

Jan. 12, 1954

J. L. HILL

2,665,597

EXPANSIBLE ANCHOR

Filed March 8, 1951

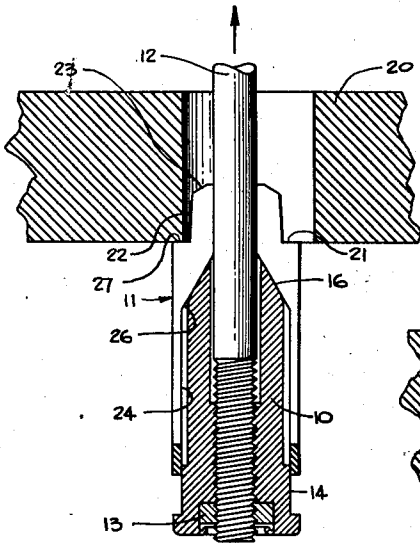


Fig. 1

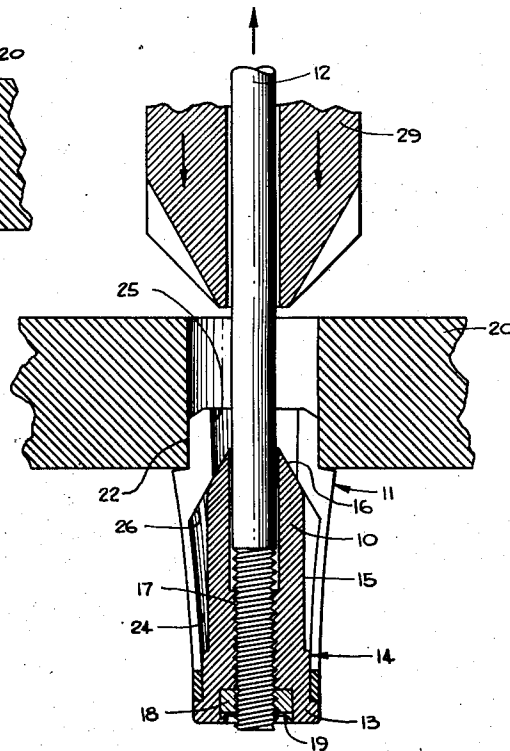


Fig. 2

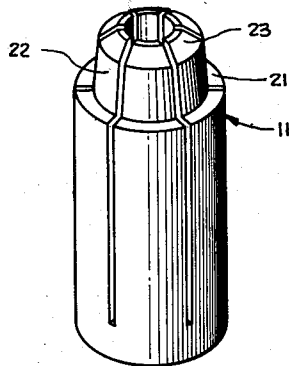


Fig. 3

JAMES L. HILL

Inventor

Hubert Miller

Attorney

UNITED STATES PATENT OFFICE

2,665,597

EXPANSIBLE ANCHOR

James L. Hill, Wichita, Kans., assignor to Boeing Airplane Company, Wichita, Kans., a corporation of Delaware

Application March 8, 1951, Serial No. 214,448

3 Claims. (Cl. 77-2)

1

This invention relates to a special tool for aiding in the countersinking of holes in heavy gage metal, and more particularly to an expansible anchor which can be passed through a hole to be countersunk, automatically expanded on the opposite side of the workpiece to prevent its withdrawal therefrom, and thus used as an anchor for the application of the required axial force to the countersinking bit. The type of countersinking tool with which the specific anchor constituting the present invention may be used is fully described and illustrated in my pending patent application Serial No. 199,071, filed December 4, 1950. This type of countersinking tool includes an axially bored countersinking bit which rotates about an axially movable drawbar which extends outward beyond the working end of the bit, and to which an axial countersinking force may be applied mechanically.

It is an object of this invention to provide an anchor suitable for installation on the free end of the drawbar of such a countersinking tool to aid in forcing the countersink bit axially into the workpiece to accomplish the countersinking cut.

It is a further object to provide an anchor of this type which utilizes the principle of the wedge or inclined surface, and which is expanded in diameter by a slight axial movement of its drawbar in a direction opposite the direction of its original insertion into a hole in a workpiece.

Another object is to provide an anchor which, when expanded, will perfectly center the drawbar with relation to the hole to be countersunk, thus assuring concentricity between the countersink cut and the hole in the workpiece.

Another object of this invention is to provide an anchor which will automatically contract to its normal diameter when it is moved away from anchoring contact with the workpiece surface, thus permitting it to be easily withdrawn through the hole after the countersinking cut has been made.

The invention, together with other objects, will be more clearly understood when the following description is read in connection with the accompanying drawings, in which:

Fig. 1 is a vertical sectional view of a preferred form of the invention attached to the drawbar of a countersinking tool, a workpiece being shown fragmentarily, and the anchor being shown in its contracted condition just after it has been passed through the hole to be countersunk;

Fig. 2 is a similar view showing the anchor ex-

2

panded, the drawbar and countersink bit centered with relation to the hole, and the countersink bit ready to begin its cutting operation; and

Fig. 3 is a perspective view of an expansible sleeve which constitutes a part of the invention. Referring to the drawings, it will be seen that this anchor includes an inclined surface type expander 10, a longitudinally split expansible sleeve 11, and a drawbar 12 seated axially in the expander and adapted to serve as the means for moving the expander axially with relation to the sleeve. It should be noted that the drawbar or a similar functional element actually constitutes an essential part of this invention.

As to details of construction, the expander is generally cylindrical and has an enlarged head 13, an adjacent intermediate cylindrical slide-way 14 of reduced diameter, an elongated cylindrical portion 15 of still smaller diameter, and a frusto-conical end 16. The expander has a central bore 17 which is threaded to receive one end of the drawbar 12. The head end of this expander is counterbored to receive a hard fibre washer 18 which is locked in position by rolling the edge of the counterbore shoulder inward, as at 19. The diameter of the head 13 is such as to permit it to pass through the hole in workpiece 20. The fibre washer serves as a friction lock to prevent the drawbar 12 from backing out of its seat in the expander during the repeated expansion and contraction of the anchor.

The sleeve 11 is generally cylindrical but has an annular shoulder 21, a slightly tapered exterior surface 22, and a frusto-conical exterior end surface 23. It has a plurality of radially disposed longitudinal slots extending from its end 23 to a point near its opposite ends, and the major part of its wall is thus divided into a plurality of sector shaped segments each of which is inherently resilient due to the characteristics of the metal of which the sleeve is made, and can therefore be moved radially outward from the sleeve axis. The external diameter of this sleeve is no greater than the external diameter of the expander head 13.

Internally the sleeve 11 has a normally cylindrical bore 24 of a diameter to slidably seat on the cylindrical slide-way 14, a smaller central bore 25 at its opposite end to slideably embrace the drawbar 12, and a connecting conical bore 26 adapted to contact and cooperate with the conical exterior surface 16 of the expander. As shown in Fig. 1, these two surfaces 16 and 26 are tapered at substantially the same angle when the small end of the sleeve is fully contracted.

Operation

Fig. 1 shows the anchor after having passed through the hole in workpiece 20 from its upper side. The anchor is next moved to an eccentric position with relation to the hole so that a portion of annular shoulder 21 underlies and is in contact with a portion of the workpiece surface surrounding the hole, as indicated at 27.

Drawbar 12 is next moved slightly axially in the direction of the arrow. Since the sleeve is held by the workpiece against movement in this direction, the expander moves in a sleeve penetrating direction, and the conical expander surface 16 (Fig. 2) cams on the sleeve surface 26 and forces the individual segments of the sleeve radially outward, increasing the exterior diameter of the sleeve surface 22 until it is forced firmly against the wall of the hole in the workpiece. The degree of outward movement of each individual segment is identical because the conical surfaces 16 and 25 are concentric to the longitudinal axis of drawbar 12. Simultaneously the diameter of annular shoulder 21 is increased, as shown in Fig. 2, so that the entire surface of the shoulder is in contact with the workpiece surface surrounding the hole. A firm anchor against movement of the anchor assembly in the direction of arrow 23 is thus created.

To release the described anchor it is only necessary to move the drawbar slightly away from its contact with the workpiece. The inherent resilience in the individual segments of the sleeve force the surface 26 to cam against the contacting surface of the expander. This camming action moves the sleeve longitudinally on slideway 14 and the entire sleeve returns to the position shown in Fig. 1, with all segments retracted. The entire anchor assembly may then be withdrawn from the hole in the workpiece.

It should be noted that the diameters of both expander and sleeve should be varied with the diameter of the hole in which it is desired to anchor the end of the drawbar. The cooperating inclined surfaces 16 and 26 should be smooth, and the shoulder between surface 16 and normally cylindrical surface 15 should preferably be gently rounded, as shown, to facilitate the camming action between the two surfaces.

While this anchor has been described in connection with a countersinking tool which has a countersink bit 29 movable axially as well as rotationally on drawbar 12, it will be apparent that it can be used on an end of any elongated element which it is desired to anchor in a drilled hole in a fixed part.

Having described the invention with sufficient clarity to enable those familiar with this art to construct and use it, I claim:

1. A normally contracted expansible anchor for a draw bar adapted to be passed axially through a hole in a work piece and to expand and anchor therein in response to draw bar thrust applied in a withdrawing direction, said anchor comprising: a generally cylindrical sleeve expander rigidly secured concentrically on the draw bar; an external annular shoulder near the outer end of said expander facing the direction of draw bar pull; an external frusto-conical camming surface at the inner end of the expander, also facing the

direction of draw bar pull; an external cylindrical surface intermediate the ends of the expander; a generally cylindrical sleeve having its outer end slidably and concentrically seated on and encompassing the said cylindrical surface of said expander for movement axially with relation thereto; an external annular shoulder near the inner end of said sleeve facing said inner end and in the direction of draw bar pull; a plurality of circumferentially spaced longitudinally disposed slots in said sleeve extending from its inner end to a point near its outer end, dividing the slotted portion of the sleeve into a plurality of radially flexible fingers, the free ends of which project in the direction of draw bar pull; and an internal frusto-conical camming surface within the sleeve near its inner end for cooperation with the similar camming surface at the inner end of the expander to force the inner ends of said fingers radially outward in response to movement of the expander with relation to the sleeve in the direction of draw bar pull.

2. The invention described in claim 1 in which the external diameter of the outer end of said sleeve is substantially equal to the external diameter of the annular shoulder at the outer end of the expander.

3. A normally contracted expansible anchor adapted to be fixed on an elongated draw bar and carried thereby, and capable of passing axially through a hole in a work piece with the draw bar and expanding in response to draw bar thrust in a withdrawing direction to anchor the draw bar in the work piece hole, said anchor comprising: an elongated substantially cylindrical expander fixed on the draw bar and having a frusto-conical inner end surface and an enlarged annular external shoulder near its outer end; and a normally contracted expansible sleeve having an annular outer end carried by and slidable axially along the cylindrical portion of said expander, that portion of the sleeve from its annular outer end to its inner end being divided longitudinally into a plurality of relatively narrow inherently resilient fingers, said sleeve having an exterior annular shoulder near its inner end for contacting a work piece surface when said fingers are expanded radially outward, said sleeve also having an interior conical surface near its inner end to cooperatively cam on the frusto-conical surface of said expander in response to a sleeve penetrating movement of the expander resulting from draw bar pull, the maximum outside diameter of said sleeve while its fingers are in contracted position being no greater than the diameter of the hole in which the draw bar is to be anchored.

JAMES L. HILL.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
1,364,489	Edelblut	Jan. 4, 1921
1,721,310	Miller	July 16, 1929
1,851,421	Conklin	Mar. 29, 1932
2,393,587	Bugg et al.	Jan. 29, 1946
2,479,660	Wright	Aug. 23, 1949