Oct. 20, 1942. A. C. DE LORME 2,299,534

PUNCH AND SUPPORT ASSEMBLAGE

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FIG. 1

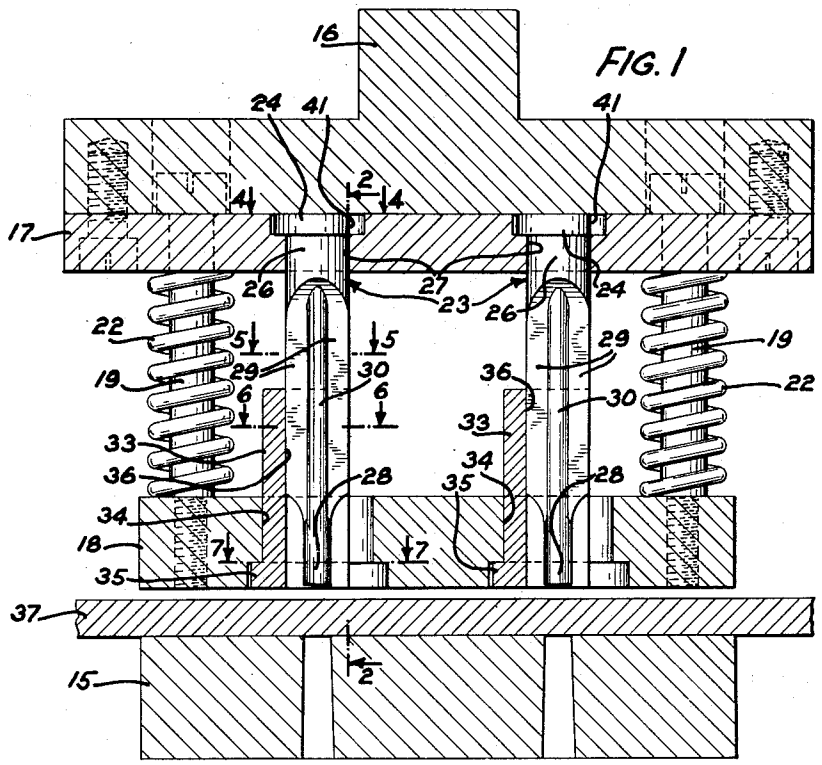


FIG. 4

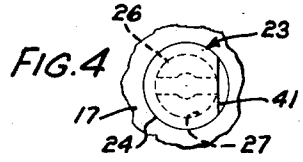


FIG. 2

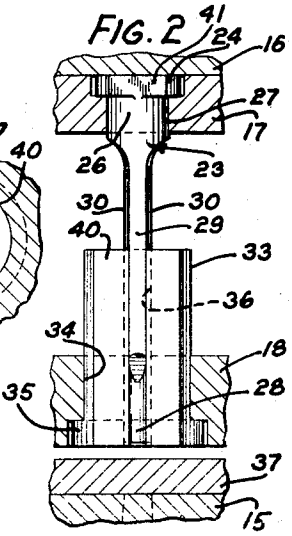


FIG. 3

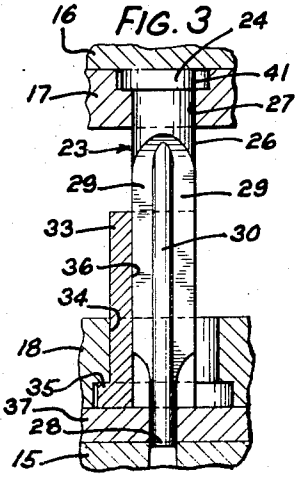


FIG. 5

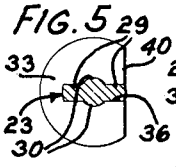


FIG. 7

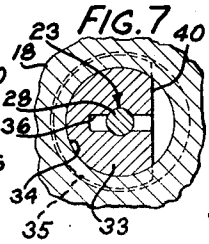
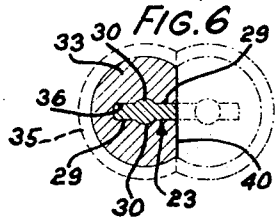


FIG. 6



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FIG. 8

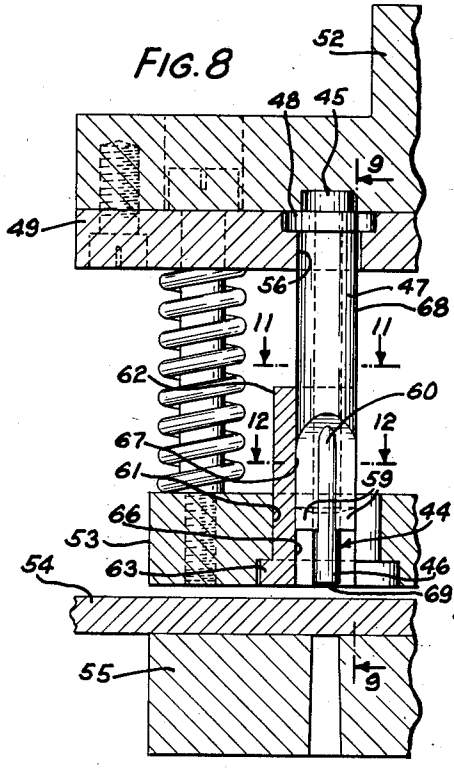


FIG. 9

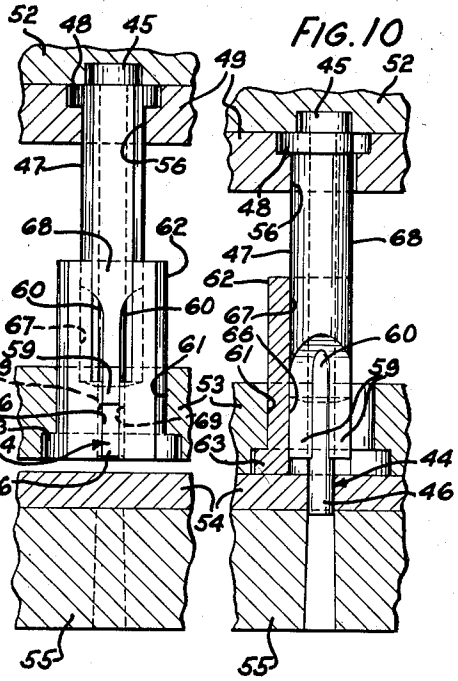


FIG. 10

FIG. 11

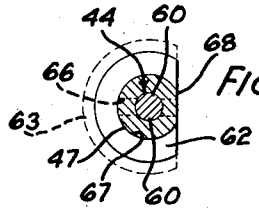
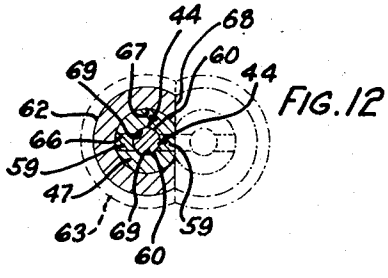


FIG. 12



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PUNCH AND SUPPORT ASSEMBLAGE

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Application May 17, 1941, Serial No. 393,911

3 Claims. (Cl. 164—118)

This invention relates to punches or perforators and their supporting means and particularly to punch and support assemblages for perforating relatively thick material.

The thickness of material that can ordinarily be punched is commonly limited to the diameter of the punch for all practical purposes. It is common knowledge that punches or perforators may buckle or break if an attempt is made to punch holes or apertures in materials greater than the diameter of the punch because the punch is usually not sufficiently radially guided and supported throughout its travel.

An object of this invention is to provide a practical and efficient punch and support assemblage which will permit perforating of material of a considerably greater thickness than the diameter of the punch without complicating, in any way, the common method of operating the same.

In attaining this object, in one embodiment of the invention, a guiding and supporting sleeve is provided through which is formed longitudinally a slot having opposite lateral portions extending from arc-shaped opposite sides of a central portion thereof adapted to receive rounded sides of a central portion of a punch. The punch is formed, above its piercing end, with lateral extensions which slidably fit in the opposite lateral portions of the sleeve slot, whereby it is completely radially supported throughout its travel.

In accordance with another embodiment of the invention, the punch is mounted in and movable with an inner supporting sleeve slidable in an outer supporting sleeve, which is provided, at its lower end, with a slot similar to that described in connection with the first embodiment, in which is slidably fitted a reduced lower forked end of the inner supporting sleeve. The upper end of the inner supporting sleeve slides in an aperture in the outer supporting sleeve extending from its upper end to its lower slotted end. In the first embodiment of the invention, one side of the supporting sleeve and the punch, above its piercing end, is flattened for the purpose of arranging two punches in close proximity where two close perforations are to be formed, the flattened side in the sleeve also facilitating the machining of the slot in the sleeve. The second embodiment is also flattened at one side of each of the inner and outer supporting sleeves for similar reasons.

Other objects and advantages of the invention will be understood by reference to the following specification and accompanying drawings, in which

Fig. 1 is a vertical sectional view, partly in elevation, through a punching mechanism showing two assemblages of punches and their supports constructed in accordance with one embodiment of this invention;

Fig. 2 is a fragmentary vertical sectional view taken on the line 2—2 of Fig. 1;

Fig. 3 is a fragmentary view of Fig. 1 showing a punch and its supporting sleeve at the completion of the perforating stroke;

Figs. 4, 5, 6 and 7 are plan sectional views taken on the lines 4—4, 5—5, 6—6 and 7—7 of Fig. 1;

Fig. 8 is a fragmentary vertical sectional view, partly in elevation, of a punching mechanism illustrating another embodiment of the invention;

Fig. 9 is a vertical sectional view taken on the line 9—9 of Fig. 8;

Fig. 10 is a fragmentary view of Fig. 8 showing the punch and its supporting member and sleeve at the completion of the perforating stroke; and

Figs. 11 and 12 are plan sectional views taken on the lines 11—11 and 12—12 of Fig. 8.

In the drawings, the usual simple form of punching mechanism is shown by way of illustration. Referring to Fig. 1, the dies and die block are indicated at 15. A reciprocating punch holder 16 is provided with a punch securing plate 17 and a material stripper plate 18 secured to the holder by means of bolts 19 passing through coiled springs 22 adapted to maintain the plate 18 in its extended normal position. The punching mechanism illustrated includes, for example, two punches with individual guiding and supporting means and, since both are identical, the following description directed to one of them applies to both.

A punch, indicated, in general, at 23, depends from the securing plate 17 and is provided with a head or flange 24, which freely fits in a circular depression in the plate. For a distance below the flange 24, the punch is circular in cross-section, as indicated at 26 (Figs. 1 and 4), and has a fixed driven fit in an aperture 27 in the securing plate 17 to prevent its rotation or, if found desirable, other means may be employed. At its lower end, the punch 23 has a piercing end 28 of circular cross-section, which extends upwardly for a distance suitably greater than the thickness of the material to be perforated. The portions 26 and 28 of the punch 23 are concentrically arranged and, between the lower and upper ends of these portions, the punch is suitably cut away at opposite sides to provide oppositely arranged tongues 29 (Figs. 1 and 2), having a thickness

less than the diameter of the circular piercing end 28 and extending inwardly from the plane of the periphery of the circular portion 26 and into arc shaped or rounded opposite side portions 30 of the punch, which are co-extensive with and in the plane of the periphery of the piercing end, the side portions extending upwardly to the portion 26.

A guiding and supporting sleeve 33 for the punch 23 is secured to the stripper plate 18 by a fixed driven fit in a shouldered aperture 34 (Figs. 1 and 7) thereof to prevent rotation thereof and a shoulder or flange 35 upon the lower end of the sleeve freely fits in the shouldered portion of the aperture. The sleeve 33 is formed with an aperture or slot 36 extending longitudinally from end to end thereof and of uniform configuration throughout its length, similar to that of the cross-section of the punch between the portions 26 and 28 thereof, as clearly shown in Fig. 6, and in which the punch reciprocates in the operation of the punching mechanism. The distance the sleeve 33 extends upwardly along the punch 23 to guide and support the same will depend upon the length of the stroke of the punch and the thickness of the materials to be punched or perforated and, therefore, the distance between the upper end of the sleeve and the lower end of the circular portion 26 of the punch should preferably be slightly greater than the thickness of the material. For similar reasons, the tongues 29, at their lower ends, terminate a suitable distance above the lower end of the piercing end 28 of the punch 23.

From the above description, it will be obvious that the piercing end 28 of the punch 23 will be fully radially guided and supported in all directions throughout its working stroke by the interlocking surfaces of the tongues 29 and arc-shaped or rounded side portions 30 of the punch, sliding on the complementary surfaces of the aperture or slot 36 of the guiding and supporting sleeve 33.

Referring to Fig. 1, the punching mechanism is shown at the top position or about to start its punching or perforating stroke to punch or perforate material, indicated at 37. The stripper plate 18, with the sleeves 33 attached thereto, is in its lowermost position. In this top position of the mechanism, more than one-half the length of the tongues 29 of the punches 23 is radially supported in the slots 36 of the sleeves 33 and the entire length of the punches between the upper and lower ends of the sleeves have a bearing (Figs. 6 and 7) in the opposite rounded portions of the slots 36. In a downward movement of the punching mechanism, the stripper plate 18 contacts the material 37 to be perforated and remains in contact therewith as the piercing ends 28 of the punches 23 contact and perforate the material. The mechanism, as it continues downwardly, causes a progressively increasing length of the tongue portions 29 of the punches 23 to have a bearing on the surfaces of the slots 36, thus providing progressively increasing radial support in all directions to the punches 23 as the punching or perforating force increases until the perforating of the material is completed, as shown in Fig. 3.

The guiding and supporting sleeve 33 is flattened at one side, as indicated at 40 (Figs. 2 and 6), throughout its length and inwardly from its periphery to the plane of the periphery of the punch 23, which is similarly flattened at its upper flange 24, as indicated at 41. This flattening of the sleeve 33 and punch 23 serves two purposes. In the case of the sleeve 33, it facilitates the machining of the slot 36, since the sleeve, after being first centrally bored to the diameter of the piercing end 28 of the punch, may then be cut back or flattened to the plane of the right hand end of the slot (Fig. 5), thus permitting the lateral portions of the slot to be readily formed by a milling tool operation. The flattening of the sleeve 33 at 40 and the punch 23 at 41 is also an advantage in that it permits a closer arrangement of punches, as shown in Fig. 6, for example, where a pair of perforations are to be formed simultaneously in close proximity.

In the embodiment of the invention shown in Figs. 8 to 12, inclusive, a punch 44, having a uniform cylindrical cross-section extending from a cylindrical head or flange 45 to a piercing end 46 thereof, is carried in and rests upon an inner supporting sleeve 47. A head or flange 48 on the sleeve 47 freely fits in a circular depression in a punch securing plate 49, the punch flange 45 freely fitting in a circular depression in a punch holder 52 with its upper surface abutting the upper wall of the depression. A material stripper plate 53 is secured to the holder 52 in a manner similar to that of the mechanism shown in Fig. 1 and material 54 to be perforated rests upon a die block 55.

The depending inner sleeve 47, which carries the punch 44, is circular in cross-section for a distance below the flange 48, except as will be described hereinafter, and has a fixed driven fit in an aperture 56 in the securing plate 49 to prevent its rotation (Fig. 8). For a suitable distance from its lower end, the apertured inner sleeve 47 is cut away at opposite sides (Figs. 8, 9 and 12), the cuts extending into the aperture and thus forming a forked lower end with two prongs or tongues 59 having a thickness less than the diameter of the punch 44 and extending inwardly from the periphery of the sleeve and to arc-shaped or rounded opposite side portions 60 of the punch (Fig. 12). The punch thus extends slightly beyond the opposite sides of the tongues 59 through the space therebetween (Figs. 8 and 9).

Secured to the stripper plate 53, by a non-rotatable driving fit in a shouldered aperture 61 thereof, is an outer supporting sleeve 62 provided with a shoulder or flange 63 upon its lower end, which freely fits in the shouldered portion of the aperture 61. An aperture or slot is formed longitudinally throughout the length of the outer sleeve 62 and has a configuration at its lower end, indicated at 66 (Fig. 12), similar to that of the cross-section of the forked lower end of the inner sleeve 47, taken with the punch 44, which extends between the tongues 59 of the forked sleeve, as clearly shown in Fig. 12. In the portion 66 of the aperture in the outer sleeve the forked end of the inner sleeve and the lower end of the punch reciprocate in unison in the operation of the punching mechanism. From the upper end of the configuration 66 of the aperture in the outer sleeve 62 to its upper end the aperture is circular, as indicated at 67 (Fig. 11), for receiving the upper circular portion of the inner sleeve 47.

The inner and outer sleeves 47 and 62 are flattened at one side, as indicated at 68 (Figs. 9 and 12), throughout their length for purposes identical to those described in connection with the structure shown in Figs. 1 to 7, inclusive.

Fig. 8 illustrates the punching mechanism in its top position ready to start its punching or per-

forating stroke to punch or perforate the material **54** and the stripper plate carrying the outer sleeve **62** is consequently in its normal lowermost position. At the top position of the mechanism, it will be observed that the entire length of the punch **44** is radially supported by the inner sleeve **47**, including the cylindrical top portion and the lower spaced tongues **59** thereof, and also by the lower piercing end **46** of the punch bearing in opposite rounded portions **69** of the configuration **66** of the slot in the outer sleeve **62**, the inner sleeve **47**, in turn, being radially supported and having a bearing in the outer sleeve **62**. As the punching mechanism moves downwardly, the stripper plate **53** contacts the material **54** to be perforated and remains in contact therewith as the piercing end **46** of the punch **44** contacts and perforates the material. As the mechanism continues downwardly, it will be noted that a progressively increasing length of the inner sleeve **47**, which moves in unison with the punch, will have a bearing in the outer sleeve **62** and thus a progressively increasing radial support in all directions for the punch **44** is provided as the punching or perforating force increases until the perforating of the material is completed, as shown in Fig. 10.

From the foregoing description, it is obvious that in each embodiment of the invention a practical and efficient punch and support assemblage is provided which provides a maximum of support for the punch against any tendency thereof to buckle or break, particularly in the use of slender punches for perforating small diameter apertures, and which permits the punching or perforation of material of considerably greater thickness than the diameter of the punch. The arrangement and structure is also such that a plurality of punches may be mounted in close relation for forming, particularly perforations of small diameter in close proximity.

It will be understood that the embodiments herein described are merely illustrative of the invention and applications thereof, the invention being limited only by the scope of the appended claims.

What is claimed is:

1. In a punch and support assemblage, a punch having supporting ribs extending longitudinally thereof on diametrically opposite sides and of less thickness than the diameter of the punch, and a support for the punch having slots throughout its length in which said ribs slide, said support engaging said punch except at said slots.

2. In a punch and support assemblage, a punch having longitudinally extending integral diametrically opposed ribs intermediate its ends and of less thickness than the diameter of the punch, and a support for the punch having slots throughout its length in which said ribs slide, said support engaging said punch except at said slots and being cut away at one side to provide an opening into one of said slots.

3. In a punch and support assemblage, a punch, a pair of longitudinally extending diametrically opposed ribs having parallel sides and of less thickness throughout their length than the diameter of said punch and terminating adjacent one end of a piercing portion of the punch and movable therewith, and a punch supporting sleeve-like member having slideways in which said ribs and piercing portion slide in the operation of said punch, said member being cut away at one side to provide an opening into one of said rib slideways.

ALFRED C. DE LORME.