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Suominen et al.

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[54] **PUNCH FOR SIMULTANEOUSLY PUNCHING UNEQUAL SIZED HOLES**

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[52] **U.S. Cl.** ..... **83/98,** 83/139, 83/188, 83/191, 83/618, 83/685, 83/688, 93/33 R

[51] **Int. Cl.** **B26f 1/02**

[58] **Field of Search** ..... 83/98, 54, 139, 188, 191, 83/618, 685, 688, 687; 93/33 R, 35 H

[56] **References Cited**

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Primary Examiner—Frank T. Yost

Attorney, Agent, or Firm—George Vande Sande

[57] **ABSTRACT**

Punch apparatus for simultaneously punching concentric but unequal sized holes in two adjacent material sheets. The punch apparatus is made up of three members: a punch, a die block, and an intermediate piece. The intermediate piece coacts with the punch and performs the function of a die block, and the intermediate piece also coacts with the die block to perform the function of a punch. The first material sheet is located intermediate the punch and intermediate piece, and the second sheet of material is located intermediate the intermediate piece and the die block. Downward movement of the punch, in cooperation with the intermediate piece, punches one hole in the sheet between the punch and intermediate piece. Downward movement of the punch also causes the intermediate piece to move downward and punch a hole in the second sheet of material, concentric with the first hole, but of a different diameter. Flexible loosening rings can be used to facilitate removal of the punched out material. In addition to the loosening rings or alternatively in lieu thereof, the punch and die block are provided with air passages to communicate with an air supply to remove the punched out material.

10 Claims, 5 Drawing Figures

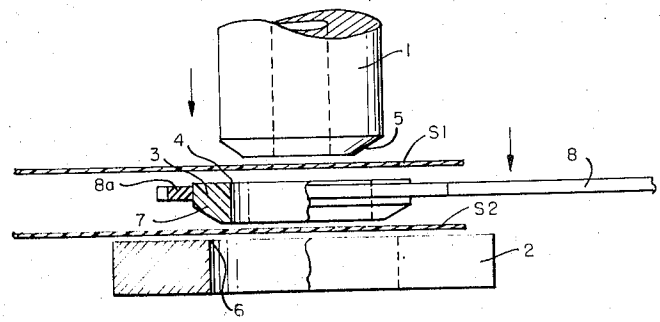


FIG. 1.

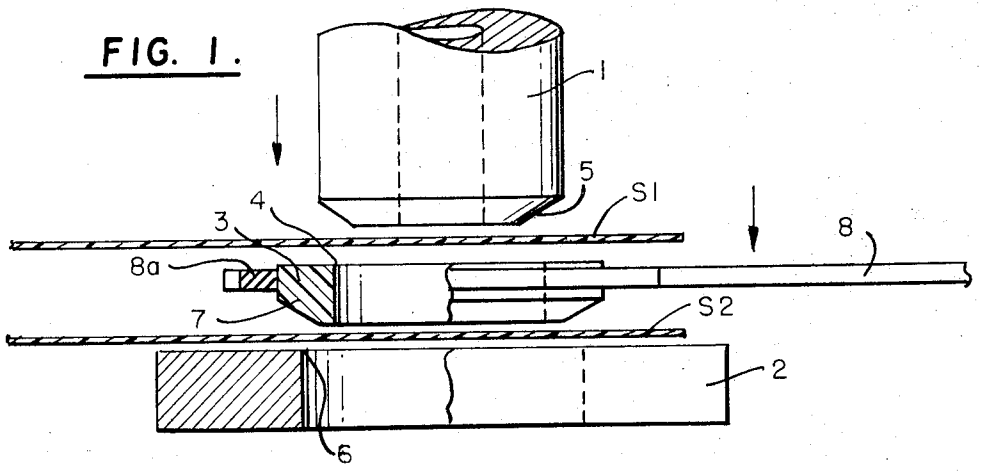


FIG. 2.

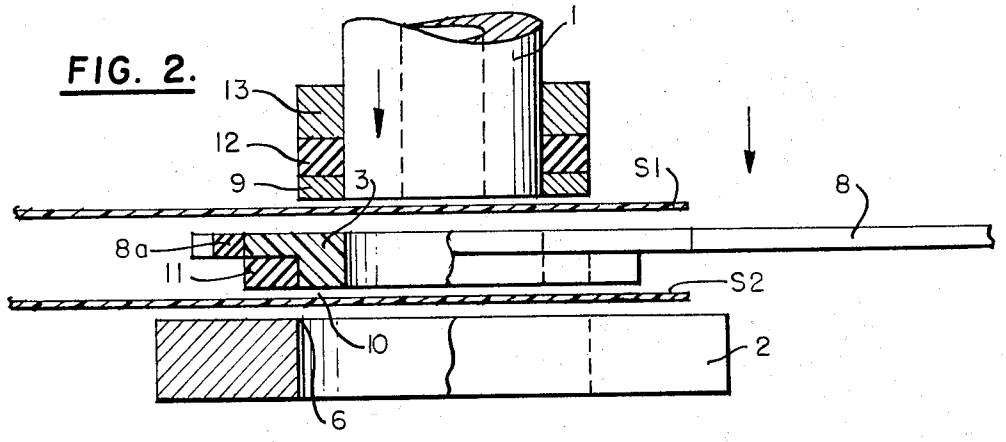


FIG. 3.

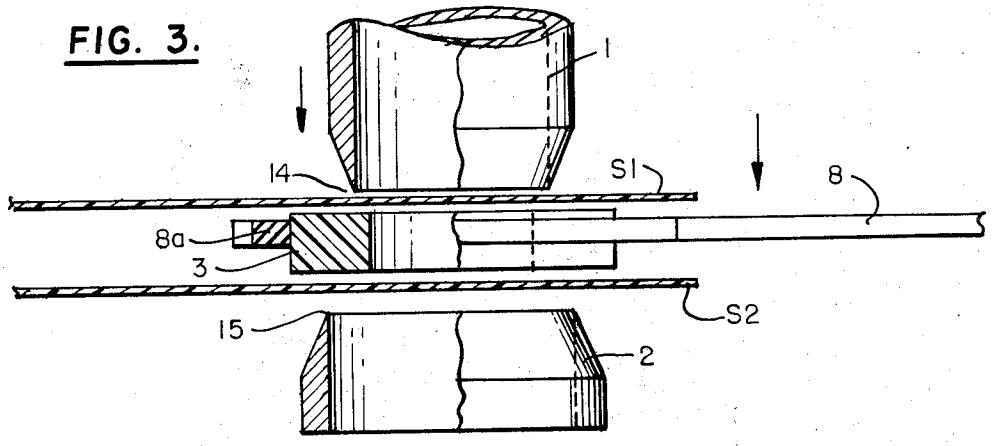


FIG. 4.

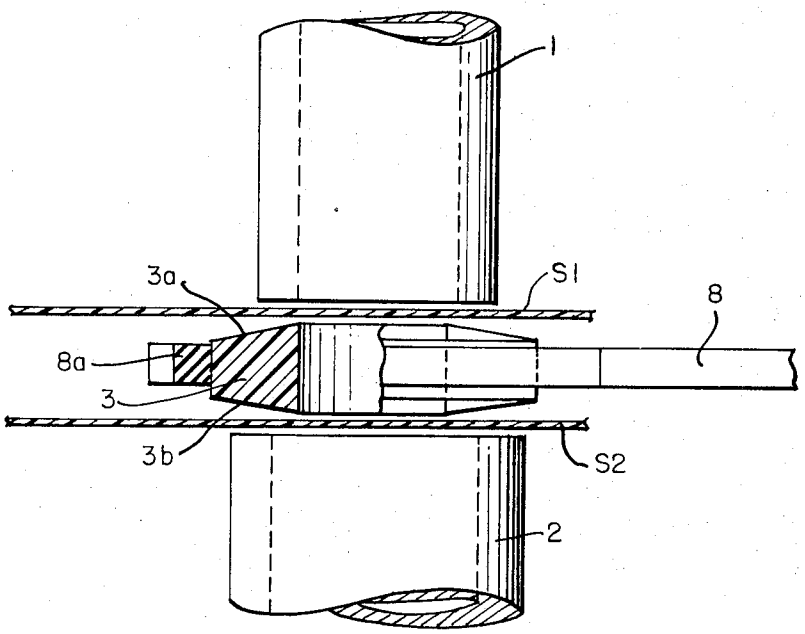
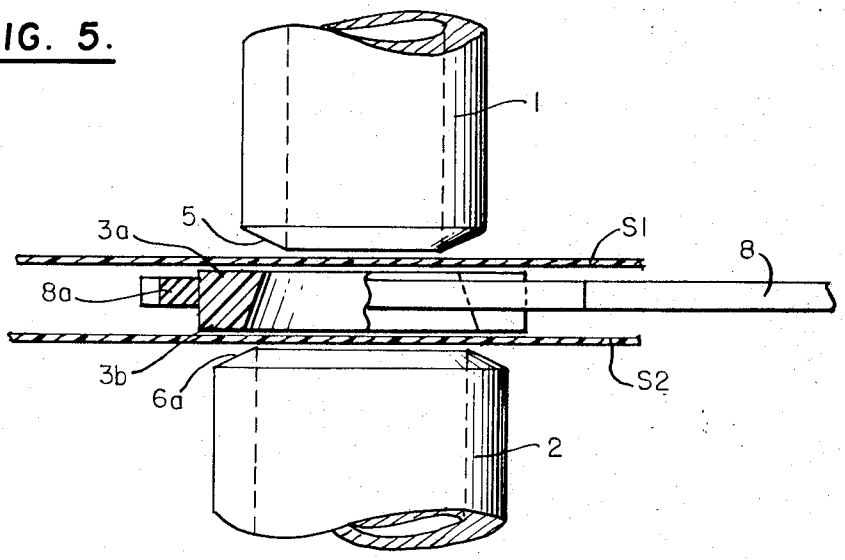


FIG. 5.



PUNCH FOR SIMULTANEOUSLY PUNCHING UNEQUAL SIZED HOLES

FIELD OF THE INVENTION

The present invention relates to punching apparatus and more particularly relates to a single punching apparatus which simultaneously punches, in two films or sheets of material, concentric holes of differing diameters.

BACKGROUND OF THE INVENTION

Until the present time, paper bags have been used virtually exclusively in the packaging of groceries and the like in grocery stores, supermarts, etc. The predominant use of paper for this purpose is continued despite the widescale introduction throughout the world of plastic bags formed of a thin film of flexible plastic material.

Plastic bags have several distinct advantages. Among these are their superior wet-strength characteristics, since, as is well known, a paper bag will be rendered virtually useless if the paper is soaked with water, whereas a plastic bag retains its full original strength. A further advantage of plastic materials is the ability to provide them in a variety of colors and also the ability to print them with attractive designs and various colors so that the bags can provide an important advertising function for the retailer. This, coupled with the fact that such bags have a longer life and can be re-used many times, renders the use of such bags attractive to a retailer because of the knowledge that the advertising on the bags many times will be effective long after the first use.

Despite these advantages of plastic bags, they have not heretofore been used to any significant degree in the packaging of groceries in supermarkets or the like. One of the chief reasons for this is that the high degree of flexibility of the plastic film has rendered it impossible for the bag to be self-supporting. In other words, when a cashier at a checkout counter of a supermarket is about to load groceries into the bag, it is important that the bag, when opened, is capable of staying open so that the cashier can readily put articles into the bag without having to spend any further effort in maintaining the bag in its open position. Obviously the virtually total lack of stiffness of the thin film of plastic material used in plastic bags makes it impossible for such a bag to remain open and upright by itself.

Various types of store fixtures have been devised whose function it is to hold a plastic bag in the open position. A related application, Ser. No. 262,899, filed June 14, 1972, discloses and claims a particular form of apparatus for such use. It is important to the apparatus disclosed in the aforementioned application that the plastic bag have a pair of concentric holes, one in each side wall of the bag. However, to use the apparatus disclosed in the aforementioned application, it is necessary for these holes to be of different diameters. The present invention is concerned with an apparatus for simultaneously punching out holes in two films of plastic material, which holes are concentric, but of different diameters.

Two such concentric holes of unequal diameters can obviously be formed in the plastic material in two different steps, by using one punch for the first hole and a second punch of different size for the second hole.

However, this two step operation is more expensive and time-consuming and leads to the greater possibility of errors, as compared with an operation to form both holes simultaneously. Applicants thus sought to devise a punch for punching unequal but concentric holes in two adjacent films of material.

SUMMARY OF THE INVENTION

The apparatus of the present invention comprises three elements: a punch, a die block, and an intermediate member. The first film of material to be punched is located between the punch and intermediate member, and the second film of material to be punched is located between the intermediate member and the die block. The intermediate member comprises a pair of substantially parallel faces. One face is adjacent the punch and one face is adjacent the die block. Downward movement of the punch, coacting with the intermediate member, causes a hole to be punched in the first film of material. The diameter of this hole is determined by the configuration of the punch and the configuration of the intermediate member adjacent the punch. The same downward movement of the punch, when the punch intersects the intermediate member, causes the intermediate member to also move downward. The movement of the intermediate member, coacting with the die block, causes a hole to be punched in the second film of material. The size of the second hole is determined by the configuration of the die block and also by the configuration of the intermediate member facing the die block.

BRIEF DESCRIPTION OF THE DRAWINGS

In the course of this specification reference will be made to the five figures of drawing as an aid to understanding the apparatus of the present invention and the manner in which it is used. In these figures of drawing:

FIG. **1** is a cross-sectional view of one embodiment of the present invention;

FIG. **2** is a cross-sectional view of a different embodiment of the present invention;

FIG. **3** is a cross-sectional view of still another embodiment of the present invention;

FIG. **4** is a cross-sectional view of still another embodiment of the present invention; and

FIG. **5** is a cross-sectional view of still another embodiment of the present invention.

DETAILED DESCRIPTION OF THE DRAWINGS

FIG. **1** is a cross-sectional view showing schematically the operative elements of one embodiment of the present invention. A punch **1** is capable of reciprocating movement in one direction. The main portion of the punch is cylindrical in shape. The face of the punch **1** is partially formed as a spherical surface **5**. In FIG. **1**, **S1** and **S2** are the films to be punched and are laid opposite one another, for example on the production line of a bag-making machine. The sheet of material is conveyed by cyclical forward motion at right angles to the plane of the drawing. **S1** and **S2** thus represent, respectively, the opposite walls of the plastic bag to be manufactured. The intermediate member **3** is formed in the shape of a ring and operates simultaneously as a die block when punching the sheet **S1** and as a punch when punching the lower sheet **S2**. The upper edge **4** of the intermediate member **3** is formed as a sharpened cut-

ting edge against which the upper sheet S1 is sheared due to the motion of punch 1. The lower face 7 of the intermediate member 3, that is the face adjacent the die block 2, is partially formed as a spherical surface.

This surface 7 cooperates with the die block 2 to form the hole in the lower sheet S2. In particular, the upper edge of the die block 2, at 6, is formed as a sharpened cutting edge. A sheet S2 is sheared through the coaction of the partially spherically formed surface 7 of the intermediate member 3 with the sharpened edge 6 of the die block 2, when the downward movement of punch 1 causes the intermediate member 3 to also move downwardly.

The intermediate member 3 is joined, by means of an arm 8, with the body of the machine or apparatus in which the tool is used. Preferably the arm 8 is provided with a spring (not shown in the drawing) or similar means keeping the intermediate member at rest approximately in the middle position between the punch 1 and the die block 2 so that the sheets, S1 and S2, can be freely fed forward between punching. The surfaces 5 and 7 are partly spherical because the spherical surface will allow slight deviations from exact alignment between punch 1, intermediate member 3, and die block 2. This facilitates setting up the tool and minimizes the possibility that the tool or portions thereof will be come entangled in the punched material.

To further provide freedom for self-alignment of the tool, the intermediate portion 3 is attached to the arm 8 by means of an elastic ring-formed member 8*a*, made, for example, of rubber or similar elastic material. Member 8*a* can, of course, be made as a combination of metal biasing spring members which have a similar effect.

In order to facilitate the sharpening of the tool parts, the hardening of the parts is preferably effected so that the hardness of the spherical surfaces 5 and 7 is greater than the hardness of the flat surfaces 4 and 6. As a result, the spherical surfaces will not be worn down and only the flat surfaces 4 and 6 will require resharpening from time to time. As is well known, the resharpening of the flat surfaces 4 and 6 is much easier than resurfacing of the spherical surfaces 5 and 7.

A further embodiment of the invention is illustrated in FIG. 2 which shows a generally similar punch 1, intermediate member 3, and die block 2. In contrast with the embodiment shown in FIG. 1, the face of punch 1 is flat, as is the lower face of the intermediate member 3. Engaged around the periphery of punch 1, adjacent its lower face, is a ring-like member 9. Immediately adjacent the ring-like member 9, and also surrounding the periphery of the punch 1, is an elastic ring 12 made of rubber or similar material. Immediately adjacent the elastic ring 12 is a fastening ring 13 also located around the periphery of the punch 1. The intermediate member 3 has both its upper and lower faces flat, in contrast with the embodiment shown in FIG. 1. Furthermore, an additional elastic ring 11 is located to surround a portion of the periphery of the intermediate member 3 adjacent the lower face thereof.

In operation, when the punch 1 is depressed, it enters into the hole in intermediate member 3 and performs the punching operation with respect to sheet S1. The ring 9, contacting the upper face of the intermediate member 3, causes the intermediate member to move downward. As the intermediate member moves downward its lower face enters the hole formed in die block 2 performing the punching of the lower sheet S2. This latter punching operation takes place between the punching edge 10 in the lower face of intermediate member 3 and the edge 6 of the die block 2. When the punch 1 rises, the releasing ring 11, which is made of rubber or some elastic material, springs back thus preventing the sheet S2 from becoming entangled in the punching apparatus. The ring 9 has a similar function with respect to the cooperation of tool 1 and intermediate member 3, to prevent the sheet S1 from becoming entangled in the punching apparatus. Although the ring 9 itself is not elastic, behind ring 9 the flexible ring 12 is provided. In addition to preventing the sheets S1 and S2 from becoming tangled in the punching apparatus, the rings 9 and 11 also press the sheets S1 and S2 against the middle member and the die block 2 resulting in a cleaner shearing effect.

Still another embodiment of the invention is shown in FIG. 3. In FIG. 3 the punch 1 and die 2 are both tubular and provided with sharp bevelled cutting edges 14 and 15 respectively, similar to so-called dinking dies. The intermediate member 3 is made of a suitable material which is somewhat softer than the cutting edges, for example teflon-plastic or other material with similar characteristics. The sheets S1 and S2 are cut against this member 3 which is also connected with the body of the apparatus by means of the arm 8 through the intermediary of the flexible member 8*a*. As a result, the intermediate member 3 can easily be changed for a new one when that becomes necessary.

Still another embodiment of the invention is shown in FIG. 4. In FIG. 4 the punch 1 and die block 2 are tubular. In contrast, however, to FIG. 3, the ends of punch 1 and die block 2 are made flat. In this case the intermediate member 3 has a surface 3*a* which coacts with punch 1 and a surface 3*b* which coacts with die block 2. The respective surfaces 3*a* and 3*b* are spherical. The intermediate member 3, in FIG. 4, is connected to an arm 8 which is itself connected to the punching apparatus. As in FIGS. 1–3, the intermediate member 3 is connected with the arm 8 through the intermediary of flexible member 8*a*.

Still another embodiment of the invention is shown in FIG. 5. In FIG. 5, the tubular punch and die blocks 1 and 2, respectively, have their end surfaces 5 and 6*a* both of spherical form. Correspondingly, the upper surface 3*a* of intermediate member 3 and the lower surface 3*b* of intermediate member 3 are made flat. This facilitates the sharpening of these edges. The hole or opening in the intermediate member 3 is conical as shown in FIG. 5. As is the case in FIGS. 1–4, the intermediate member 3 is attached to the arm 8 through the intermediary of elastic ring 8*a*.

In all the embodiments, that is in the embodiments of FIGS. 1–5, the waste stampings, the material that is stamped out of sheets S1 and S2, can be removed by blowing compressed air through the openings in punch 1, die block 2, and intermediate member 3.

It should be readily apparent that applicants have provided a punch which is capable of punching, simultaneously, in two different thin flexible sheets, two concentric holes of differing diameters.

What we claim is:

1. Punching apparatus, capable of simultaneously and concentrically punching in two sheets of material holes of differing diameters, comprising

a punch and die block, said punch being capable of reciprocating movement relative to said die block,

an intermediate member located intermediate of said punch and said die block,

said intermediate member having surfaces adjacent said punch and said die blcok,

whereby cutting of one sheet of material occurs by cooperation between said punch and said face of said intermediate member adjacent said punch, and cutting of said second sheet of material occurs by reason of coaction between said face of said intermediate member adjacent said die block and said die block.

2. The punch apparatus of claim **1** wherein said punch has a face adjacent said intermediate member which is spherical,

said face of said intermediate member adjacent said die block also being spherical,

said spherical surface of said punch cooperating with a planar surface of said intermediate member adjacent said punch,

and said spherical surface of said intermediate member cooperating with a planar surface of said die block adjacent said intermediate member.

3. The punch apparatus of claim **1** wherein said punch has a face adjacent said intermediate member which is spherical, said die block has a spherical surface adjacent said intermediate member,

said surfaces of said intermediate member being planar.

4. The punch apparatus of claim **1** in which said punch and die block are tubular, each with planar surfaces adjacent said intermediate member,

said intermediate member having a spherical surface adjacent both said punch and said die block.

5. The punch of claim **1** wherein one of the punch-intermediate member surfaces is planar and the other is spherical,

one of the intermediate member-die block surfaces is planar and the other is planar, and in which

said spherical surfaces have a higher hardness than said planar surfaces.

6. The apparatus of claim **1** in which

said intermediate member surface adjacent said punch has an opening of diameter equal to the diameter of said punch,

said intermediate member surface adjacent said die block forms a punching edge equal in size to an opening in said die block surface adjacent said intermediate member.

7. The punching apparatus of claim **6** in which said punch and said intermediate member have flexible releasing rings.

8. The apparatus of claim **1** in which said punch and die block are tubular with bevelled cutting edges,

said intermediate member having planar surfaces against which said punch and die block are pressed for cutting.

9. The apparatus of claim **1** in which said intermediate member is attached to a tool body by an arm,

in which said intermediate member is secured to said arm by a flexible member.

10. The apparatus of claim **1** in which said punch, die block and intermediate member have openings for an air supply to remove waste material.

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