Aug. 27, 1946. L. A. SMITH 2,406,442

FLY CUTTER

Filed Aug. 11, 1943

Fig. 1.

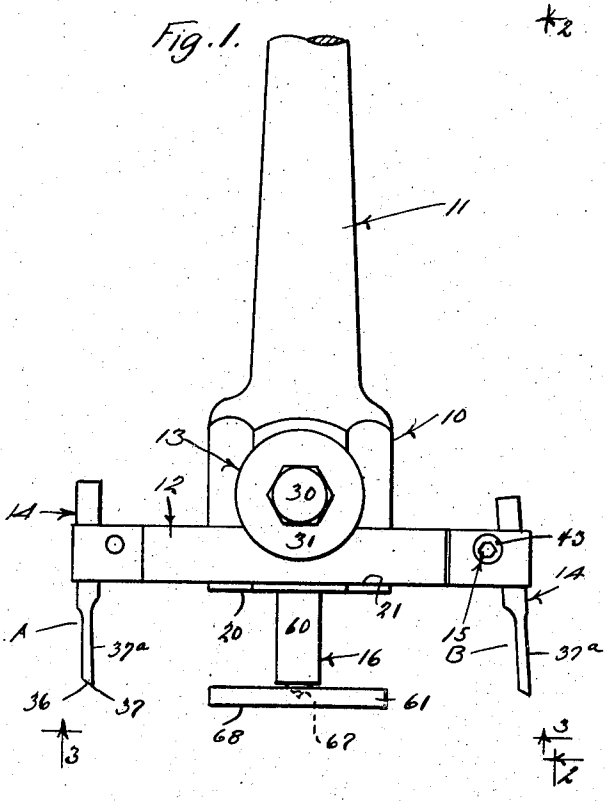


Fig. 2.

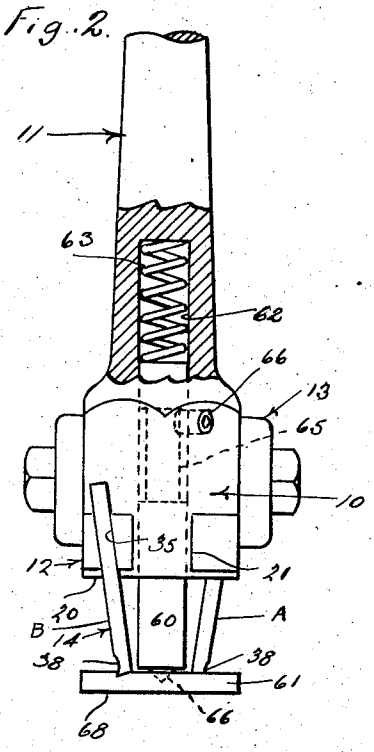
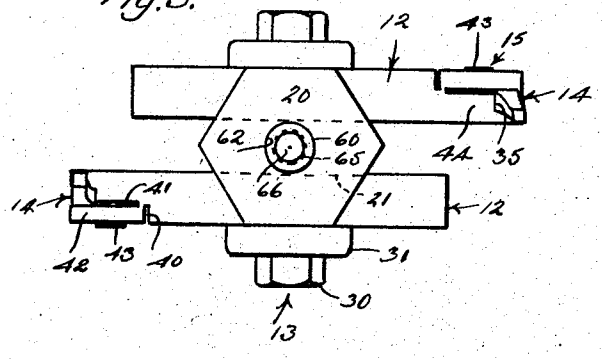


Fig. 3.



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FLY CUTTER

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7 Claims. (Cl. 77—69)

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This invention relates to a cutter and has particular reference to that type of cutter generally known as a fly cutter. A general object of the invention is to provide a simple, sturdy and highly efficient tool of this character.

Adjustable cutters of the type known as fly cutters are commonly used for various cutting operations, particularly for cutting round holes in sheet materials of different kinds, and they operate to cut an annular groove or channel and thereby remove a round disc or slug. Ordinary devices of this character are not altogether satisfactory, due primarily to the fact that they are not sufficiently firm or rigid and are such that there is a marked tendency for them to chatter while in use, and frequently they tend to dig into the work, resulting in the breakage of cutters.

It is an object of the present invention to provide a construction for a cutter of the character referred to that is extremely simple and compact, making it inexpensive of manufacture and highly practical to use.

Another object of the invention is to provide a simple, sturdy construction that operates to firmly support the cutting parts and thus eliminates uneven operation or chatter such as commonly occurs in devices of this character.

Another object of my present invention is to provide a cutter of the character referred to in which the cutter-carrying arms are supported close to the lower end of the body so that the space between the body and the work is minimized.

A further object of this invention is to provide a cutter of the character mentioned in which the cutting tools are supported so that their cutting parts or edges are related to the points at which the cutters are supported by the arms in a manner so that the cutters tend to lift away from the work or be relieved rather than to dig into the work in a manner to cause injury to the parts.

Another object of my invention is to provide an improved pilot construction for tools operating to make an annular cut. I provide a pilot that effectively holds the work and also guides the cutter.

The various objects and features of my invention will be fully understood from the following detailed description of a typical preferred form and application of my invention, throughout which description reference is made to the accompanying drawing, in which:

Fig. 1 is a side elevation of a typical preferred form of my present invention. Fig. 2 is another side view of the device taken in the direction of lines 2—2 on Fig. 1 with a portion broken away to show in section, and Fig. 3 is an end elevation of the cutter, being a view taken as indicated by line 3—3 on Fig. 1.

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The device provided by this invention includes, generally, a body 10, a shank 11 for mounting the body in a suitable machine or operating device, a pair of arms 12 carried by the body to project laterally therefrom adjacent its lower end portion and so that they are adjustable to project various distances from the body, retaining means 13 for securing the arms in the desired position relative to the body, cutters 14 carried by the outer end portions of the arms to depend therefrom, retaining means 15 for the cutters operable to firmly set or grip them in the desired adjusted positions, and a pilot 16 depending centrally from the lower end of the body 10.

The body of the tool provided by my invention is preferably in the form of a unitary block of steel, or the like, having considerable mass and proportioned so that it is inherently rigid and solid. In the preferred form of the invention the body is polygonal in cross section, for instance it may be hexagonal as shown in the drawing. The body is made sufficiently long to accommodate the various parts hereinafter described and its lower end 20 is preferably finished so that it is flat and lies in a plane normal to the longitudinal axis of the body and of the tool.

The shank 11 projects upwardly from the body concentrically therewith, and is preferably formed integral with the body as shown in the drawing. The shank is provided as a means for applying the tool to a machine or operating device and to this end may be designed and proportioned to fit such driving means. For ordinary purposes it is desirable to provide a tapered shank as is shown in the drawing.

The arms 12 are slidably carried in channels 21 formed parallel to each other in diametrically opposite sides of the body 10 adjacent the lower end of the body. The arms are preferably in the form of elongate members or bars preferably square in cross section, and are adapted to be arranged in various adjusted positions in the channels in order to vary the positions of the cutters which are carried by their outer ends.

The channels 21 which slidably carry the arms 12 are located opposite each other in diametrically opposite sides of the body and are located close to the lower end 20 of the body so that there is but a short distance between the lower sides of

the arms and the bottom of the body. Through this construction the arms are supported by the body in a position as close as practical to the bottom end of the body.

The means 13 provided for retaining or setting the arms in the body may be any suitable means that will adequately serve this purpose. In the preferred construction I provide cap screws 30 threaded into the sides of the body which are channeled and I provide disc shaped clamping members 31 on the cap screws to bear on the outer faces of the arms to clamp them into the channels 21. By tightening the cap screws the clamping members 31 are effectively forced against the arms to firmly secure them against longitudinal movement in the channels.

The cutters 14 are elongate bodies of cutting material, such as tool steel, carried in channels 35 formed substantially vertically in the outer end portions of the arms 12. In practice the lower end portions of the cutters 14 are finished or dressed so that each cutter has a lower cutting edge 36. The lower cutting edges 36 of the cutters are pitched from the horizontal so that each cutter has a lower cutting point 37 and the two cutters are dressed so that the point 37 of the cutter A is at the inner end of the edge 36 while the point 37 of the cutter B is at the outer end of the edge 36. The side 37^a of the cutter extending up from the point is preferably dressed to recede and have clearance as the cutter advances.

In accordance with my invention the cutters 14 are disposed so that they do not track in exactly the same paths but rather the cutter A operates to cut the inner portion or wall of the cut while the cutter B operates to cut the outer portion or wall of the cut. This may be accomplished by dressing the cutters so that their cutting edges and points are suitably disposed. However, in practice it is desirable to form the channels 35 which carry the cutters so that the cutting parts of the cutters are properly located. In the case illustrated the channel which carries the cutter A supports it so that it is in a truly vertical position when viewed as shown in Fig. 1, while the channel 35 which supports the cutter B is pitched downwardly and outwardly enough to locate the point 37 of the cutter B a suitable distance outward of the path of the cutter A.

In accordance with my invention the channels 35 in the arms 12 carrying the cutters 14 are pitched downwardly and rearwardly with reference to the direction of rotation of the cutter so that the cutting points and edges of each cutter are located below the arm and rearward of the point at which the cutter is supported by the arm with reference to the direction in which the cutter is rotated. That is to say, the cutters 14 are pitched to depend downwardly and rearwardly relative to the direction of cut so that their cutting parts are behind the point at which the cutters are supported by the arms. Through this construction, should the cutters feed too fast into the material, they will tend to be forced back and to lift from the material rather than to bite into it. It is to be understood, of course that the forward faces 38 of the cutters immediately above the edges 36 are dressed or faced so that the cutters give the chips the desired clearance.

The means 15 provided by my invention for retaining the cutters 14 in the desired adjusted position may vary as circumstances require. In the case illustrated I have shown the outer end portion of each arm provided with cuts 40 and 41, the cut 41 extending inwardly from the channel 35 so that the part 42 defining one wall of the channel can be sprung to grip the cutter. A clamp screw 43 is threaded to the part 44 of the end portion of the arm and engages the part 42 in a manner to clamp it tightly against the cutter.

My present invention provides an improved pilot construction applicable, generally, to rotary cutters or to cutters operating to make an annular cut in the work. My invention provides, primarily, a pilot rod 60 slidably carried by the body concentric with the axis of rotation and means in connection with the pilot rod 60 to normally yieldingly urge it downward from the lower end of the body to engage the work as the cutter operates. The invention further provides means for retaining the pilot rod in the body and a pressure plate 61 in connection with the pilot rod to bear on the work.

In the preferred construction the body is provided with a central socket 62 extending into it from its lower end. The socket may be formed by providing a central bore in the body from its lower end. The pilot rod may be a plain, straight, round bar which slidably fits the socket 62 and proportioned so that its lower end portion projects a suitable distance from the lower end of the body 10, while its upper end terminates a suitable distance short of the upper end of the socket 62.

A compression spring 63 is arranged in the socket 62 above the rod 60 or between the top of the rod and the upper end of the socket, so that it normally yieldingly urges the rod downwardly.

Various means may be provided for retaining the rod in the socket. In the construction shown I have provided a reduced portion 65 at a suitable point along the length of the rod, that is, at a point within the body 10, and I have provided a stop screw 66 in the body to project into the socket to the reduced portion 65 of the rod to act as a stop limiting the longitudinal movement of the rod in the socket. The lower end portion of the rod is provided with a point or center 66 which may be used to engage the work, for instance to engage a center hole or center punch mark provided in the work. In accordance with my invention I provide a pressure plate 61 that can be used in connection with the pilot rod. This plate may be in the form of a disc having a central tapered socket 67 designed to be engaged by the point 66 of the pilot rod. The bottom face 68 of the plate 61 is flat and designed to bear on the work, giving a large bearing surface to have a clamping effect. When the tool is being used to cut gaskets, or the like, for instance, when it is being used on materials that are soft or flexible, it is desirable to use the pressure plate 61 as it will have a desirable holding or clamping effect on the part which is cut out by the action of the tool. When the tool is being used on harder materials or metals it may be sufficient to merely allow the center 66 of the pilot rod to engage a small pilot hole or center punch mark provided in the work. The spring 63 may be made such as to exert a suitable amount of pressure on the pilot rod and this may be varied according to the work being done. The spring may be such as to merely provide a holding pressure to hold the work in place, or it may be made fairly strong, so that it acts to eject the part cut out by the action of the tool.

In using the device the arms 12 are adjusted to project the desired distances from the body

and are set in such adjusted positions by the means 13. The cutters 14 are arranged in the desired positions where they are clamped by the means 15 and their cutting edges and points are dressed to have the desired cutting action, it being understood that the paths of the two cutters overlap while the path of the cutter A extends inwardly from that of the cutter B so that the cutter A makes the inner portion of the cut while the cutter B makes the outer portion of the cut. During the cutting operation the pilot rod, or the pilot rod with the pressure plate under it, bears on the work, steadying the rod and holding the work, particularly the slug or disc portion that is cut out by the tool.

Having described only a typical preferred form and application of my invention, I do not wish to be limited or restricted to the specific details herein set forth, but wish to reserve to myself any variations or modifications that may appear to those skilled in the art or fall within the scope of the following claims:

Having described my invention, I claim:

1. A cutter of the character described including a central elongate body having outwardly opening cutter carrying channels formed in it at diametrically opposite sides and at right angles to the longitudinal axis of the body, arms slidably carried in the channels to project laterally from the body, means for individually clamping the arms laterally of the longitudinal axis of the body to hold them against movement in the channels including clamp members engaging the arms to bear on them laterally of the axis of the body and a screw member operating each clamp member, and cutters carried by the arms to depend therefrom.

2. A cutter of the character described including a central elongate body having open cutter carrying channels formed in it from diametrically opposite sides extending at right angles to the longitudinal axis of the body, arms slidably carried in the channels to project laterally from the body, means for individually clamping the arms against movement in the channels, and cutters carried by the arms to depend downwardly therefrom and rearwardly of the direction of cut so these cutting parts are behind the points at which the cutters are supported by the arms.

3. A cutter of the character described including a central elongate body having transverse cutter carrying channels formed parallel to each other in opposite sides of the body and open at their outer portions, arms slidably carried in the channels to project from the body, means for individually clamping the arms laterally of the longitudinal axis of the body and against the bottoms of the channels so they are held against movement in the channels, and cutters carried by the projecting portions of the arms to depend therefrom.

4. A cutter of the character described including a central elongate body notched at opposite sides to have transversely disposed cutter carrying channels in it at diametrically opposite sides parallel to each other and adjacent the lower end of the body, arms slidably carried in the channels to project laterally from the body, means applied to the exterior of the body at the sides of the body for clamping the arms in the channels against movement in the channels, and cutters carried by the projecting end portions of the arms to depend therefrom.

5. A cutter of the character described including a central elongate body having laterally disposed cutter carrying channels formed in it at diametrically opposite sides, arms slidably carried in the channels to be parallel with each other and to project from the body, means for clamping the arms against movement in the channels, and cutters carried by the projecting portions of the arms to depend downwardly therefrom and rearwardly of the direction of cut so the cutting edges of the cutters are behind the points where the cutters are supported by the arms, each cutting edge being pitched and terminating in a cutting point, the paths of cut of the cutters overlapping and the point of one cutter being at the inner end of the edge and the point of the other cutter being at the outer end of the edge.

6. A cutter of the character described including a central elongate body having outwardly opening cutter carrying channels formed in it at diametrically opposite sides and at right angles to the longitudinal axis of the body, arms slidably carried in the channels to project laterally from the body, means for individually clamping the arms against movement in the channels, there being a central opening extending into the body between the channels, a pilot member carried by said opening to project from the lower end of the body, a spring in the opening normally yieldingly urging the pilot downward, and cutters carried by the arms to depend therefrom.

7. A cutter of the character described including a central elongate body having laterally opening transversely disposed cutter carrying channels formed in it at diametrically opposite sides to be parallel to each other and adjacent the lower end of the body, arms slidably carried in the channels to project laterally from the body, means on the sides of the body overlying the outer sides of the arms for clamping the arms in the channels laterally of the body against movement in the channels, and cutters carried by the projecting end portions of the arms to depend therefrom.

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