being of such length that they will not project to the base of the perforations 37 and thus will permit the screws to be adjustable within the roll.

Despite the serrated edge used, since each of the serrations comprises a point extending beyond a pyramidal base, the cut-out formed by the present apparatus is even and bounded by straight edges. The yielding surface into which the blades are pressed acts as the female cutting die or member to cooperate with the edges of the blades to produce a straight, clean cut.

Variations in the spacing of perforations may be obtained by variations in the relative size of rolls 14 and 15. Care should be taken, however, that the circumferential speed of the knife blade is the same as that of the web to be cut so that an even regular cut may be formed.

A web thus apertured may be readily utilized in the formation of apertured or windowed bags or enclosures, the spacing of the cut-outs or perforations being arranged to permit successive bags to be formed from the sheet without waste.

The method of cutting or excision may obviously be applied to the formation of openings, cut-outs of any desired shape or extent. If desired, this method may be used to form continuous slots in a sheet or to excise continuous ribbons therefrom, and the cutting edge and roller of the type herein disclosed may even be of real utility in cutting successive sheets in varying shapes and sizes.

Many variations and uses of my device will now be clear to those skilled in the art. I prefer therefore to be limited not by the particular disclosure but only the appended claims.

I claim:

1. An apparatus for forming successive perforations in sheet-material, said apparatus comprising a roll of substantially yielding material, means for passing said sheet around said roll, and a second roll carrying a blade, said blade having the conformation of the perforation to be formed, and being periodically engageable with said sheet and pressing through said sheet into said first roll, said blade having a serrated edge.

2. An apparatus for forming successive perforations in sheet material, said apparatus comprising a roll of substantially yielding material, means for passing said sheet around said roll, and a second roll carrying a blade, said blade having the conformation of the perforation to be formed, and being periodically engageable with said sheet and pressing through said sheet into said first roll, said blade having an edge comprising a series of angularly disposed cutting edges.

3. An apparatus for forming successive perforations in sheet material, said apparatus comprising a roll of substantially yielding material, means for passing said sheet around said roll, and a second roll carrying a blade, said blade having the conformation of the perforation to be formed, and being periodically engageable with said sheet and pressing through said sheet into said first roll, said blade having an edge comprising a series of pyramidal members, each of the edges of said pyramidal members being a cutting edge.

4. An apparatus for forming successive perforations in sheet material, said apparatus comprising a roll of substantially yielding material, means for passing said sheet around said roll, and a second roll carrying a blade, said blade having the conformation of the perforation to be formed, and being periodically engageable with said sheet and pressing through said sheet into said first roll, said blade being mounted on a base plate, and clamping means on said base plate engaging said blade, said base plate also comprising a yieldingly mounted ejecting member normally arranged substantially at the plane of the edge of said blade but displaceable beneath said edge when said blade engages said sheet and said yieldingly surfaced roll, said extrusion member displacing an excised portion of the sheet after the blade has engaged said sheet, and suction means for removing said excised portion of the sheet before the next cutting operation.

5. An apparatus for forming successive perforations in sheet material, said apparatus comprising a roll of substantially yielding material,

means for passing said sheet around said roll, and a second roll carrying a blade, said blade having the conformation of the perforation to be formed, and being periodically engageable with said sheet and pressing through said sheet into said first roll, said blade being mounted on a base plate, clamping means on said base plate engaging said blade, said base plate also comprising a yieldingly mounted ejecting member normally arranged substantially at the plane of the edge of said blade but displaceable beneath said edge when said blade engages said sheet and said yieldingly surfaced roll, said extrusion member displacing an excised portion of the sheet after the blade has engaged said sheet, suction means for removing said excised portion of the sheet before the next cutting operation, and a perforation in said base plate in communication with the atmosphere.

6. An apparatus for forming successive perforations in sheet material, said apparatus comprising a roll of substantially yielding material, means for passing said sheet around said roll, and a second roll carrying a blade, said blade having the conformation of the perforation to be formed, and being periodically engageable with said sheet and pressing through said sheet into said first roll, said blade being mounted on a base plate, clamping means on said base plate engaging said blade, said base plate also comprising a yieldingly mounted extrusion member normally arranged substantially at the plane of the edge of said blade but displaceable beneath said edge when said blade engages said sheet and said yieldingly surfaced roll, said extrusion member displacing an excised portion of the sheet after the blade has engaged said sheet, suction means for removing said excised portion of the sheet before the next cutting operation, and a perforation in said base plate in communication with a source of at least atmospheric pressure.

7. A cutting apparatus comprising a yieldingly surfaced platen and a cutting blade engageable with said platen, said blade comprising a series of serrations, each serration including a plurality of cutting edges terminating in a common apex and extending from a polygonal base.

8. In a cutting apparatus for making a regular even incision in a web, a yieldingly surfaced platen, means for passing the web over the yieldingly surfaced platen and a cutting blade engageable with said platen, said blade comprising a series of serrations, each serration including a plurality of cutting edges terminating in a common apex and extending from a polygonal base.

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