

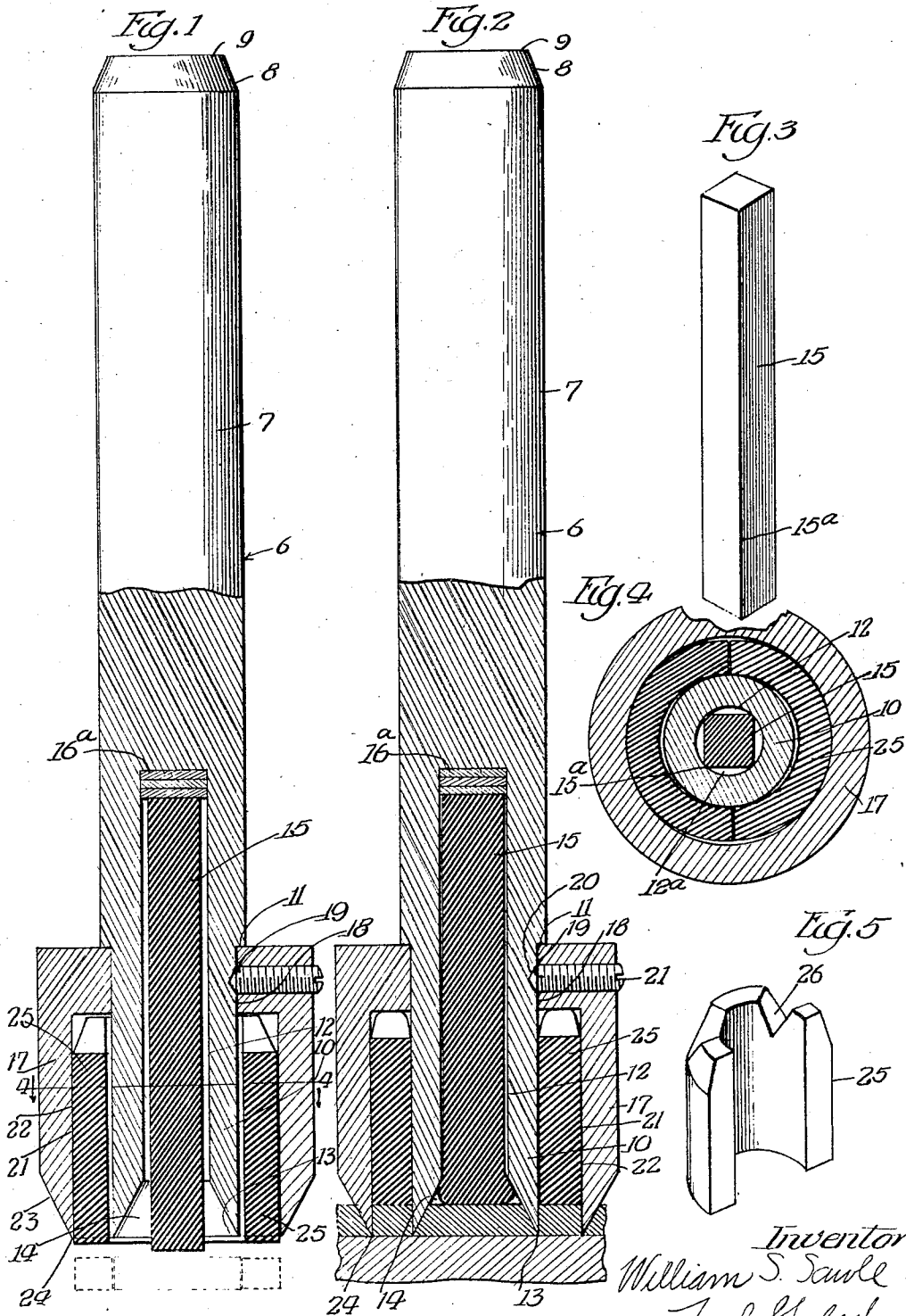
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PUNCHING TOOL

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UNITED STATES PATENT OFFICE

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PUNCHING TOOL

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The present invention relates generally to cutting or punching tools and more particularly to those tools which are adapted to be used to cut circular apertures, such, for example, as bolt holes in gaskets or strips of sheet material.

One object of the invention is to provide a punching tool in which the means for ejecting the circular wads or disks that are punched from the gaskets or strips consists of an elongated spring rubber piece which is polygonal in cross section and is confined in a cylindrical cavity or socket in the cutting end of the tool in such a manner that the corners thereof engage the annular side wall of the socket and consequently operate to hold the ejector-piece in place against accidental outward displacement.

Another object of the invention is to provide a tool of the aforementioned character in which the operative or lower end of the tool is ground or bevelled internally to form the usual circular cutting edge and in addition provide a frusto-conical chamber or compartment around the outer end of the wad-ejecting piece which compartment serves to receive or accommodate the distorted rubber when the piece is compressed longitudinally during use of the tool.

Another object of the invention is the provision of a supplemental cutting member which is adapted to be sleeved over and secured to the cutting end of the tool and is provided with a cutting edge which coacts with the cutting edge of the tool to form washers or other such ring shaped objects when the tool is used for that purpose.

A further object of the invention is to provide a supplemental cutting member of the aforesaid type embodying washer ejector means in the form of a split spring rubber bushing which is held in its operative position by engaging frictionally the outer periphery of the supplemental cutting member.

A still further object of the invention is to provide a punching tool which is generally of a new and improved construction, consists of but a few parts and may be manufactured at a low and reasonable cost.

Other objects of the invention and the va-

rious advantages and characteristics of the present construction will be apparent from a consideration of the following detailed description.

In the drawings which accompany and form a part of this specification or disclosure and in which like numerals of reference denote corresponding parts throughout the several views:

Figure 1 is a longitudinal sectional view of a tool embodying the invention, illustrating in detail the specific construction of the supplemental cutting member and the cutting end of the tool, as well as the arrangement and formation of the various spring rubber ejector means;

Figure 2 is a view similar to Figure 1 showing the tool and supplemental cutting member in the position that they assume when driven into a piece of sheet material;

Figure 3 is a perspective of the elongated spring rubber piece which forms the wad-ejector means for the cutting end of the tool;

Figure 4 is a transverse section taken on the line 4—4 of Figure 1, disclosing in detail the manner in which the corners of the ejector-piece grip or frictionally engage the cylindrical wall that forms or defines the socket in the cutting end of the tool; and

Figure 5 is a perspective view of one of the members of the split spring rubber bushing which operates as the washer ejector-means for the supplemental cutting member.

The invention is exemplified in a tool for use in punching holes in sheet material, such, for example, as gasket composition, cork, rubber or fibrous material. This tool comprises an elongated cylindrical body 6 which is preferably formed of tempered steel. The upper end of this body forms a handle 7 which is adapted to be held in one hand during use of the tool. The extreme upper end of the body 6 is bevelled, as at 8 and terminates in a flat hammering surface or anvil 9. The lower or cutting end 10 of the body is suitably machined so that it is smaller in diameter than the handle 7 and forms a shoulder 11. A cylindrical socket or cavity 12 is drilled or otherwise formed in the cut-

ting end 10. This cavity has an open lower end and is arranged concentrically with respect to the body 6. It extends upwardly into the handle 7, as disclosed in Figures 1 and 2. The extreme lower part of the cutting end 10 of the tool is bevelled internally to form a circular cutting edge 13. The latter is in direct alignment with the outer periphery of the cutting end 10 and consequently operates, during use of the tool, to cut a hole or aperture of a straight sided character. The bevelled portion which results in the formation of the cutting edge 13 defines a frusto-conical chamber 14 which extends between said edge and the lower end of the socket 12.

An elongated member or piece 15 serves to eject the wads or disks that are formed by the cutting edge 13 when the tool is driven into gasket or other sheet material. This piece 15 is formed of spring rubber and is square in cross section as clearly illustrated in Figure 4. The thickness of the piece is such that when the piece is forced into the socket 12 the corner portions 15^a thereof engage frictionally the cylindrical wall that defines or forms the socket and as a result hold the piece removably in place. Said piece 15 is preferably arranged in the socket 12 so that the lower end thereof protrudes a short distance beyond the cutting edge 13. When the tool is driven into a gasket or like article the protruding portion as well as the remainder of the piece, is compressed. Upon release of the tool the piece 15 due to its resiliency springs back into its normal shape and thereby forces outwardly the wad or disk that is embedded or lodged in the chamber 14 as a result of the tool driving operation. The frusto-conical chamber 14 operates to accommodate the distorted rubber in the lower end of the piece 15. The four spaces 12^a between the wall of the socket and the sides of the piece 15 accommodate the distorted rubber of the upper end and central portion of said piece (see Figure 2). A characteristic and an advantage of utilizing a solid spring rubber ejecting piece of the type described is that no lubricant of any sort is necessary in the use of the tool. In addition, the cost of manufacture or production is reduced to a minimum for the reason that it is possible to obtain a rubber ejector-piece at a low cost and no separate or additional means need be employed for retaining the piece in place. In the event the piece 15 wears out or loses its resiliency, it may be withdrawn from the socket and replaced by a similar rubber ejector-piece. A plurality of sheet metal disks 16^a are interposed between the inner end of the piece 15 and the top of the socket 12. By increasing or decreasing the number of these disks a change may be effected in the position of the piece relating

to the socket. In other words, if it should be desired to have the outer end of the piece 15 protrude a greater distance from the cutting edge 13 one or more disks 16^a will be added to those already in place. The addition of these disks effects a corresponding lowering of the piece relative to the socket. When it is desired to raise the protruding end of the piece 15 with respect to the edge 13 one or more of the disks 16^a are withdrawn until the desired change in position is effected. The disks 16^a exemplify means of an improved character whereby the ejector-piece may be adjusted in the socket 12.

To permit the tool to be used to form washers, as well as to make bolt holes in gaskets, a supplemental cutting member 17 is provided. This member is of cylindrical conformation and has formed in the upper part thereof a concentric bore 18 through which the cutting end 10 of the body is adapted to extend. The member 17 is adapted to be sleeved over the end portion 10 and shifted upwardly thereon until arrested by engagement with the shoulder 11. A set screw 19 operates to hold the supplemental cutting member 17 in connected relation with the body 6. This set screw extends transversely through the upper part of the member 17 and has the inner end thereof shaped to fit in a recess 20 in the cutting end 10 of the body. The outer end of the screw has a kerf 21 which is adapted to receive the blade of a screw driver or a similar turning tool. The inner peripheral part of the lower part of the supplemental cutting member 17 is cut away to form an annular space 22 around the end portion 10. The extreme lower part of the member 17 is formed with an external bevel 23 which forms a circular cutting edge 24. This edge is preferably arranged so that when the member 17 is in its operative position it is coplanar with the cutting edge 13 and co-operates therewith to form washers or ring-shaped objects. By having the bevel 23 formed on the exterior of the member 17; the cutting edge 24 is in direct alignment with the inner peripheral portion that defines the outer boundary of the annular space 22. As a result of this arrangement the aforesaid cutting edge operates in conjunction with the edge 13 to form washers having straight sides.

A spring rubber bushing 25 is adapted to eject the washers automatically from the annular space 22 after they have been cut by the edges 13 and 24. This bushing is positioned in the space 22 and is split longitudinally so that it is of a two-piece character. The inside diameter of the bushing is slightly smaller than that of the outer periphery of the cutting end 10. As a result of this arrangement the ends of the

bushing pieces grip frictionally the end 10 and force the central parts of the bushing pieces into frictional engagement with the inner periphery of the member 17. By virtue of the gripping characteristics of the bushing, said bushing is held in place against undesired withdrawal. The length of the bushing is preferably such that the lower end terminates slightly outwardly of the cutting edges 13 and 24. The upper or inner end of the bushing has V-shaped grooves 26 formed therein. These grooves permit the rubber to recede into the space 22 when the bushing is under compression as a result of use of the tool. The bushing pieces are preferably applied after the member 17 is connected in place by the set screw 19. They are assembled by shifting them longitudinally into the space 22.

When the tool is to be used for cutting bolt holes in gaskets, the body is used independently of the supplemental cutting member 17. Said body is used by gripping the handle 7 in one hand and hammering against the surface 9 so as to drive the cutting end 10 into the gasket which is preferably placed upon a wooden block. When the body is driven so that the cutting edge 13 has passed completely through the gasket, it is withdrawn. As soon as the withdrawal takes place the spring rubber ejector-piece 15 springs back into its normal position and causes ejection of the wad or disk which is lodged in the chamber 14. In the event the ejector-piece 15 protrudes too far below the cutting edge 13 and thereby hampers or hinders operation of the tool, one or more of the disks 16^a are removed so as to adjust the ejector-piece to the proper position.

When the tool is to be used to form washers or other such ring-shaped objects, a supplemental cutting member 17 is sleeved over the cutting end 10 and locked in place by means of the set screw 19. The pieces of the bushing 25 are then shifted into their operative position as hereinbefore described.

When the tool is in its completely assembled position, that is, when it has attached thereto the supplemental cutting member 17, it is operated by gripping the handle 7 and hammering the surface 9 so as to drive the tool into the material from which the washers are to be cut. After the tool has been driven the proper distance, it is withdrawn, which action enables the bushing 25 as well as the ejector piece 15 to expand and thereby eject the washer and wad.

The punching tool herein described is simple as far as construction is concerned in that it consists of but a few parts. By reason of the fact that the ejector means is made from rubber, the tool may be produced at a comparatively low cost.

The invention is not to be understood as restricted to the details set forth, since these

may be modified within the scope of the appended claims, without departing from the spirit and scope of the invention.

Having thus described the invention, what I claim as new and desire to secure by Letters Patent, is:

1. A punching tool of the character described, comprising a body provided at one end thereof with a handle and having formed at its other end a circular cutting edge and a longitudinally extending open-ended cylindrical socket, and a wad ejector consisting of a block of elastic material located in the socket, said block being polygonal in cross section and having the corners thereof engaging frictionally the wall of the body that defines the socket.

2. A punching tool of the character described, comprising a body provided at one end thereof with a handle and having formed at its other end a circular cutting edge and a longitudinally extending open-ended cylindrical socket, and a wad ejector consisting of a block of elastic material located in the socket, said block being of square cross section and having the corners thereof engaging frictionally the wall of the body that defines the socket.

3. A punching tool of the character described, comprising a cylindrical body provided at one end thereof with a handle and having formed at its other end a longitudinally extending open-ended cylindrical socket, the extreme end portion of said one end of the body being bevelled internally adjacent the socket to form a circular cutting edge and a frusto-conical chamber communicating with the socket, and a wad ejector consisting of a block of elastic material mounted in the socket and positioned so that the outer end thereof terminates adjacent the cutting edge, the aforesaid chamber being operative to accommodate the said outer end of the block when the block is compressed during use of the tool.

4. In a punching tool of the character described, the combination of a body provided at one end thereof with a handle and having at its other end a pair of circular cutting elements arranged concentrically and spaced apart to form an annular intervening space, and ejector-means consisting of a longitudinally split bushing of elastic material positioned in the annular space, said bushing being so formed with respect to inside diameter that the ends of the bushing sections grip frictionally the outer periphery of the inner cutting element and tend to force the central portions of said sections into frictional engagement with the inner periphery of the outer cutting element.

5. In a punching tool of the character described, the combination of a body provided at one end thereof with a handle and hav-

ing at its other end a pair of circular cutting elements arranged concentrically and spaced apart to form an annular intervening space, and ejector means consisting of
5 a bushing of elastic material positioned in said annular space and split longitudinally into two sections, said bushing being so formed with respect to inside diameter that the ends of the sections grip frictionally
10 the outer periphery of the inner cutting element and tend to force the central portions of said sections into frictional engagement with the inner periphery of the outer cutting element.

15 6. In a punching tool of the character described, the combination of a body provided at one end thereof with a handle and having at its other end a pair of circular cutting elements arranged concentrically
20 and spaced apart to form an annular intervening space, and a spring rubber bushing positioned in the annular space and operative to eject ring-shaped wads therefrom, said bushing having the inner end thereof
25 notched to allow for recession during use of the tool.

Signed at Chicago, Illinois, this 18th day of April, 1929.

WILLIAM S. SAWLE.

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