April 28, 1964 J. S. FLEMING 3,130,885

PUNCH AND DIE FOR TEARING PAPER

Filed Nov. 1, 1962 4 Sheets-Sheet 1

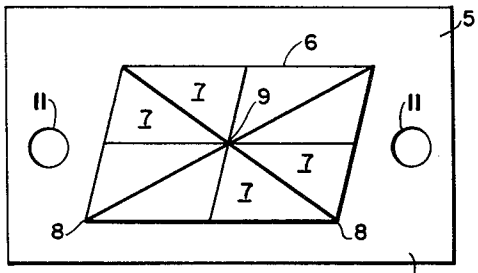


FIG. 1.

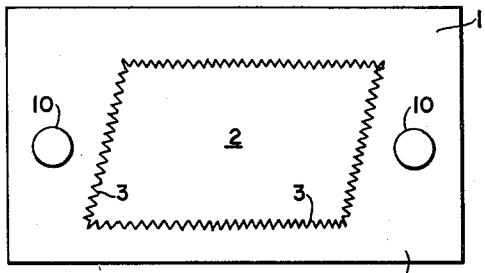


FIG. 2.

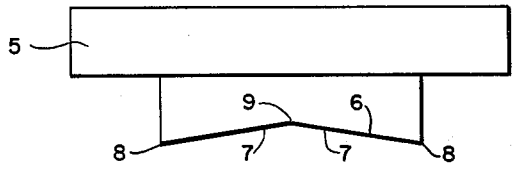


FIG. 3.

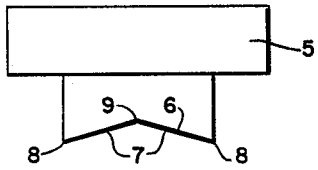


FIG. 4.

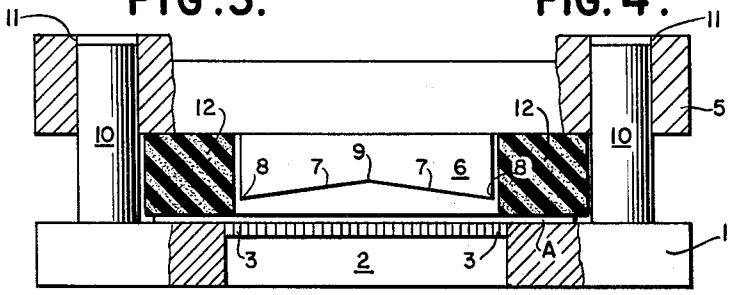


FIG. 5.

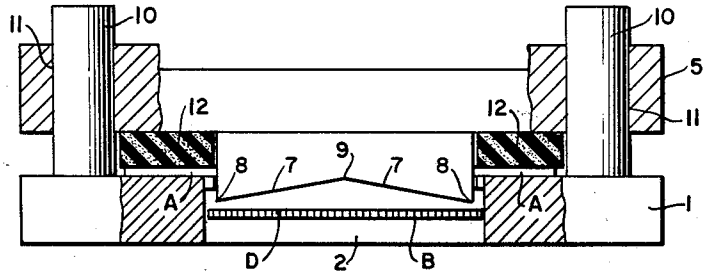


FIG. 6.

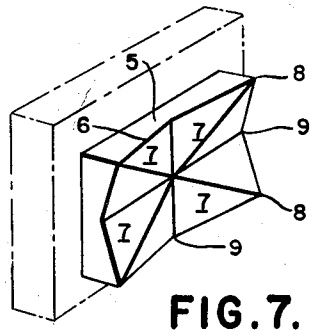


FIG. 7.

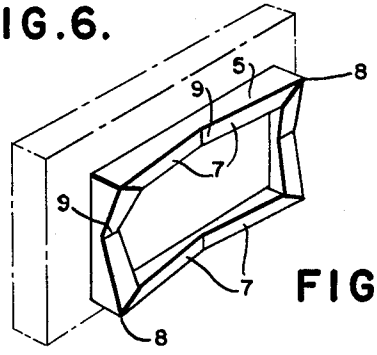


FIG. 8.

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PUNCH AND DIE FOR TEARING PAPER

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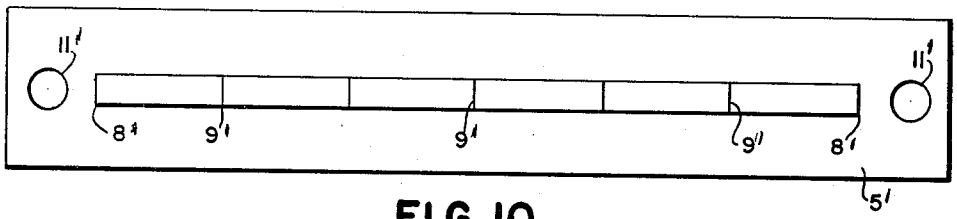


FIG. 10.

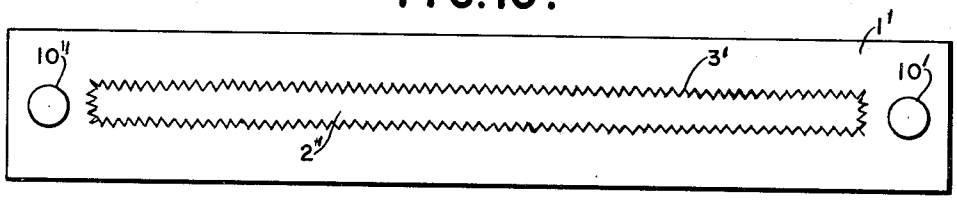


FIG. 13.

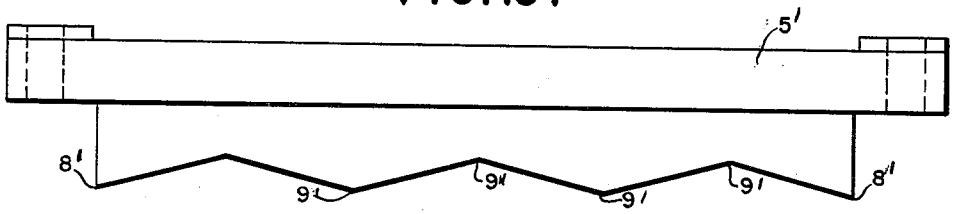


FIG. 11.

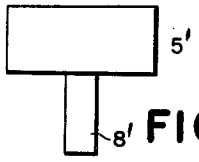


FIG. 12.

FIG. 14.

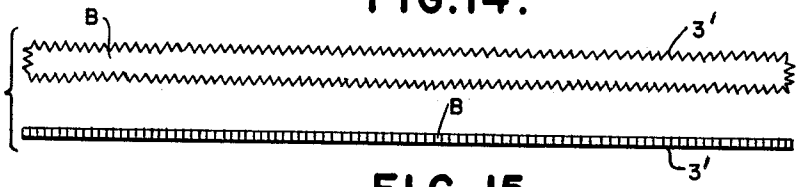


FIG. 15.

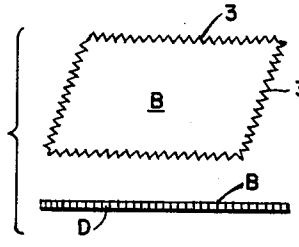


FIG. 9.

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PUNCH AND DIE FOR TEARING PAPER

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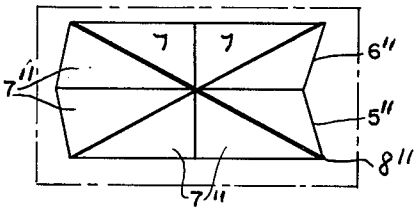


FIG. 24.

FIG. 16.

FIG. 22.

FIG. 23.

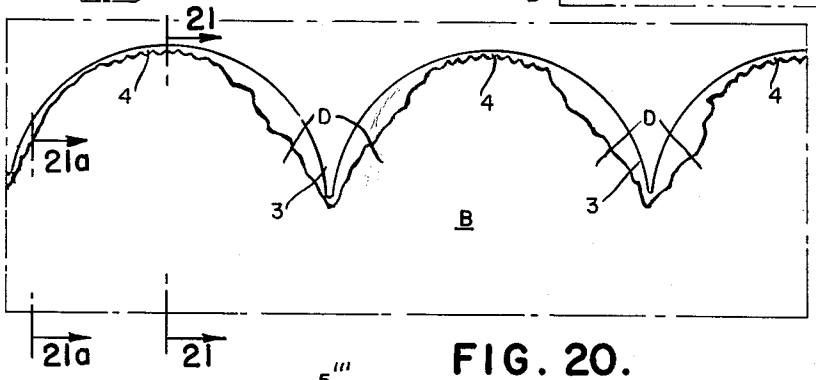


FIG. 20.

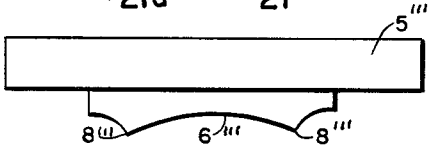


FIG. 17.

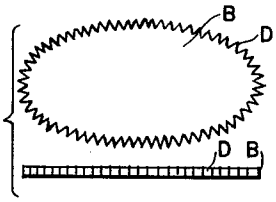


FIG. 19.

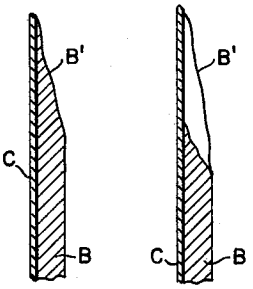


FIG. 21. FIG. 21a.

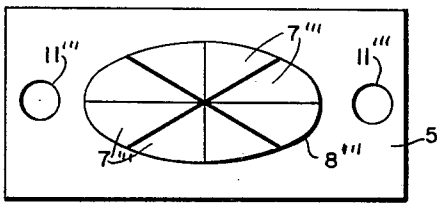


FIG. 18.

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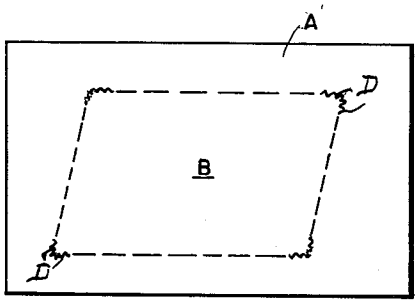


FIG. 25.

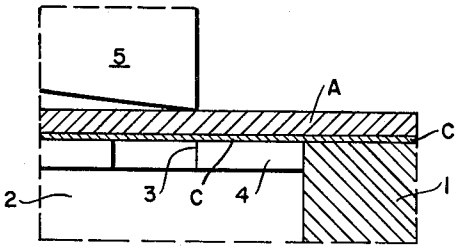


FIG. 28.

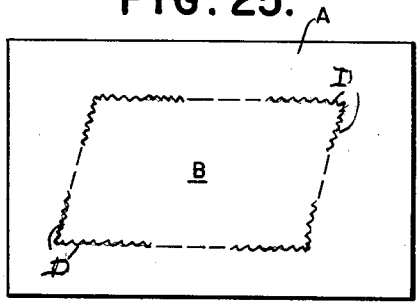


FIG. 26.

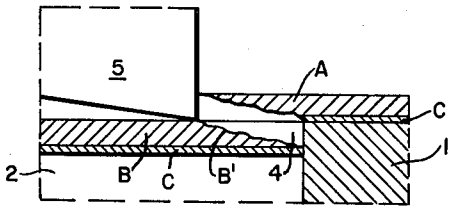


FIG. 29.

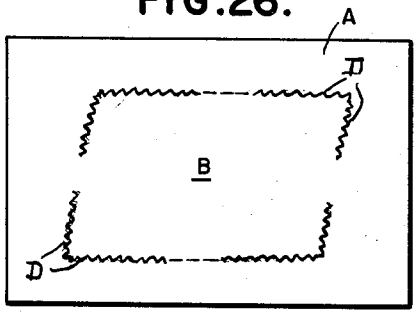


FIG. 27.

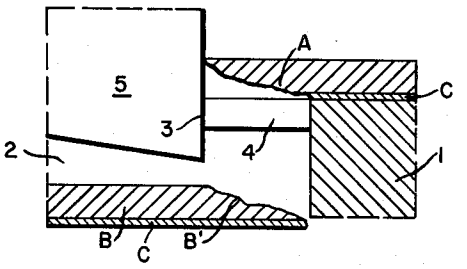


FIG. 30.

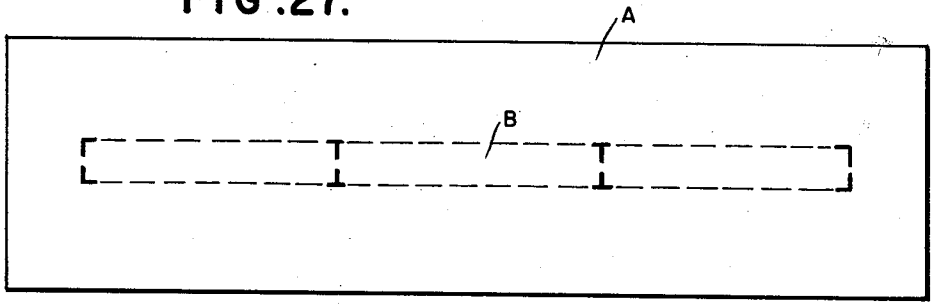


FIG. 31.

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United States Patent Office 3,130,885 Patented Apr. 28, 1964

3,130,885

PUNCH AND DIE FOR TEARING PAPER

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Filed Nov. 1, 1962, Ser. No. 234,759
6 Claims. (Cl. 225—97)

The invention relates to a machine for tearing from a paper work sheet a paper strip having the soft cushioned edge disclosed in the Fleming Patent Number 2,856,939, dated October 21, 1958.

An object is to provide a punch and die machine for tearing from a paper work sheet a paper strip having the soft cushioned edge as aforesaid, with the added feature of said soft edge being a serrated soft edge, that is to say it consists of a continuous series of approximately uniform serrations, found in practice to have improved dental cleaning effect inasmuch as in addition to other advantages it is better adapted for the reception of food particles within the notches of the serrations and dragging them from between the teeth during the movement of said strip between the teeth of the person using the said paper strip and against the gums.

Another object is to provide a punch and die machine for punching from a paper work sheet paper strips of varied patterns, such for example as multilateral, polygonal, oval or round strips.

Other objects and advantages will appear hereinafter or will be obvious.

The invention consists in the novel construction and combinations of parts hereinafter set forth in the claims.

In the accompanying drawings,

FIGURE 1 is a bottom plan view of the punch for a rhomboid strip, being part of one embodiment of the invention.

FIGURE 2 is a side view of the same.

FIGURE 3 is an end view of the same.

FIGURE 4 is a top plan view of the die for said embodiment.

FIGURE 5 is a side view of the machine with the punch in raised position and the work sheet in place between the punch and the die.

FIGURE 6 is a view similar to FIGURE 5, with the punch in its lower position and the strip punched from the work sheet.

FIGURE 7 is a perspective view of the punch for a rectangular strip.

FIGURE 8 is a perspective view of a modification thereof.

FIGURE 9 shows plan and edge views of the rhomboid strip.

FIGURE 10 is a bottom plan view of the punch part of a second embodiment of the invention.

FIGURE 11 is a side view of the same.

FIGURE 12 is an end view of the same.

FIGURE 13 is a top plan view of the die for said second embodiment.

FIGURE 14 is a side view of the same.

FIGURE 15 shows plan and edge views of the strip produced by the machine of said second embodiment.

FIGURE 16 is a perspective view of the punch part of said second embodiment.

FIGURE 17 is a side view of the punch part of a third embodiment of the invention.

FIGURE 18 is a bottom plan view of the same.

FIGURE 19 shows plan and edge views of the strip produced by the machine of said third embodiment.

FIGURE 20 is a plan view of a fragment of said strip produced by the machine of said third embodiment.

FIGURE 21 is a section on the line 21—21, FIGURE 20.

FIGURE 21*a* is a section on the line 21*a*—21*a*, FIGURE 20.

FIGURE 22 is a fragmentary plan view, showing on an enlarged scale the soft edge of the paper strip constituted by its serrations and the teeth of the die serrations piercing, that is to say in penetrating engagement with, said soft edge.

FIGURE 23 is a view similar to FIG. 22 of the soft edge constituted by its serrations.

FIGURE 24 is a bottom plan vie of the punch part of a fourth embodiment of the invention, the machine of which is adapted to produce a foldable strip consisting of two rhomboid strips joined together and foldable at the joint.

FIGURES 25, 26 and 27 are plan views of the paper work sheet showing on an enlarged scale the progressive tearing of the rhomboid paper strip out of the work sheet by progressive downward movement of the punch.

FIGURE 28 is a fragmentary vertical section on an enlarged scale showing the initial contact of the punch with the work sheet.

FIGURE 29 is a view similar to FIGURE 28 showing the punch depressing and tearing a part of the inchoate strip out of the work sheet and the soft torn edge of the inchoate strip in a notch of the die serrations.

FIGURE 30 is a view similar to FIGURE 29 showing the punch at the end of its downward movement and the paper strip punched out of the work sheet.

FIGURE 31 is a bottom plan view of the work sheet showing diagrammatically the initial contact of the punch therewith at the four corners and also at points intermediately of the length of the narrow elongated paper strip.

The punch and die machine for tearing from a paper work sheet A, a paper strip B, having opposite soft beveled edges each constituted by a continuous series of uniform serrations D, is described as follows:

In the drawings, the numeral **1** designates the die, having an opening **2**, opposite sides of which are each provided with a continuous series of uniform horizontally projecting serrations comprising teeth **3** and notches **4**, between said teeth.

The punch **5**, adapted to work within said opening within the inner ends of the teeth of said serrations, has a recessed bottom **6**, the surfaces **7** of which are inclined at a low angle to the horizontal and intersect the opposite vertical walls of the punch at acute angles **8**, said bottom surfaces intersecting each other at obtuse angles **9**.

In operation, the punch is forced down within said die opening within the inner ends of the teeth of said die serrations and guided for true vertical movement precisely aligned with the die, by guide posts **10** of the die engaging perforations **11** of the punch, the work sheet A interposed between the die and the punch being held securely against that portion of the die marginal to its said opening by a resilient cushion **12** of sponge rubber or its equivalent interposed between the die and the punch above the work sheet, said cushion being compressed during the punching.

The tear of the work sheet to provide the paper strip with opposite soft beveled edges each constituted by a continuous series of uniform serrations is described as follows:

As the work sheet is progressively stretched taut across the die opening by progressive downward movement of the punch, the punch first contacts and depresses the work sheet at the four corners of the inchoate strip, assuming the strip is a rhomboid as in FIG. 1, and pushes said four corners edgewise in the plane of the paper out of the work sheet into penetrating engagement with the four corner teeth of the die serrations to establish four

points of resistance from which the tear is started, and being continued in conformity with the shape of the die serrations but out of contact therewith to further depress and tear said four corners of the inchoate strip out of the work sheet and push them edgewise into penetrating engagement with the next succeeding teeth of the die serrations, which ends the tear cycle and completes one step or cycle of the tear. Said second penetrating engagement with the next succeeding teeth of the die serrations in turn starts a second tear cycle, this operation being continued with progessive alternate penetrating engagement and tear until the tearing of the paper strip out of the work sheet is completed and the completed strip is pressed down out of the work sheet at the end of the downward movement of the punch.

The stretching of the work sheet taut across the die opening and the pushing of said corners progressively into penetrating engagement with the teeth of the die serrations is due to the low angle to the horizontal of said bottom surfaces 7 of the punch and the intersection of said bottom surfaces with the vertical wall of the punch at acute angles 8. The intersection of said bottom surfaces with each other at obtuse angles 9 is necessary to complete the tearing operation.

The serrations D of the paper strip are quite uniform and close together, and the adjacent edges thereof have approximate right angle relation to each other.

If the strip is a narrow elongated strip as in FIG. 14 of length about six inches and width one-quarter inch, the related narrow elongated punch first contacts the work sheet at said four corners and also at two-inch intervals intermediate thereof, as in FIG. 27. This is because the low inclination to the horizontal of the bottom surfaces 7 of the punch is subject to only slight variation, due to the thinness of the paper.

Inasmuch as the punch is moved downwardly within the die opening within the inner ends of the teeth of the die serrations, and the resulting paper strip serrations D which constitute its soft edge extend within the notches of the die serrations, the area of the paper strip B is larger than the area of the die opening 2 to the extent of the paper strip serrations constituting its soft edge.

The serrated soft edges D of the paper strip B are beveled and have the pulp of the paper exposed upon one side B' thereof, and are provided with the thin superficial coating C of water repellant material upon their non-beveled sides to support said soft edge against undue vertical yielding during movement of said strip between adjacent teeth and against the gums, the pressure load being distributed between said soft edge and said coating.

The right is reserved to modifications coming within the scope of the claims.

The second, third and fourth embodiments have the same reference characters applied thereto as has said first embodiment but distinguished therefrom by the exponents, ' for said second embodiment, " for said third embodiment, and "' for said fourth embodiment.

I claim:

1. In a punch and die machine means for tearing from a paper work sheet a paper strip having opposite soft beveled edges constituted by a continuous series of uniform serrations, comprising a die having an opening, opposite sides of which are each provided with a continuous series of uniform horizontally projecting serrations and a punch adapted to work within said opening within the inner ends of the teeth of said die serrations, said punch having a recessed bottom the surfaces of which are inclined at a low angle to the horizontal and which intersect the opposite vertical walls of the punch at acute angles.

2. A punch and die machine as defined in claim 1, in which said bottom surfaces intersect the vertical walls of the punch at acute angles extending entirely around the punch, and said bottom surfaces intersect each other at obtuse angles.

3. In a punch and die machine, means for tearing from a paper work sheet a narrow elongated paper strip having opposite soft beveled edges constituted by a continuous series of uniform serrations, comprising a die having a narrow elongated rectangular opening, and a narrow elongated rectangular punch workable within said opening within the inner ends of the teeth of the die serrations, said punch having a recessed bottom the surfaces of which are inclined at a low angle to the horizontal, the endmost of said bottom surfaces intersecting the opposite vertical end walls of the punch at acute angles, said bottom surfaces intersecting each other at obtuse angles.

4. In a punch and die machine means for tearing from a paper work sheet a foldable paper strip consisting of two rhomboid strips joined together and foldable at the joint, said strip having opposite soft beveled edges each constituted by a continuous series of uniform serrations, comprising a die having an opening the shape of which corresponds to that of said strip, the opposite sides of said opening being each provided with a continuous series of uniform serrations, and a punch of said shape workable within said opening within the inner edges of the teeth of the die serrations, said punch having a recessed bottom the surfaces of which are inclined at a low angle to the horizontal and which intersect the vertical walls of the punch at acute angles entirely around the punch, said bottom surfaces intersecting each other at obtuse angles.

5. In a punch and die machine means for tearing from a paper work sheet a rhomboid paper strip having opposite soft beveled edges each constituted by a continuous series of uniform serrations, comprising a die having an opening the shape of which corresponds to that of said strip, the opposite sides of said opening being each provided with a continuous series of uniform serrations, and a punch of said shape workable within said opening within the inner ends of the teeth of the die serrations, said punch having a recessed bottom the surfaces of which are inclined at a low angle to the horizontal and which intersect the vertical walls of the punch at acute angles entirely around the punch, said bottom surfaces intersecting each other at obtuse angles.

6. In a punch and die machine means for tearing from a paper work sheet an oval paper strip having a soft beveled edge extending entirely around it, said soft edge being constituted by a continuous series of uniform serrations, comprising a die having an opening of oval shape, said opening having a continuous series of uniform serrations extending entirely around it, and a punch of oval shape workable within said opening within the inner ends of the teeth of said serrations, said punch having a recessed bottom the surfaces of which are inclined at a low angle to the horizontal and which intersect the vertical walls of the punch at acute angles, said bottom surfaces intersecting each other at obtuse angles.

References Cited in the file of this patent

UNITED STATES PATENTS

956,434	Schwartz	Apr. 26, 1910
2,120,329	Henneke et al.	June 14, 1938
2,856,939	Fleming	Oct. 21, 1958

FOREIGN PATENTS

5,260	Great Britain	Mar. 2, 1911