

[54] **ROTARY ANVIL CONSTRUCTION**

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[22] Filed: **Feb. 7, 1972**

[21] Appl. No.: **223,903**

[52] U.S. Cl..... **83/659, 83/698, 83/347**

[51] Int. Cl..... **B26d 7/20**

[58] Field of Search **83/658, 659, 347,**
83/698

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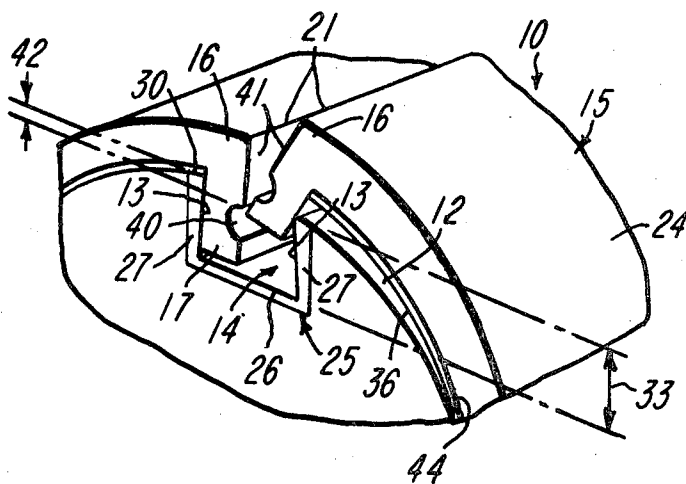
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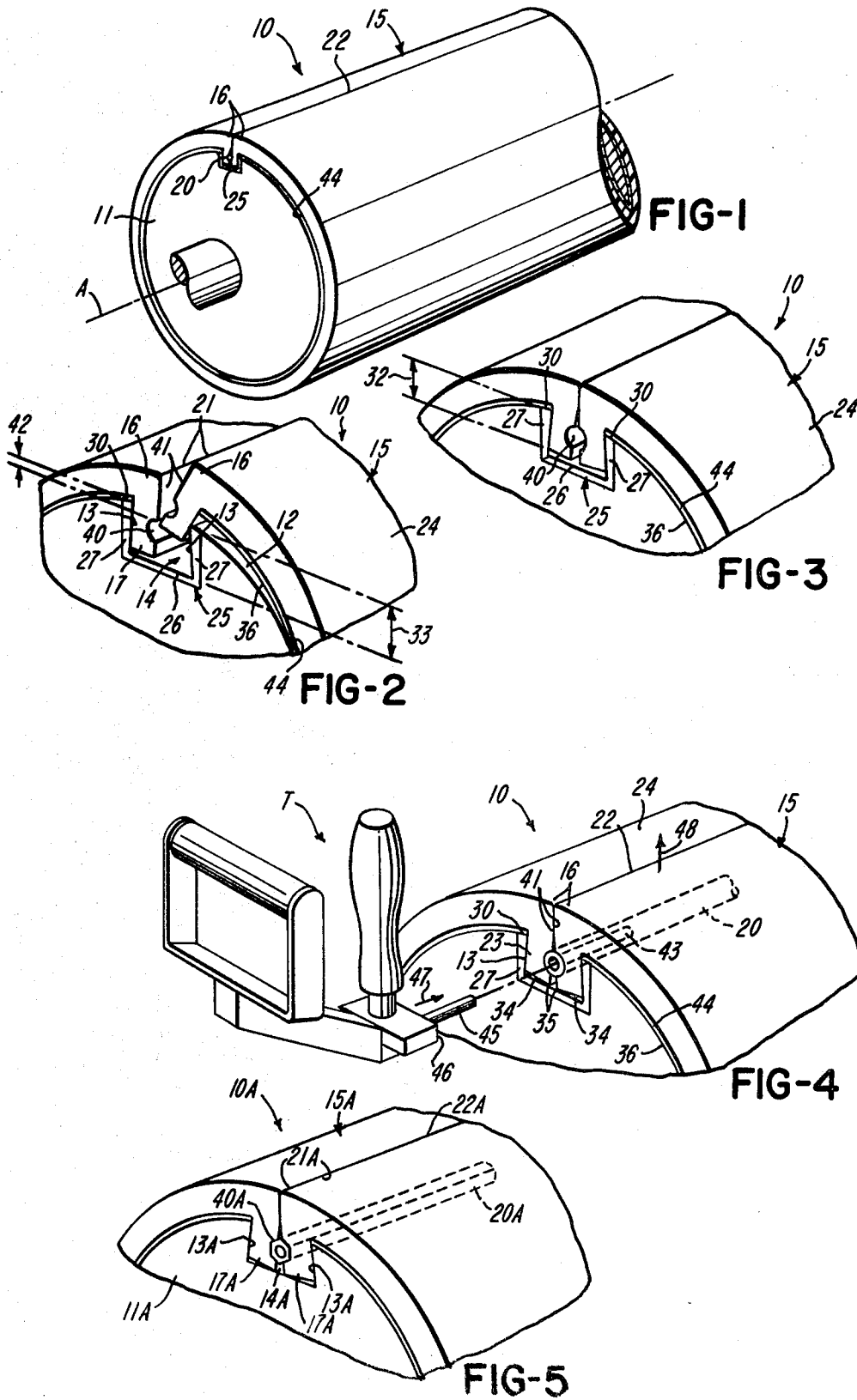
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ABSTRACT

A rotary anvil construction is provided which comprises a cylindrical anvil and a die-cutting mat attached in position thereagainst with the mat being made of a compressible resilient elastomeric material and having opposite end portions provided with a pair of identical locking flanges which extend within a groove in the anvil wherein the groove is comprised of a pair of spaced holding surfaces. A wedge is provided between the flanges and serves to urge the flanges tightly against the holding surfaces and thereby tighten and lock the mat against the anvil while simultaneously moving associated outer edges of the mat firmly against each other to provide a single line contact therebetween.

17 Claims, 5 Drawing Figures





ROTARY ANVIL CONSTRUCTION

BACKGROUND OF THE INVENTION

There are numerous rotary anvil constructions in current use which utilize die-cutting mats which are attached by various means against the outside surfaces of their associated anvils. However, these previously proposed anvil constructions are usually very complicated and expensive and it is often very difficult to install and remove present mats from their associated rotary anvils. In addition, some of the present die-cutting mats have opposed end portions of complicated configurations which either result in increasing the cost of the associated mat or result in complex or multiple junction lines once the mat is attached on its associated rotary anvil.

SUMMARY

This invention provides an improved rotary anvil construction which employs a simple die-cutting mat and which is easy to install firmly in position on its associated rotary anvil yet may be readily removed in a minimum of time. In addition, the die-cutting mat is held on its rotary anvil so that a single rectilinear line contact is provided between its end portions and such line extends longitudinally across the anvil.

Other details, uses, and advantages of this invention will be readily apparent from the exemplary embodiments thereof presented in the following specification, claims, and drawing.

BRIEF DESCRIPTION OF THE DRAWING

The accompanying drawing shows present preferred embodiments of this invention, in which

FIG. 1 is a fragmentary perspective view of a rotary anvil construction of this invention having an easily installed and removed die-cutting mat;

FIGS. 2, 3, and 4 are fragmentary perspective views illustrating a series of steps which may be employed to install and lock the die-cutting mat of FIG. 1 in position; and

FIG. 5 is a fragmentary perspective view illustrating another exemplary embodiment of the rotary anvil construction of this invention.

DESCRIPTION OF ILLUSTRATED EMBODIMENTS

Reference is now made to FIG. 1 of the drawing which illustrates one exemplary embodiment of a rotary anvil construction of this invention which is designated generally by the reference numeral 10. The anvil construction 10 is particularly adapted to be used with an associated rotary cutter or cylinder (not shown) having cutting means or blades thereon and the anvil construction 10 serves as a backup allowing the blades of such rotary cutter to be urged against a workpiece such as a sheet of either plain or corrugated paper or other suitable sheet material which is to be cut to enable cutting thereof sharply and without jagged edges.

The anvil construction 10 comprises a rotary anvil or cylinder 11 having an outer substantially cylindrical surface 12 and having a pair of spaced holding surfaces 13 extending inwardly from the surface 12 and the surfaces 13 define opposed side walls of a longitudinal groove 14 which extends along the full length of the cylinder 11 in substantially parallel relation to the central longitudinal axis A of such cylinder. The cylinder

11 may be made of any suitable material and is preferably made of a rigid material such as metal.

The rotary anvil construction 10 includes a die-cutting mat which is designated generally by the reference numeral 15 and has opposite end portions 16 provided with a pair of identical locking lips or flanges 17. Each flange 17 extends from the terminal end of its associated end portion 16 and is received within the groove 14.

The construction 10 comprises wedge 20 which is provided between the flanges 17 and the wedge serves to urge such flanges tightly against the holding surfaces 13 and thereby tighten and lock the mat 15 firmly against the outside cylindrical surface 12 of cylinder 11. Simultaneously with this locking action the wedge 20 moves outer edges 21 of the mat 15 firmly against each other to provide a single line junction or contact 22 therebetween, see FIG. 1, and such line contact comprises a rectilinear line contact. During the process of wedging the flanges 17 firmly in position, it will be seen that the wedge 20 partially compresses the lower portions of the flanges 17, as illustrated at 23 in FIG. 4, while urging and slightly compressing the edges 21 against each other to assure the provision of the single line contact 22 and such single line coincides substantially precisely (i.e., free of bulges or indentations) with a right circular cylindrical outside surface 24 defined by the outside surface of the mat 15 once it is installed in position.

As will be apparent particularly from FIGS. 1-4 of the drawing, the cylindrical rotary anvil or cylinder 11 has an insert 25 of substantially U-shaped cross-sectional configuration fixed within the peripheral cylindrical outside surface 12 of the anvil 11 and extending the full length of such anvil. As best seen in FIG. 2 of the drawing, the insert 25 has a U-shaped configuration, when viewed from an end thereof or in cross-section, defined by a bight 26 and a pair of outwardly extending leg portions 27 with the leg portions 27 having outer surface portions 30 which comprise the substantially cylindrical surface 12 of cylinder 11. The insert 25 has a pair of spaced transverse planar surfaces each adjoining an associated one of the surface portions 30 and such planar transverse surfaces define the holding surfaces 13 of cylinder 11.

The holding surfaces 13 diverge toward the longitudinal axis A extending through the cylinder 11 and are arranged in what might be considered a dovetailed manner whereby once the wedge 20 is installed in position the mat 15 is held firmly against the cylinder 11 for normal operation of the anvil construction 10. However, the mat is easy to remove and in a manner which will be described in detail subsequently.

As will be apparent particularly from FIG. 2, the flanges 17 extend substantially perpendicularly from the end portions 16 and each flange 17 has a height 32 which is less than the depth 33 of the groove 14. Thus, once the wedge 20 positions the flanges 17 in the manner illustrated in FIG. 4, the flanges are urged against the diverging holding surfaces 13 whereby flanges 17 and wedge 20 define a dovetailed structure which cooperates with the dovetailed arrangement of the holding surfaces 13 yet there is minimal contact between the terminal ends 34 of the flanges 17 and the fixed insert 25 whereby there is minimum contact between the flange ends 34 and cylinder 11. This minimum contact, if any, is only at corner portions 35 of ends 34 and as-

sure that there is no tendency for forces to act in a direction perpendicular the longitudinal axis A of cylinder 11 whereby there is no tendency to move the flanges radially outwardly away from such longitudinal axis.

The mat 15 has an inside surface 36 and each of the flanges 17 has a channel 40 therein extending inwardly from its outer surface 41. The channel 40 extends across the full width of its flange and is spaced from the inside surface 36 by a distance indicated at 42. The channels 40 are arranged in aligned relation with the mat 15 installed in position and cooperate to receive the wedge 20 therethrough so that the wedge tightens and locks the mat against the anvil 11 and simultaneously moves the outer edges 21 in position to define the single line contact 22 between such edges.

Each of the channels 40 is defined by a substantially semi-cylindrical surface also designated by the reference numeral 40; and, each of the channels 40 has a particular cross-sectional area. The wedge 20 in this example is in the form of a right circular cylindrical rod which has a substantially circular cross-sectional outer outline, the area of which is substantially greater than the combined cross-sectional areas of the channels 40. The wedge 20 has a central longitudinal opening 43 extending axially therein from at least one end thereof and the central portion of such rod or wedge 20 is solid. However, if desired, the wedge may be tubular and the opening 43 may extend the full length of such wedge. Thus, once the wedge or rod 20 is installed in position in the manner illustrated in FIG. 4 it provides the locking and holding action previously described.

The mat 15 has a bottom sheet-like portion or backing sheet 44 which defines the portion thereof which is held against the cylindrical surface 12 of the cylinder 11 and the sheet-like portion 44 is preferably made of a suitable metallic material and has an exposed surface which defines the inside surface 36 of the mat 15. The metal backing sheet 44 assures that the mat 15 maintains its form under all operating and storage conditions; however, it will be appreciated that the mat 15 need not necessarily have the backing sheet 44 provided as an integral part thereof whereby it may be comprised entirely of a suitable elastomeric material which may be reinforced with a suitable woven material or other suitable reinforcing members.

Having presented a detailed description of the anvil construction 10 the presentation will now proceed with the manner in which the mat 15 may be simply installed on the cylinder or anvil 11. In particular, the mat 15 is positioned with one of its flanges 17 within the groove 14 whereupon the mat 15 is wrapped around the cylindrical surface 12 so that the other of its flanges 17 is arranged above groove 14 in the manner illustrated in FIG. 2; other flange 17 is then inserted in position within the groove 14 in the manner illustrated in FIG. 3 whereby the flanges 17 are arranged with their channels 40 in aligned relation and are ready to have the wedge 20 installed in position therein.

The wedge 20 is then inserted axially through the aligned channels 40 in the manner illustrated in FIG. 4. The wedge 20 is preferably installed using a suitable tool such as a tool T which has a right circular cylindrical projection 45 extending therefrom which is adapted to be received within cylindrical opening 43. To install the wedge 20, projection 45 is positioned within opening 43 and a surface 46 of the tool T is urged against

the end of the wedge as indicated by the arrow 47 to thereby force such wedge into channels 40 and resiliently compress the flanges 17 against the holding surfaces 13 locking the mat 15 in position in the manner previously described.

It is a simple matter to remove the mat 15, and to accomplish such removal, the projection 45 is inserted within opening 43 in the wedge 20 whereupon the tool T is moved outwardly in a direction indicated by the arrow 48, i.e., in a direction which is substantially perpendicular to the longitudinal axis A of the rotary anvil construction 10. This movement causes compression of flanges 17 a sufficient amount to allow the wedge 20 and flanges 17 to be extracted from the groove 14.

From the above description it is apparent that the mat 15 may be installed and removed from cylinder 11 with simplicity enabling easy reversal and repositioning thereof and thereby enabling the operating life of the mat 15 to be extended. To facilitate installation of the wedge 20 in position, it will be appreciated that a suitable lubricant may be applied on its outside surface. In addition, the leading end of the wedge may be slightly tapered to further assure easy installation.

Another exemplary embodiment of this invention is illustrated in FIG. 5 of the drawing. The anvil construction illustrated in FIG. 5 is very similar to the anvil construction 10; therefore, such anvil construction will be designated generally by the reference numeral 10A and parts thereof which are similar to corresponding parts of the anvil construction 10 will be designated by the same reference numeral as in the anvil construction 10 also followed by the letter designation A and not described again. Only those component parts which are different from corresponding parts of the anvil construction 10 will be designated by a new reference numeral also followed by the letter designation A and described in detail.

Instead of having an insert such as insert 25 of construction 10, the anvil construction 10A has an anvil or cylinder 11A provided with spaced planar holding surfaces 13A formed directly in the cylinder itself and surfaces 13A define opposed walls of a groove 14A in such cylinder. The surfaces 13A diverge toward the longitudinal axis of cylinder 11A in a dove-tailed manner and these surfaces are used in an identical manner as the surfaces 13 of cylinder 11.

The mat 15A has edges 21A which are slightly beveled whereby once the wedge 20A is installed in position it urges the flanges 17A of the mat 15A tightly against the holding surfaces 13A integrally provided in the cylinder 11A to thereby tighten and lock the mat 15A against the cylinder 11A while simultaneously moving the beveled outer edges 21A firmly against each other to assure provision of the single line contact 22A which has optimum smoothness.

It will also be noted that each flange 17A has a channel 40A of roughly U-shaped outline, when viewed from an end thereof, and once the mat 15A is installed in position the channels are arranged in aligned relation and receive the wedge 20A therewithin. The wedge 20A has a noncircular peripheral outline which in this example is hexagonal and corresponds to the approximately hexagonal outline defined by the aligned channels 40A. Further, it will be appreciated that the channels 40 and 40A of mats 15 and 15A may have any suitable cross-sectional configuration and each mat may

receive any suitable wedge within its aligned channels once it is installed on an associated cylinder.

The mat 15A is installed in position on its anvil or cylinder 11A in a similar manner as described previously in connection with the mat 15 of the anvil construction 10. In addition, such mat may be easily removed from its cylinder as described earlier and the tool T may be used for installation and removal.

As previously suggested, the mat of this invention may be made of any suitable elastomeric material which is capable of being used in association with a rotary cutter; and, it has been found such mat may be made of any suitable polymer such as polyurethane, or a suitable rubber compound whether natural or synthetic rubber.

While present exemplary embodiments of this invention, and methods of practicing the same, have been illustrated and described, it will be recognized that this invention may be otherwise variously embodied and practiced within the scope of the following claims.

What is claimed is:

1. In combination: a rotary anvil having an outer substantially cylindrical surface and having a pair of spaced holding surfaces extending inwardly from said cylindrical surface and defining opposed walls of a longitudinal groove in said anvil, a die-cutting mat made of a compressible resilient elastomeric material attached against said anvil, said mat comprising a main central portion having opposite end portions provided with a pair of identical locking flanges extending from said end portions and being received within said groove, and a wedge between said flanges, said wedge serving to urge said flanges tightly against said holding surfaces and thereby tighten and lock said mat against said anvil while simultaneously moving associated outer edges of said mat firmly against each other to provide a single line contact therebetween.

2. A combination as set forth in claim 1 in which said holding surfaces comprise parallel planar surfaces.

3. A combination as set forth in claim 1 and further comprising an insert of substantially U-shaped cross-sectional configuration fixed within the peripheral outline of said anvil and extending the full axial dimension thereof, said insert having a pair of surface portions comprising said substantially cylindrical surface and having a pair of planar surfaces each adjoining an associated one of said surface portions and defining said holding surfaces.

4. A combination as set forth in claim 2 in which said parallel planar holding surfaces diverge toward a longitudinal axis extending through said anvil in a dovetailed manner.

5. A combination as set forth in claim 4 in which said flanges extend substantially perpendicularly from said end portions and have a height which is less than the depth of said groove so that said wedge positions said flanges against said diverging holding surfaces with

minimum contact between the terminal ends of said flanges and said anvil.

6. A combination as set forth in claim 5 in which said mat has an inside surface and each of said flanges has a channel therein extending across its full width and spaced from said inside surfaces.

7. A combination as set forth in claim 5 in which said mat has an inside surface and each of said flanges has an outer surface and a channel extending inwardly from its outer surface and across the full width of said mat with said channel being spaced from said inside surface, said channels being arranged in aligned relation with said mat installed around said anvil and cooperating to receive said wedge therewithin.

8. A combination as set forth in claim 7 in which each of said channels has a substantially semicylindrical surface and said wedge has a substantially circular cross-sectional outline.

9. A combination as set forth in claim 7 in which said mat has a flexible metal sheet bonded therein, said metal sheet having an exposed surface which defines the inside surface of said mat.

10. A combination as set forth in claim 7 in which said flanges are made as an integral part of said mat of the same compressible resilient elastomeric material to thereby define said mat as a single piece construction.

11. A combination as set forth in claim 7 in which each of said flanges has a substantially rectangular cross-sectional outline.

12. A combination as set forth in claim 1 in which said substantially cylindrical surface of said anvil comprises a substantially right circular cylindrical surface, said mat has a substantially rectangular peripheral outline prior to installation thereof on said anvil, and with said mat installed in position with said wedge between said flanges said associated outer edges of said mat define said single line contact as a rectilinear line contact.

13. A combination as set forth in claim 7 in which said wedge has an opening extending longitudinally therein from at least one end thereof, said opening being adapted to receive an associated tool therewithin for installation and removal of said wedge.

14. A combination as set forth in claim 8 in which said wedge is a tubular wedge having a longitudinal central opening which is adapted to receive an associated tool therewithin for installation and removal of said wedge.

15. A combination as set forth in claim 13 in which said holding surfaces comprise an insert fixed in said anvil.

16. A combination as set forth in claim 7 in which each of said channels has a substantially U-shaped outline when viewed from an end thereof.

17. A combination as set forth in claim 16 in which said wedge has a noncircular cross-sectional outline.

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