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SELF-CLEANING CUTTING DIE WITH STRIPPER ELEMENT

Filed Oct. 6, 1964

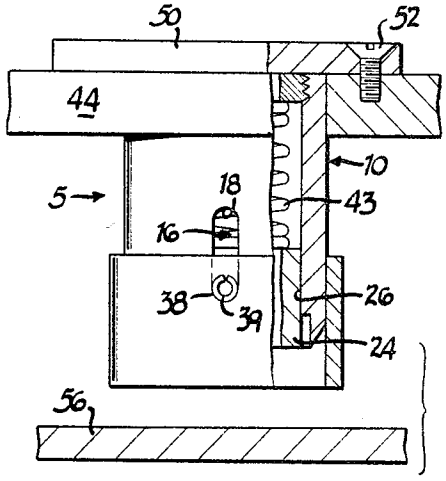


FIG. 1

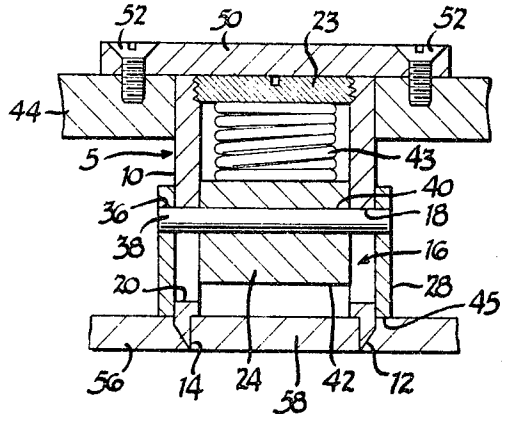


FIG. 3

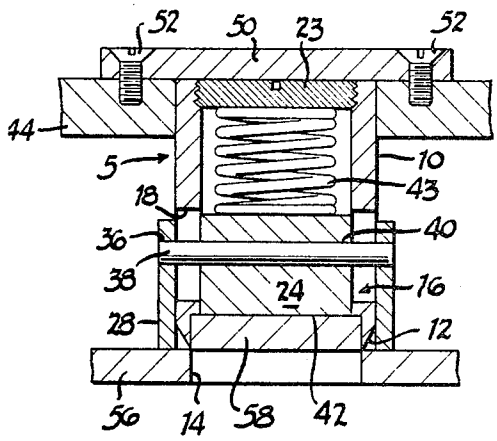


FIG. 4

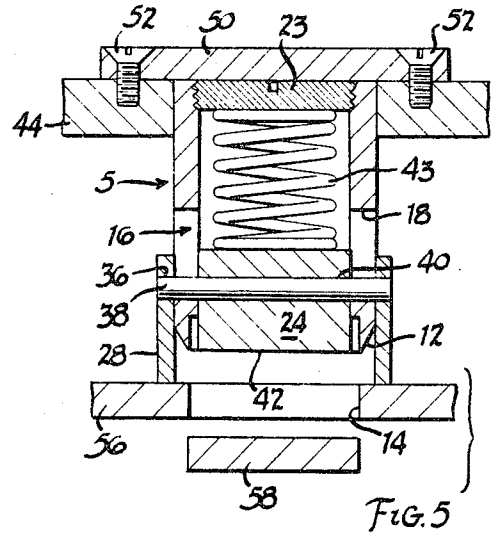


FIG. 5

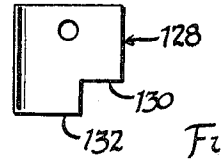


FIG. 6

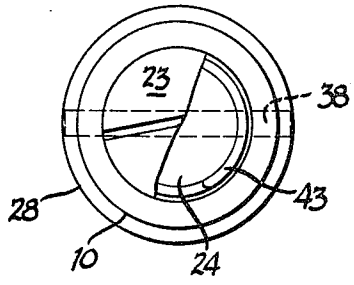


FIG. 2

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SELF-CLEANING CUTTING DIE WITH STRIPPER ELEMENT

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This invention relates to cutters for sheet materials and more particularly to self-cleaning cutting dies with stripper elements for cutting holes in various types of sheet stock such as gasket materials, paper stock, cork, plastic and the like, and is an improvement of the cutting die disclosed in my Patent 3,137,188, issued June 16, 1964.

The above referred to patent discloses a commercially successful die which overcomes many of the prior difficulties and the present application is for an improvement, because it provides for a new alignment of operating parts and the adjustability thereof for the purpose of various uses and is arranged to provide a physical compact unit which may be used individually or in combination with other like dies and stored away when not in use and returned to service without any adjustment whatsoever. The die also is arranged to provide for the proper ejector and stripping arrangement to avoid manual participation.

It is therefore an object of my invention to provide an improved cutting die.

Another object of my invention is to provide an improved cutting die wherein the ejector thereof remains in proper alignment with its housing and its effectiveness is controlled to meet varying conditions.

Other objects of this invention will appear in the following description and appended claims, reference being had to the accompanying drawings forming a part of this specification wherein like reference characters designate corresponding parts in the several views.

In the drawings:

FIGURE 1 is a view in elevation of the die embodying features of my invention;

FIGURE 2 is a top view of the die shown in FIGURE 1, without the upper parts of the die;

FIGURE 3 is a view in cross section illustrating the device in the position of severing a portion from a sheet of material;

FIGURE 4 is a view in cross section illustrating withdrawal of the die and the cut slug from the stock and the position of parts at the time when the ejector contacts the slug to begin the self-cleaning action;

FIGURE 5 is a view in cross section illustrating the further withdrawal of the die from the stock at the exact moment of completion of the ejection step, and

FIGURE 6 is a side view of a modified form of stripper.

Before explaining the present invention in detail, it is to be understood that the invention is not limited in its application to the details of construction and arrangement of parts illustrated in the accompanying drawings, since the invention is capable of other embodiments and of being practiced or carried out in various ways. Also, it is to be understood that the phraseology or terminology employed herein is for the purpose of description and not of limitation.

In accordance with my invention, I provide an improved self-cleaning cutting die with a stripper element. The die includes a tubular element having a cutting edge on one end and an adjustable cap on the opposite end. An ejector is slidably positioned in the tubular member and guided in its movements therein by a pin movable in diametrically opposed slots in said tubular element. The action of said ejector is controlled by a spring positioned between the adjustable cap and the ejector. By this diametrically opposed slots and pin arrangement, the ejector stays in correct alignment within its housing in the tubular element, and the effectiveness of the ejector may be varied by movement of the adjustable cap to thereby suit various working conditions on different materials or due to wear of the cutting edge of the tubular element. This adjustable cap locks in the spring in the tubular element so as to provide a compact unit which may be stored away when not in use and returned to service as a unit. This type of die may be used individually or in combination with other like dies.

Referring to the drawings, the numeral **5** designates in general my improved die. The die includes a tubular body element or cutter **10** having an exterior bevel **12** formed on its lower end that tapers to a cutting edge **14**. The element **10** is provided with diametrically opposed elongated axially extending slots **16** having semi-circular ends **18** and **20**. The slots terminate above the cutting edge **14** and below the top of the element **10**. The end of the element **10** opposite the cutting edge **14** is closed by an adjustable screw threaded cap **23**.

An ejector **24**, which is of cylindrical formation, but may be of various shapes, is positioned within the interior bore **26** of the tubular cutter **10** and has an outside diameter providing a free sliding fit. On the outside of the tubular cutter, there is provided a tubular control sleeve or stripper **28** for actuating the cylindrical ejector **24** and stripping the sheet from the outside of the cutter **10**. Near the upper edge of the stripper **28** are provided diametrically opposed apertures **34** and **36**. The ejector **24** is provided with a bore **40** adjacent the top end thereof and it extends diametrically therethrough. A pin **38** is passed through aperture **34**, bore **40** and aperture **36**. The pin **38** may be solid or hollow like a tube. In the present instance, the pin **38** is hollow as shown at **39** thereby permitting any suitable tool (not shown) having a circular body and a tapered end to be inserted in the hollow ends of the pin to expand the pin ends to lock the pin in the apertures **34** and **36** of the stripper **28**. If desired, the pin **38** may be press-fitted in apertures **34** and **36**. This pin arrangement provides a connection between the ejector **24** and stripper **28** whereby these units move together in a unitary manner.

As will be noted in FIGURES 3, 4 and 5, the bottom end **42** of the ejector **24** forms an ejector or slug engaging portion that is spaced approximately the thickness of the stock to be cut away from the lower edge **45** of stripper **28**. As will be described later, this spaces the ejector above the stock during cutting and provides the novel self-cleaning cutting action and ejection function provided by the present invention.

Within the bore **26** of cutter **10** is positioned a spring **43** between the ejector **24** and the adjustable cap **23**. By adjusting the cap **23**, the effectiveness of the spring **43** is varied. The spring **43** is for the purpose of pushing the ejector **24** and the stripper downwardly to provide the self-cleaning and delayed ejection function of the present invention. In view of cap **23**, the spring **43** is locked in position, and there is provided a compact and completely assembled die unit which may be stored away when not in use.

The die unit **5** is suitably mounted for operation on a platen **44** of a suitable cutting press, the platen **44** being provided with a hole **46** to receive the exterior surface of the tubular cutter **10** as a press-fit. The upper part of the cutter **10** may be serrated if desired. After the cutter **10** is fitted in hole **46**, a back-up plate **50** is fastened to the platen **44** above the cutter **10** and cap **23** by means of screws **52**.

As shown in FIGURE 3, the platen **44** has been brought

downwardly in the arrow **54** direction until the cutting edge **14** has penetrated completely through the thickness of the sheet stock material **56**. As previously mentioned, the bottom end **42** of ejector **24** is spaced rearwardly of the lower edge **45** of stripper **28**.

Thus, as the cutting edge **14** moves downwardly through the stock, the edge **45** contacts the top of the stock and forces the pin **38** and the ejector **24** upwardly so that the bottom edge **42** is retained in noncontacting relation above the top surface of the stock at the time the cut is made.

As shown in FIGURE 4, the tubular cutter **10** has been retracted from the stock to a point where the cutting edge **14** is just above the top surface of the stock. It will be noted that the spring **43** has forced the ejector **24** downwardly relative to the tubular cutter **10**, maintaining the edge **45** on top of the stock and the bottom surface **42** of the ejector **24** is now in contacting relationship with the top of the slug **58** that has been removed from the sheet stock **56** because of its friction or press fit within the interior bore **26** of the tubular cutter **10**. At this point, the slug has been lifted free of the stock and the self-cleaning action and delayed ejection is about to take place.

As shown in FIGURE 5, the tubular cutter has been removed still farther away from the upper surface of stock **56** and the slug **58** has just been completely ejected past the cutting edge **14** to fall free as the cutter **10** will continue to move away from the stock in the arrow **60** direction. It will be noted that the spring **43** has continued to expand and force the cylindrical ejector **24** downwardly in the arrow **54** direction maintaining the edge **45** in contact with the upper surface of the stock **56** until the pin **38** has now reached the bottom end **20** of the elongated slot **16**. At this point, the slug **58** is beginning to drop away as the cutter **10** continues its movement away from the stock in the arrow **60** direction, so that the slug will be dropped gently and loosely on top of the stock.

Therefore, as shown in FIGURE 5, when the cutter **10** is being retracted and the lug **58** is just at its fully ejected position, it will fall vertically downwardly out of the machine adjacent and along the top surface of the stock **56** and the stock will be automatically cleaned as will the die.

In FIGURE 6 I have shown a modified form of stripper designated **128**. This stripper **128** is tubular the same as stripper **28** except that it has a portion cut away as at **130** to provide a partial stripping ring on its lower surface **132** while the stripper **28** has a full ring on its lower surface. Stripper **128** is used in die **5** in the same manner as stripper **28** is used. In some instances with certain material the partial or about one-half ring insures ejection of the cut slugs.

From the foregoing it will be readily apparent that I have provided an improved cutting die in which the ejector is maintained in proper alignment in its housing the cutter **10** and this is accomplished by the pin **38** extending through diametrically opposed slots. Furthermore, the die is assembled as a unitary structure with provisions for varying the effectiveness of the ejector arrangement.

I claim:

1. In a substantially horizontally disposed self-cleaning cutting die, a platen, a tubular body having a wall and a cutting edge at one end thereof secured to the platen, diametrically opposed elongated slots in said wall and extending lengthwise of said body and terminating in spaced relation from said cutting edge, an ejector positioned in slidable relation within said tubular body and having a passage extending therethrough in alignment with said slots, a stripper positioned in slidable relation over the outside of said tubular body and having diametrically opposed apertures in alignment with said passage and slots, a pin extending through said apertures, passage and slots, and spring means interposed between the ejector and the platen to induce relative movement between the cutting edge of the tubular body and the ejector after the cutting edge has been moved to clear the upper surface of the material being cut, said stripper having a partial ring on its stripper outer surface.

2. In a substantially horizontally disposed self-cleaning cutting die, a platen, a tubular body having a wall and a cutting edge at one end thereof secured to the platen, an ejector positioned in slidable relation within said tubular body, a stripper positioned in slidable relation over the outside of said tubular body and having a partial ring on its outer surface, means connecting said ejector with said stripper in slidable relation with said tubular body, an adjustable cap for said tubular body at the opposite end of said cutting edge, and spring means interposed between said adjustable cap and said ejector to provide for variations of spring function in the relative movement between the cutting edge of the tubular body and the ejector.

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