United States Patent [19]

Koehlinger et al.

[11] **3,920,122**

[45] **Nov. 18, 1975**

[54] **LABEL WEB AND DIE MAKING METHODS**

[75] Inventors: **Allen W. Koehlinger**, Cincinnati, Ohio; **Wesley J. Rece, Jr.**, California, Ky.

[73] Assignee: **R. A. Jones & Co., Inc.**, Covington, Ky.

[22] Filed: **Dec. 26, 1973**

[21] Appl. No.: **428,362**

[52] **U.S. Cl.** ..... **206/390;** 40/2 R; 156/257; 206/820; 161/109

[51] **Int. Cl.²**... **B65D 85/67;** B32B 3/10; G09B 3/02

[58] **Field of Search** ..... 206/390, 820, 411, 225, 206/389, 409; 242/1; 161/167, 109; 156/247, 257; 40/2 R; 229/51 TS, 69, 66

[56] **References Cited**

UNITED STATES PATENTS

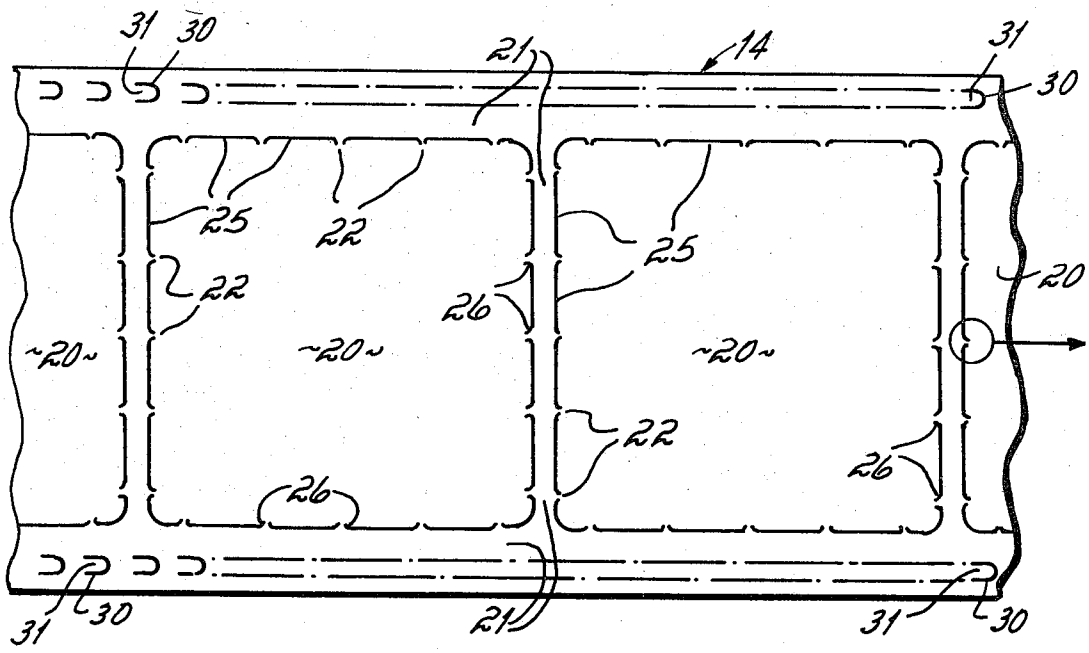
2,165,394	7/1939	Lyness	206/820
2,213,666	9/1940	Burke	40/2 R
2,967,010	1/1961	Cuffey, Jr. et al.	229/51 TS
3,255,949	6/1966	Buttery	229/51 TS
3,297,508	1/1967	Jahp	156/249
3,467,250	9/1969	D'Elia et al.	206/411
3,767,039	10/1973	Schroter	206/411
3,862,684	1/1975	Schmitt	206/277

Primary Examiner—William T. Dixson, Jr.
Attorney, Agent, or Firm—Wood, Herron & Evans

[57] **ABSTRACT**

An improved label web includes an elongated web remnant having a plurality of partially precut labels supported therein by bridges of material which taper from one width near the remnant to a smaller width near the label. Depressions receiving the bridges are formed in the labels, when they are partially precut, but their dimension and configuration is selected so that when the labels are removed from the web and placed on a product, the depressions are visually insignificant. The major portions of the bridges remain with the remnant and any portion remaining with the label tends to fill the depression enhancing the label's appearance. Improved die structure and methods for making die structure to preferentially form labels are included. In one method, the desired curved die cutting edge is formed by displacing and nicking a straight die cutting edge, from one side and at an angle to the general perpendicular projection of the edge above the die surface.

17 Claims, 10 Drawing Figures



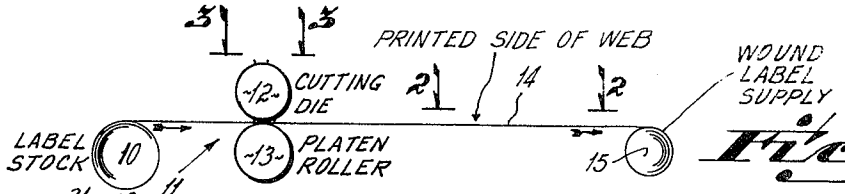


Fig. 1

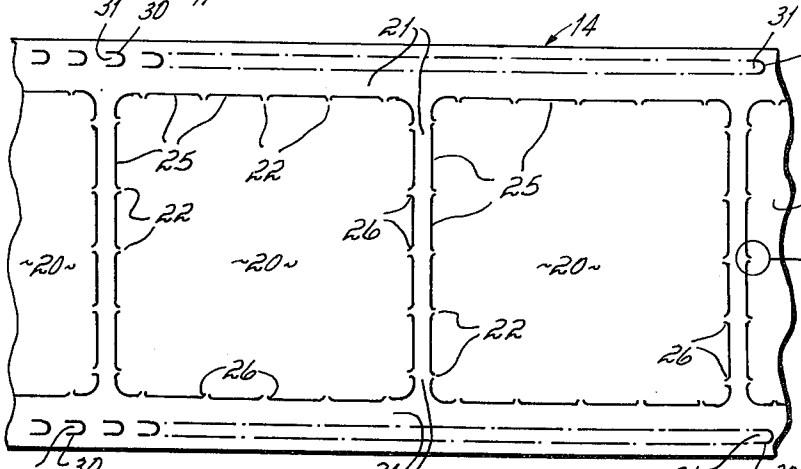


Fig. 2

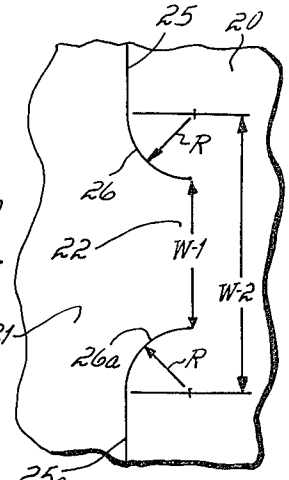


Fig. 2a

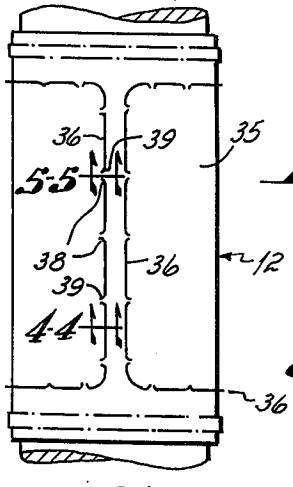


Fig. 3

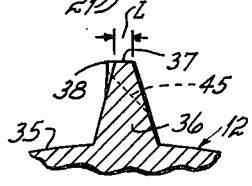


Fig. 4

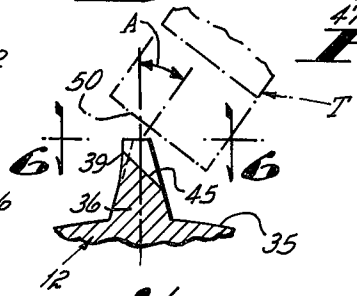


Fig. 5

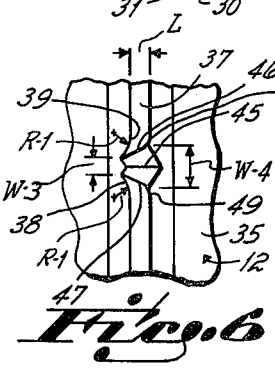


Fig. 6

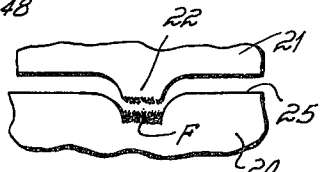


Fig. 7

Fig. 8

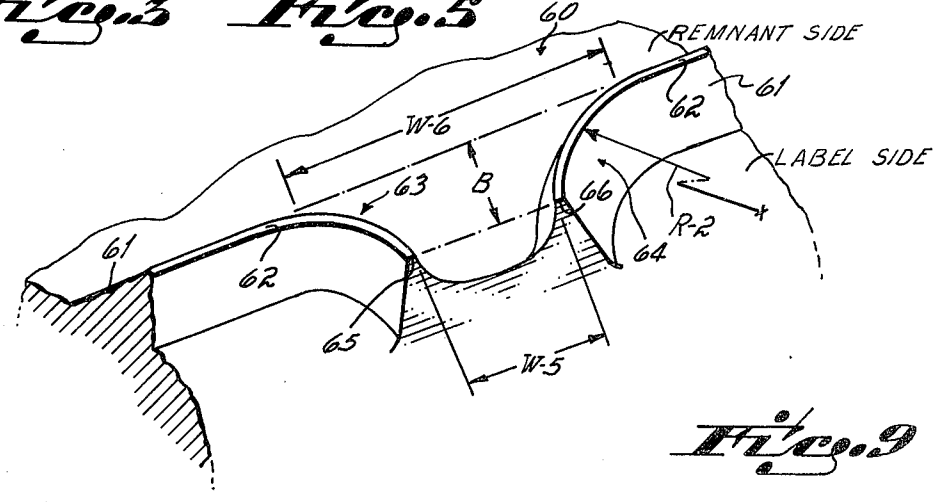


Fig. 9

LABEL WEB AND DIE MAKING METHODS

This invention relates to label supply webs and to apparatus for partially cutting labels from a web. More specifically, this invention relates to improved label web structure wherein labels removed from the web are substantially free of projections of web material and present visually clean cut labels edges, and to apparatus for partially cutting said labels from supporting webs.

In U.S. Pat. No. 3,661,625, now owned by applicant, there is disclosed a labeling apparatus operable to detach labels from an elongated label web and to thereafter apply them to an item such as a product container. Briefly, the apparatus disclosed in that patent utilizes a lable supply comprising an elongated web remnant supporting a plurality of removable labels therein. Each label is held within a web opening by virtue of small nicks or bridges of material extending between the web and the label. The elongated web is advanced through the apparatus to an adhesive station where adhesive is applied to the rear side of the labels. Thereafter the labels are moved to an applying station where the web remnant is held and a resilient plunger is actuated through the web to detach the label, to carry it to a container, and to apply it thereto by pressing the label against a container surface.

In the past, it has been the practice to partially precut labels from the web remnant so as to leave supporting bridges of web material between the label and the web remnant. While the number of these bridges was minimized, consistent with the strenth required to hold the label in the web until detachment, it was still noted that when the labels were removed, bits of the web remnant, in the form of portions of the bridges, stayed with the label. The label edge, then, did not provide a clean cut appearance but rather appeared to have a number of ragged projections or appendages spaced all around the label. The ragged appearance was even more pronounced when the color of the labels contrasted with that of the surface to which the labels were applied.

While the ragged appearance could be minimized by the expedient of reducing the number of bridges or by coloring the label edges similarly to the labeled surfaces, the projections on the labels still presented a disadvantage to the technique of labeling disclosed in said patent. Manifestly, the bridges could not be cut at the detaching station since a resilient plunger was used to detach the labels from the web, but rather the bridges were torn apart indiscriminately, frequently leaving bridge portions with the label in a random manner. Thus, as contrasted with other types of labeling, using label supplies such as magazine fed label stacks wherein the labels are entirely die cut, the labels provided from the partially cut web were at a disadvantage from an aesthetic viewpoint.

The consideration of undesired projections on labels is an important one in the marketplace where the product container must be as immaculate as possible. For example, where the labels are used on flexible containers of light duty liquid detergent products it is desired, from a commercial standpoint, to provide a clean cut label with no ragged appearance. Such containers are usually placed on a supermarket shelf in the same areas as containers of competing products. A ragged label thus might tend to detract from the container, as contrasted with other containers where completely die cut

labels are used, for instance, and a sale may be lost to the competition

It has been one objective of the invention to provide an improved label supply wherein lables, removably held in a web remnant by bridges of web material, can be detached from the remnant without carrying portions or projections of bridge material therewith.

A further objective of the invention has been to provide an improved label supply including a web remnant removably supporting labels therein via bridges of web material connected to the labels, and the labels when detached from the web by a resilient plunger providing a surrounding label edge which appears to be clean cut and attractive with no visible projections or appendages.

A still further objective of the invention has been to provide an improved cutting die for partially cutting labels from a supporting web.

To these ends, the invention provides an improved label supply including an elongated web remnant supporting removable labels therein via bridges of web material between the label and the remnant, the bridges being preferentially formed so that when the labels are detached from the web, the bridge material tends to remain with the web remnant and small visually insignificant depressions are formed in the label. It is desired that any portion of the bridge remaining with the label will tend to fill the depressions but will not extend beyond the label edge.

When the labels are partially precut from the web, the bridges are formed between respective ends of the cuts around each label so that the width of the bridge varies from a wider width near the remnant, to a narrower width near the label. More specifically, each label in the web is substantially defined by a plurality of cuts therearound, each cut having ends curved toward the label on a minimal radius. Each curved end of a cut terminates just short of a respective curved end on an adjacent cut to define the desired bridge. When the label is punched transversely from the web by a resilient plunger, the bridge tends to remain with the web remnant, separating from the label at its point of connection thereto, within the label edge and within the depression which is partially formed in the label, prior to detachment, by the curved cut ends.

In a preferred embodiment, it was discovered that although the bridge stayed with the web when the label was detached from the web remnant, at least some fibers of the bridge material remained wit the label. These fibers extended from the bottom of the visually insignificant depression left in the label outwardly toward the edge of the label and thereby enhanced the total label appearance by at least partially filling the depression.

In prior patents such as Sherman U.S. Pat. No. 2,264,339, labels are cut in the labeling machine by a cutting die which leaves points of attachment between the labels and a strip. The patent is devoid of any detail regarding the pertinent structure of the strip or label. Apparently, the points of attachment must be strong enough to carry the envelopes to which the labels are attached, between stations in the apparatus and there is disclosed no particular concern about the sightliness of the labels left on the envelope.

In this connection, it should be appreciated that a further objective of the invention has been to provide a label web supply wherein partially precut labels are held within the web by bridges of material having a pre-

determined configuration of specified dimensions, and the labels are intentionally provided with depressions receiving the bridges, the depressions also being formed of a predetermined configuration of specified dimensions so that they automatically become visually insignificant upon removal of a label from a web. A connected objective of the invention has been to particularly define the specific label supply web structure and the specific characteristics of the bridges holding the labels in the web so that the removed label has an apparently clean cut label edge.

The invention also provides improved cutting die structure having cutting edges terminating in curves of a minimal radius for forming the preferred cuts in a label web as pointed out above. As will be seen in the following detailed specification, normal mechanical machining techniques of the die forming trade are not suitable for forming the desired curved cutting edges since such techniques are generally limited to a cutting radius of not less than about 0.032 inches (without extensive die modification and expense which might reduce the radius to about 0.020inches.) A substantially smaller radius is desired in the formation of the label and connecting bridges. The improved die provided by the invention thus incorporates a cutting edge having curved portions, each with a radius substantially less than 0.032inches.

One method, contemplated by the invention, of forming an improved die includes modifying a cutting die, having an essentially unbroken cutting edge defining a desired label profile, by displacing the metal on one side of the cutting edge from the other side. The displaced metal forms a curved, minimal radius cutting edge and, after the die has been so treated, it provides a plurality of cutting edges terminating in curved ends, each of which ends lies adjacent, but spaced from, a corresponding curved end of another cutting edge. The nicked cutting edge thus can be used to partially precut labels from a label web, leaving the preferential bridges, as described above, between the label and the web remnant.

These and other objects and advantages of the invention will become readily apparent from the following detailed description and drawings in which:

FIG. **1** is a diagrammatic view of a web supply cutting operation wherein labels are partially precut from a supporting web;

FIG. **2** is a view of an improved label web taken along lines **2—2** of FIG. **1** and showing label supporting bridges in magnified form;

FIG. **2***a* is a magnified view of one of the bridges shown in FIG. **2**;

FIG. **3** is a view of an improved cutting die taken along lines **3—3** of FIG. **1**;

FIG. **4** is a magnified cross-sectional view of a cutting edge of the improved die taken along lines **4—4** of FIG. **3**;

FIG. **5** is a magnified cross-sectional view of an improved die taken along lines **5—5** of FIG. **3** and illustrating one mode of die preparation;

FIG. **6** is a magnified view taken along lines **6—6** of FIG. **5** and shows magnified curved cutting edges of an improved die;

FIG. **7** is a magnified view of a portion of an improved label, according to the inventio, which has been removed from a supporting web;

FIG. **8** is an illustration of a portion of a prior art label having an edge which includes a plurality of projections of bridge material after the label is removed from the web; and

FIG. **9** is an isometric view of a portion of a die formed according to a different technique than the die in FIGS. **3–6.**

Referring now particularly to the drawings, FIG. **1** diagrammatically depicts the preparation of a partially precut label supply, a potion of which is shown in FIG. **2.** In FIG. **1** an elongated, uncunt web of label stock in the form of a roll **10** is unwound the directed through a cutting station **11** comprising a rotary cutting die **12** and a platen roller **13.** At the cutting station, the elongated web is partially precut to provide an elongated label supply **14.** After cutting, the elongated label supply **14** is rewound upon itself to form a roll **15.** Prior to the formation of the roll **15,** and either before or after the web is drawn through the cutting station **11,** one side of the web can be subjected to a printing operation so that the areas which are to form the labels to be removed from the web are provided with desired printing indicia. Of course, both sides of the label can be printed where transparent containers are to be utilized, for example.

Once the percut web has been wound into the roll form as shown in **15,** it is thus in a form where it can be advantageously utilized in a labeling apparatus such as that disclosed in U.S. Pat. No. 3,661,625, the subject matter of which is incorporated herein by reference. In that apparatus, the precut label supply is drawn through an adhesive station where a tacky surface is established on the rear side of the partially precut labels, and the label web is than drawn into a detaching or an application station. At this station, a resilient plunger is driven through the web **14** to detach a label therefrom, to carry the label toward a product, and to thereafter press the label against a label receiving surface on the product. The resilient plungers utilized for this operation may be as disclosed in the aforesaid patent or may be such as disclosed in copending application Ser. No. 186,138 filed on Oct. 4, 1971, Herbert LaMers, inventor. The subject matter of that application is also incorporated herein by reference.

Returning now to the drawings of the present application, FIG. **2** shows a partially precut, elongated label web **14** comprising partially precut labels **20** removably supported in a web remnant **21.** The labels **20** generally extend from one end of the web **14** to the other and, as shown in FIG. **2,** each label is completely surrounded by portions of the web remnant **21.** The labels are shown in the drawings as having a generally square outline but it should be appreciated that the labels may have any of a great number of widely varying shapes and sizes.

Of course, the labels could be contiguous within the remnant **21,** that is adjacent labels could be connected to each other. In that event, however, the portion of the material connecting adjacent labels to eacch other would remain with one of the labels when the labels were removed from the web. In this alternate configuration, the adjacent label edges many possibly be completely severed from each other at the cutting station **11,** each label being held within the web only along its sides.

In the preferred embodiment, however, each label is surrounded by portions of the web remnant **21** and is removably held within the remnant by connecting members which will be referred to as "nicks" or bridges **22.**

Each of the partially precut labels in the web **14** have a shape which is substantially defined by a plurality of cuts **25** between the web remnant **21** and the label **20.** Each cut **25** has curved ends **26,** the ends curving inwardly toward the label shape defined by the cuts. Each of the cuts **25** lies generally in an end-to-end relationship with another cut **25,** each cut thus being, for purposes of description, adjacent another cut so that the curved end **26** of one cut is spaced from the curved end **26** of another or adjacent cut. In FIG. **2,** the curved ends of the cuts **25** and their spacing is amplified for clarity, it being understood that the actual bridges are smaller and less distinguishable than they actually appear on the formal drawing.

As shown particularly in the amplified version of FIG. **2***a*, corresponding curved ends **26** and **26***a* of adjacent cuts **25** and **25***a* form briding means **22** extending between the web remnant **21** and the label **20.** The bridges **22** have a tapered shape of varying widths, the width of the bridge near the remnant being relatively greater than the width of the bridge near the label. When the label **20** is removed in a transverse direction from the remnant **21,** by a resilient plunger as in the labeling apparatus disclosed in the patent cited above, the bridges **22** are torn apart at some point between the connection of the bridge to the label and to the web remnant.

More specifically, the bridges tend to part at a point which is interior of the label edge, as defined by the cuts **25,** so that the major portion of the bridge remains with the remnant **21** and only a very small portion remains with the label **20.** The portion of the bridge which remains with the label **20,** if any, is useful, however, in that the fibers F of the bridge material extend from the bottom of the depression formed along the cuts **25** and curved cuts **26,** upon removal of the label, and thereby tend to fill the depression and minimize the depression's visual effect in the label edge. This is shown diagrammatically in FIG. **7.** Even where the depression is not completely filled by the fibers of the bridge material which are left with the label, the end result is a label having very slight depressions which are visually insignificant insofar as a normal viewing distance of, for example, eighteen inches to two feet and beyond, it concerned. The result is a substantial improvement over labels which are cut according to prior methods and which, when removed from the label web, appear, for example, as shown in FIG. **8** of the drawings, the bridges forming projections or appendages on the edge of the label and presenting a somewhat ragged appearance.

The number and the actual dimensions of the bridges holding the labels in the label web are dependent upon the nature of the label web material, i.e., its thickness, moisture content, material characteristics, etc. With respect to common paper type labels, it has been found that a 60-pound litho paper coated on one side, such as that produced by the Newton Falls Company, is suitable for many labeling applications. It is generally contemplated that 40-pound paper up to 80-pound paper of the same general type may be utilized, and for special applications other types or forms of paper, or other material in kind or degree, may have useful application and can be treated according to the invention in a preferred manner. For example, foil with a bond backing or foil with a ground wood backing could also be used as a label web material from which the labels are partially precut according to this invention. Different kinds of plastic material could also be utilized, such as polyvinyl chloride, mylar, and polypropylene. In addition, it should be noted that the invention could also be used with labels having pre-applied adhesive such as thermo-activated adhesive. All of the above label web material specifications are set out herein by way of example only and are not to be taken as limiting.

With regard to the supporting of the labels within the web remnant **21,** the specific working parameters are: (1) enough support should be provided in order that the labels will not fall from the web remnant prior to the time they reach the application or removal station in the label apparatus; and (2) on the other end of the spectrum, the number of the bridges around a given label should be reduced as much as possible for appearance purposes. In this regard, and considering the fact that the label web is drawn longitudinally through a curved path within the label apparatus, it has been found that the strongest support is required on the ends of the label, (the ends being considered to be those portions generally transverse to the elongated web), and relatively less support is required along the sides of the labels. Thus, the number of bridges along the label sides could be reduced as compared with a number along the ends of the label, or in the alternative, the varying width of the bridges along the ends of the label could be increased as compared with the width of the bridges along the label sides. As has been previously stated, the number of bridges and their specific dimensions for a given label supply are determined by the character of the label web material and the label configuration.

In order to more specifically describe a preferred embodiment of the invention and in the case where 60-pound litho paper coated on one side is utilized, FIG. **2***a* depicts the general dimensions of a bridge **22** having a narrow width **W-1,** a greater width **W-2** and generally tapered edges (**26** and **26***a*), partially defining the bridges. The tapered edges of the bridge may not be entirely curved as shown but may include small straight portions as well. In any event, and for all practical purposes, the actual bridge profile closely approximates the corresponding depression in the label and is generally tapered as described. In this regard, it is important to note that the edge of the die used to make the cuts **26** and **26***a* has a given thickness of, for example, about 0.002 inches. One side of this edge, next to the label, is curved but the other side next to the bridge **22** may have straight portions as well. (This is hereinafter explained in more detail). Thus, the label edge has a depression formed by curved edges while the bridge has tapered edges which may be somewhat straighter. In any event, the curves **26** and **26***a* on the label edge each have a radius R for descriptive purposes. With the 60-pound paper specified above, the dimension **W-1** can be in the approximate range of about 0.015 inches to about 0.045 inches and the dimension **W-2** can be in the approximate range of about 0.027 inches to about 0.055 inches. The radius R of the curved label edge can be in the approximate range of about 0.006 inches to about 0.015 inches. In one specific embodiments, the lesser width **W-1** is about 0.020 inches, the greater width **W-2** is about 0.040 inches and the radius R is about 0.012 inches. The preferred moisture content by weight of the paper is in the approximate range of about 4 to 6%.

It will be understood that the dimensions discussed above are approximations only and may vary by at least

several thousandths due to manufacturing tolerances and the like. Furthermore, it is to be understood that cuts **25** and the curved ends **26** of the cuts are themselves approximately 0.002 inches in width but may also vary by several thousandths. For further explanation, the width W-1 refers to the width of the bridge material between the cuts **26** near the label, and the width W-2 refers to the width of the bridge at the point where the tapering of the tapered bridge edges begins near the web remnant. For descriptive purposes, reference to any radius by the phrase, "internal radius", means the radius of the internal edge of the cuts in the label **26** or of the die cutting projection as the case may be.

Further, it should be noted that while the curved ends **26** are generally cut on a radius, the imaginary center reference point from which the radius is drawn can be located at various locations so that the exact relationship of the layouts of the curved ends **26** can be varied to form somewhat differently shaped bridges than that as shown in FIG. **2***a*. Thus, the curved ends **26** can be set more deeply or less deeply into the label material during the cutting operation. While the various dimensions W-1, W-2 and R can be varied depending upon the character of the material of the elongated web and upon the size of the label, it is preferable to select those specific dimensions which provide the least amoung of "depression" in the label edge when the labels are removed from the web remnant.

The depression in the label edge thus formed when the labels are removed is diagrammatically shown in FIG. **7.** Again, FIG. 7 is a magnified version and is not to scale. The depression in the label and the other elements of the figure are amplified or reduced for clarity. In this figure, the label **20** has been removed from a web remnant **21,** the figure showing an amplified illustration of a bridge **22** which has parted. As shown in FIG. **7,** the major portion of the bridge **22** has remained with the web remnant **21** and only a very small portion of the bridge **22** remains with the label **20.** As seen in this figure, that small portion of the bridge material (fibers F) which remains with the label **20** extends upwardly and outwardly toward the edge of the label from the bottom of the depression which is partially formed by the curved lines **26.** In this manner, the fibers F tend to fill the depression and to make it less visible. As can be appreciated, the result of leaving the major part of the bridge with the web remnant and utilizing any portion of the bridge left with the label to partially fill up the depression created therein is significantly improved over the prior labels such as those illustrated in FIG. **8** wherein ragged projections P of bridge material extend outwardly of the label edge E and provide a ragged appearance to the label.

In addition to the partial cutting of the label from the elongated web at the station **11,** U-shaped sprocket holes partially defined by predetermined shape cuts **30** are formed in marginal edges of the web remnant **21.** In FIG. **2,** the sprocket holes are removably filled by tabs **31** and, when the web is engaged by a web driving sprocket means in the labeling apparatus, the tabs **31** are pushed outwardly of the plane of the web so that the teeth of the sprocket means can engage the web to drive it. Other suitable forms of sprocket holes can be used.

The construction of the cutting apparatus utilized to partially precut the labels in the elongated web is shown particularly in FIGS. **3** and **6** of the drawing. While it should be understood that a flat cutting die could be used, the rotary die to be described has been found to be suitable. In FIG. **3** a rotary cutting die **12** is illustrated and includes a body having a cylindrically-shaped die surface **35.** A plurality of cutting edges or projections **36** extend radially outwardly from the surface **35** and are generally perpendicular thereto. Each cutting edge or projection **36** provides a cutting land **37** having, as shown in FIG. **4,** a width L. In a preferred embodiment, this width is approximately 0.002 inches, but this can vary by several thousandths of an inch. Depending on the size of the label to be cut from the elongated web and the size of the rotary cutting die **12,** a plurality of cutting edges **36** are provided on the surface **35** to substantially define one or more desired label shapes.

Each of said plurality of cutting edges has two opposite ends, such as at **38** and **39.** Each of the ends **38** and **39** are curved inwardly toward the label shape substantially defined by the projections **36.**

As discussed above, it is desired to render a cut in a label web so that the cut defining the label edge has curved ends with an internal radius in the approximate range of about 0.006 inches to about 0.015 inches. As shown in FIG. **6** then, it is desired that the radius R-1 of the curved ends **38** and **39,** as shown in FIG. **6,** must be within the same approximate range.

To this end, the rotary cutting die **12** is formed by first providing an unbroken cutting edge or cutting projection completely defining the desired label shape and extending outwardly from the surface **35.** The unbroken cutting edge is then preferentially "nicked" to form depressions in the cutting edge and thereby the plurality of cutting edges as shown in FIG. **3.**

The preferential treatment of the unbroken cutting edge is specifically shown in FIG. **5** wherein a tool T (shown in phantom lines) having a symmetrical, chisel-like edge **50,** is forced at an angle A against the cutting projection **36.** The striking of the cutting projection or edge **36** by the tool T results in a forcible displacement of the edge in a transverse direction inwardly toward the label shape so that the displaced portion or material of the cutting edge **36** is thereby radiused to form the curved ends **38** and **39.** The angle A, formed between the longitudinal axis of the tool, which is perpendicular with respect to the cutting edge **50,** and the generally perpendicular direction of the cutting projection **36,** (with respect to surface **35**), can be varied throughout an approximate range of about 25° to about 60°; however, it is preferred that this angle be in the approximate range of about 30° to about 45°. It is to be understood that even the broader range is approximate and may be extended depending on the tool used, the die material, and the result desired.

Of course, the force with which the tool T is struck against the cutting projection **36** controls the depth of material displacement, which depth is defined by the bottom line **45** (FIGS. **4–6**). In addition, it will be appreciated that the widths W-3 and W-4 of the nicked out portion also correspond to the striking force of the tool T and to the angle A. In this respect, the angle and the striking force can be adjusted so that the widths W-3 and W-4 of the nicked out portion of the cutting projection correspond to the respective widths W-1 and W-2 of the desired bridge **22.** Thus, the striking force and angle A is selected so that the width W-3 is preferably in the approximate range of about 0.015 inches to about 0.045 inches and the width W-4 is in

the approximate range of about 0.027 inches to about 0.055 inches. By this method, the unbroken cutting edge is separated into a plurality of cutting edges, each of which has opposite ends terminating, for example, along the lines **46** and **39** and along the lines **47** and **38** as shown in FIG. **6.**

When the tool T has generally parallel sides extending from edge **50,** the lines **46** and **47** may have relatively straight portions but they also include radiused portions as at **48** and **49,** respectively and which are formed by the displacement of metal or die material by the tool. Thus, the actual sides of the bridges **22** (formed by the die) are partially straight and partially curved, the curved portions having a radius corresponding generally to the dimensions specified for R and R-**1.** It is quite apparent, however, that regardless of the actual profile of the edges of the bridge, the edges are tapered so that the bridge has a greater width near the web remnant and a lesser width near the label. It must be remembered that since the cutting land **37** is approximately 0.002 inches in width, the shape of the bridge **22** formed by the die closely approximates the general curved shape of the depression which is cut into the label by the curved edges **38** and **39.** It should be appreciated that the actual "nicking" can either be done by hand, with a tool as shown, or mechanically with a similar tool. Further it should be appreciated that the various figures are not drawn to scale but are for illustrative purposes only.

In addition to the above disclosure with regard to the cutting die and the method of making the cutting die, it is to be appreciated that other methods capable of providing the relatively small radius curves on the cutting edge of the die are available. For example, it is possible to form the cutting die by an electronic discharge machining technique, known in the machining trade.

One such die having a cutting edge formed by the electronic discharge machining technique is shown in FIG. **9** of the drawings. In essence, this technique involves the initial shaping of the die and its cutting edges by an electronic discharge operating to flake away the workpiece or the material near the desired die cutting edge. The desired die profile obtained by this method is shown diagrammatically in FIG. **9;** of course, the cutting edge shown in FIG. **9** is not shown to scale.

FIG. **9** discloses a portion of a rotary cutting die useful, for example, in the cutting operation depicted in FIG. **1,** in place of the cutting die **12.** Specifically, the figure depicts only a portion of the die at an area near the ends of two cutting edges, the scope then of this view being somewhat similar to that of FIG. **6.** The cylindrical die in FIG. **9** includes a cylindrical die surface **60** and a plurality of cutting edges or cutting projections **61.** Each of the projections extends generally perpendicularly and radially away from the die surface **60** and tapers from a relatively wide base to a relatively narrow cutting land **62.** The cutting land **62** is, as in the die described in FIGS. **3–6,** approximately 0.002 inches in width. Each of the plurality of projections **61** terminates at curved ends such as is shown at **63** and **64.**

In the electronic discharge process of die making, the cutting edge or projection **61** is not displaced but rather the edge is completely formed by the electronic process. As shown in FIG. **9,** each of the curved ends **63** and **64** of the projections **61** are spaced apart from each other a given width, such as indicated at W-**5,** so that when the cutting die is utilized on a web of paper, the spaced apart curved ends leave a bridge of material between the web remnant and the label, each of the curved ends cutting into the label and forming a depression therein. The straight portions of the cutting projection **61** are spaced apart at an even greater distance, such as shown at W-**6.** Thus, it can be seen that when the cutting die is utilized with a strip of paper, the bridge left between the label and the web remnant tapers from a relatively wider dimension (W-**6**) from a point near the web remnant to a narrower dimension (W-**5**) at a point near the label. Actually, the cuts made in the label web by this die ary very similar to the cuts shown in FIG. **2***a.*

With respect to the curved ends **63** and **64,** it can be seen in FIG. **9** that each of the curves involves a complete curvature of both sides of the cutting land **62.** Each of the curved ends is formed on a curvature having an internal radius such as diagrammatically indicated at R-**2.** The imaginary point from which this radius is drawn may be varied, however, so that the dimension indicated by the Arrow B (between the imaginary straight line extension of the projections **61** and the respective ends **65** and **66** of the curves **63** and **64**) may be different from the value of R-**2.** The manufacture of a die such as shown in FIG. **9** of the electronic machining process is an advantageous one in that more control can be maintained over the actual formation of the curved ends of the cutting edges, as compared with the mechanical nicking process as shown in FIGS. **3–6.**

While it is to be understood that the actual dimensions W-**5,** W-**6** and R-**2** of the die can suitably be in about the same approximate ranges as earlier set out herein with respect to the die structure shown in FIG. **6,** a preferred embodiment of the structure of FIG. **9** would include an R-**2** dimension in the approximate range of about 0.006 inches to about 0.015 inches, a W-**5** dimension in the approximate range of about 0.015 inches to about 0.045 inches, a W-**6** dimension of about 0.027 inches to about 0.055 inches and a B dimension of about 0.008 inches to about 0.010 inches. Even more specifically, one embodiment of a die such as shown in FIG. **9** could include an R-**2** dimension of about 0.012 inches, a W-**5** dimension of about 0.018 inches, a W-**6** dimension of about 0.037 inches and a B dimension of about 0.008 inches.

It should thus be appreciated that the applicants have provided a highly unique and improved label supply web and improved die structure for preferentially cutting the web in a unique novel manner so that the label, when removed from the web and placed on an object, presents an apparently clean cut label edge.

These and other modifications and alterations will become readily apparent to those of ordinary skill in the art without departing from the scope of the invention. For example, the various dimensions of the essential elements of the die structure, of the bridges between the web remnant and the label, or of the label itself may be varied somewhat for any particular application. It is to be understood that the ranges of the various dimensions set out herein are by way of example only and not by limitation and applicants thus intend to be bound only by the appended claims.

We claim:

1. A rolled, preprinted, precut label supply including an elongated web supporting labels therein, for use in apparatus adapted to apply labels to products, said apparatus including means for establishing a tacky surface to one side of said labels, a reciprocating resilient plunger means for engaging labels, for passing through

said web and detacning labels therefrom, for carrying labels toward and applying labels to products, and thereafter withdrawing through a web remnant, said resilient plunger means having a forward label engaging face with a predetermined shape, and sprocket means for transporting said web through said label applying apparatus, said preprinted, precut label supply comprising:

an elongated web in the form of a roll including a plurality of labels and a web remnant to which said labels are attached, said labels being located throughout said remnant from one end to the other of said web,

said labels being partially cut from said web remnant by a plurality of cuts extending completely through said web to define label profiles therein, the ends of said cuts comprising curves each having spaced apart from a corresponding curve of another cut to leave bridging means between said labels and said web remnant thereby to releasably hold said labels in said remnant,

each of said bridging means having a predetermined width varying from a greater width at an end of said bridging means near said web remnant to a lesser width at an opposite end of said briding means near said label so as to permit the detachment of said labels by said resilient plunger, transversely to said web remnant, without indiscriminate tearing of the label and such that the major portion of said bridging means remains with said web remnant,

said labels having two sides, at least one of which is adapted to bear printed indicia, and

sprocket holes in said web remnant and extending therealong, said sprocket holes disposed in said remnant to permit accurate registration of said remnant and said labels with respect to said resilient plunger.

2. A label supply as in claim **1** wherein depressions are formed in edges of said labels when labels are removed from said web remnant, and wherein said bridging means is parted when said label is removed from said web, any portion of said bridging means remaining with said label at least partially filling said depression in said label edges.

3. A label supply as in claim **1** wherein said labels have a shape corresponding to the predetermined shape of the plunger means.

4. A label supply as in claim **1** wherein said curves have an internal radius in the approximate range of about 0.006 inches to about 0.015 inches.

5. A label supply as in claim **4** wherein said radius is about 0.012 inches.

6. A label supply as in claim **4** wherein said greater width of said briding means is in the approximate range of about 0.027 inches to about 0.055 inches.

7. A label supply as in claim **4** wherein said greater width is about 0.040 inches.

8. A label supply as in claim **4** wherein said lesser width of said bridging means is in the approximate range of about 0.015 inches to about 0.045 inches.

9. A label supply as in claim **8** wherein said lesser width is about 0.020 inches.

10. A label supply as in claim **4** wherein said greater width of said bridging means is in the approximate range of about 0.027 inches to about 0.055 inches, and the lesser width of said bridging means is in the approximate range of about 0.015 inches to about 0.045 inches.

11. A label supply as in claim **10** wherein said internal radius is about 0.012 inches, said greater width is about 0.040 inches and said lesser width is about 0.020 inches.

12. A label supply as in claim **11** wherein said elongated web comprises 60-pound paper coated on one side and having a moisture content by weight in the approximate range of about 4% to about 6%.

13. A label supply as claim **11** wherein said elongated web comprises foil with a ground wood backing.

14. A label supply as in claim **11** wherein said elongated web comprises foil with a bond backing.

15. A label supply as in claim **11** wherein said elongated web comprises a plastic material.

16. A label supply for use in label applying apparatus having a resilient plunger with a forward face of predetermined shape for engaging a label carried in a web, for detaching the label from the web, and for applying the label to a product, said label supply comprising:

an elongated web in the form of a roll including a plurality of labels and a web remnant to which said labels are attached, said labels being located throughout said remnant from one end to the other of said web,

said labels being partially cut from said web remnant by a plurality of cuts extending completely through said web, the ends of said cuts comprising curves, each curve being spaced apart from a corresponding curve of another cut to leave bridging means between said labels and said web remnant thereby to releasably hold said labels in said remnant,

said bridging means having predetermined widths varying from a greater width at an end of said bridging means near said remnant to a lesser width at an opposite end of said bridging means near said label so as to permit the detachment of said labels by said resilient plunger, transversely to said web remnant, such that the major portion of said bridging means remains with said web remnant, and

said labels having two sides, at least one of which is adapted to bear printed indicia.

17. A label supply as in claim **16** wherein depressions are formed in edges of said labels when labels are removed from said web remnant, and wherein said bridging means is parted when said label is removed from said web, any portion of said bridging means remaining with said label at least partially filling said depressions in said label edges.

* * * * *

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 3,920,122

DATED : November 18, 1975

INVENTOR(S) : Allen W. Koehlinger et al

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 2, line 49, "wit" should be --with--.
Column 4, line 24, "percut" should be --precut--.
Column 4, line 32, "than" should be --then--.
Column 4, line 33, "this" should be --that--.
Column 4, line 56, "portion" should be --portions--.
Column 4, line 57, "eacch" should be --each--.
Column 4, line 60, "many" should be --may--.
Column 5, line 45, "it" should be --is--.
Column 6 , line 14, delete the second occurrence of "the".
Column 6, line 61, "embodiments" should be --embodiment--.
Column 7, line 27, "amoung" should be --amount--.
Column 7, line 28, "±" should be --"--.
Column 7, line 68, "and" should be --to--.
Column 8, line 32, "±" should be --"--.
Column 9, line 45, "shown" second occurrence to -- drawn --.
Column 11, line 1, "detacning" should be --detaching--.
Column 11, line 17, "having" should be --being--.

Signed and Sealed this

Fifth Day of October 1976

[SEAL]

Attest:

RUTH C. MASON
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents and Trademarks