June 22, 1965 A. K. SCHOTT 3,190,165

STRUCTURE FOR PUNCHING MACHINE

Original Filed March 6, 1961 2 Sheets-Sheet 1

Fig. 1

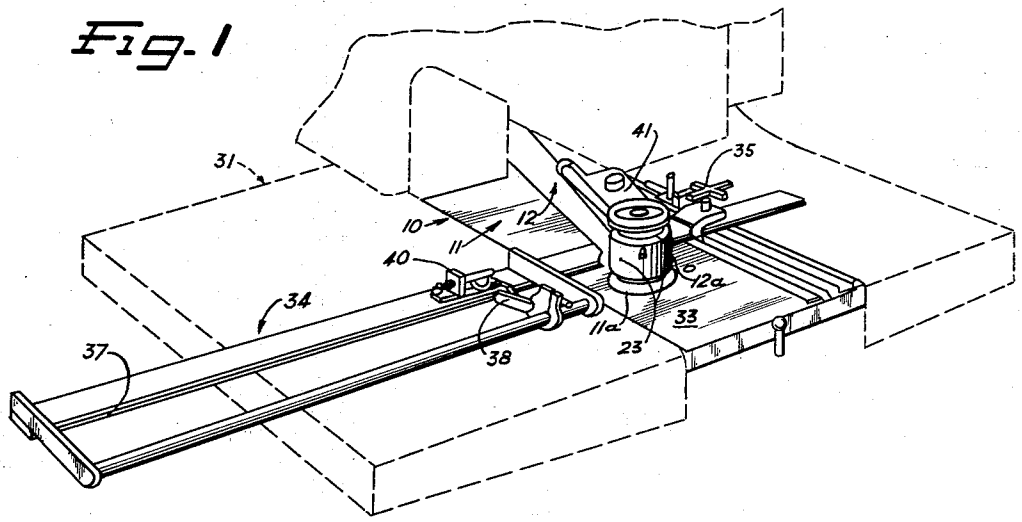
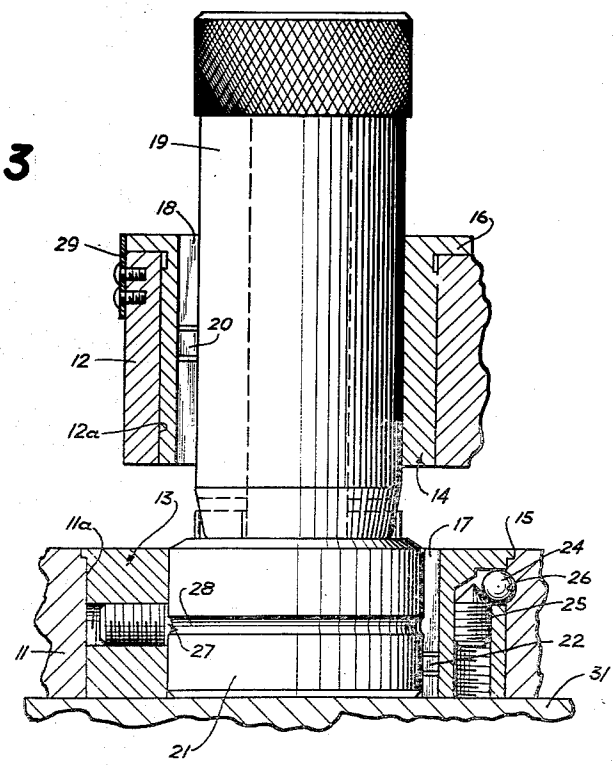



Fig. 3




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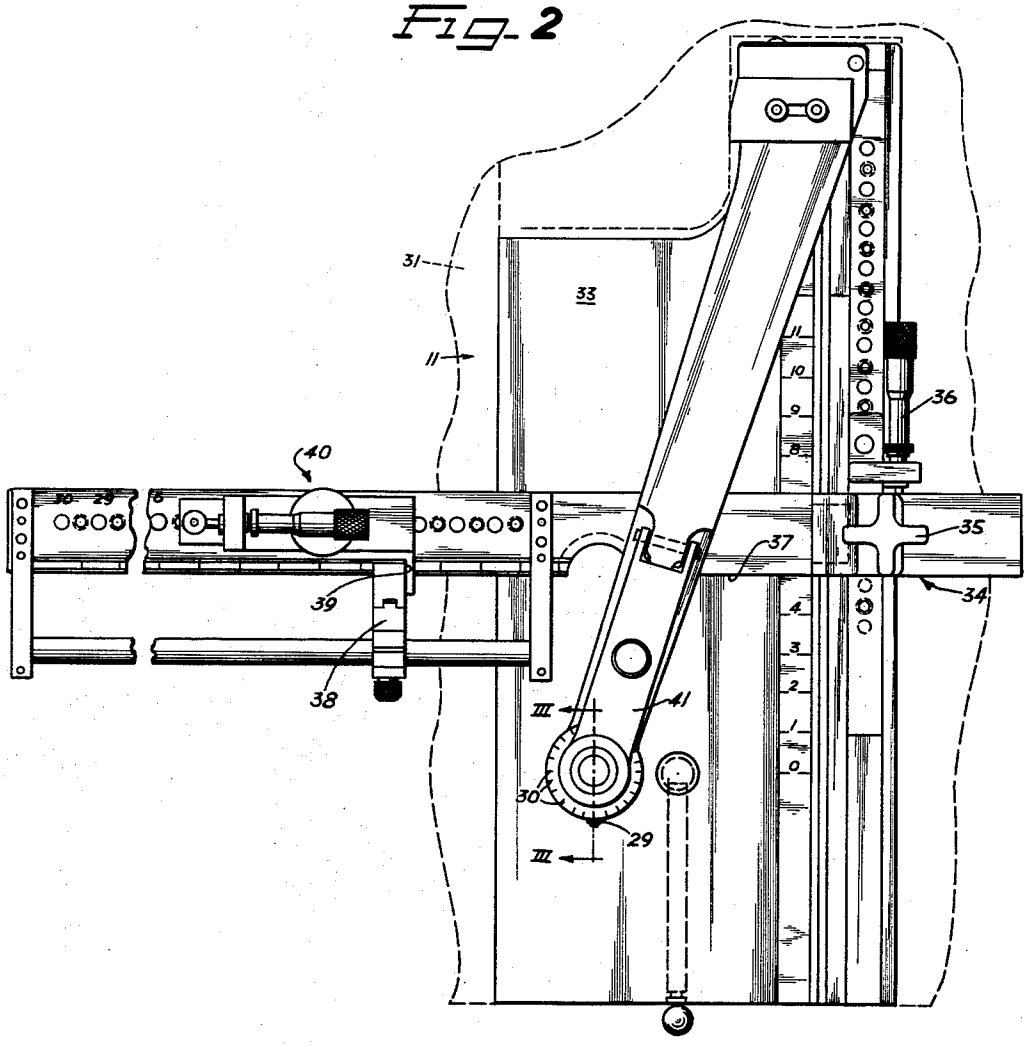
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Fig. 2




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3,190,165

# STRUCTURE FOR PUNCHING MACHINE

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Original application Mar. 6, 1961, Ser. No. 93,578. Divided and this application June 18, 1962, Ser. No. 203,373

2 Claims. (Cl. 83—467)

This invention relates generally to punching machines, and more specifically to a novel punch and die supporting structure for angularly positioning the punch and die about the reciprocation axis.

This application is a division of my copending application of the same time, Serial No. 93,578, filed March 6, 1961.

Although the principles of the present invention may be included in various punching machines and devices, a particularly useful application is made in a punching machine of the type that acts on a single workpiece, the workpiece being positioned by adjustable gaging forming a part of the device.

The present invention contemplates the joint usage therewith of workpiece-locating means or gaging adapted to engage the workpiece at reference edges or points, and to accurately position the same with respect to a predetermined reference point on the punching machine, such point usually being the reciprocation axis of the tooling. More specifically, the cutting edges of punches and dies are frequently adapted to provide a non-circular opening or operation on the workpiece, and the structure of this invention is especially adapted to enable the selective positioning of such non-circular tooling to any angular position about the reciprocation axis thereof.

Accordingly, it is an object of the present invention to provide an improved punching machine.

Another object of the present invention is to provide tool and die supporting means which enable such tool and die means to be positioned at a selected angular position about a common axis.

A still further object of the present invention is to provide means by which the tool support and the die support may be locked at a selected angular position.

Many other advantages, features and additional objects of the present invention will become manifest to those versed in the art upon making reference to the detailed description and the accompanying sheets of drawings in which a preferred structural embodiment incorporating the principles of the present invention is shown by way of illustrative example.

On the drawings:

FIGURE 1 is a perspective view of a punching device provided in accordance with the principles of the present invention, the same being illustrated in conjunction with a suitable press, shown in broken lines, for operating the same;

FIGURE 2 is an enlarged top view of the punching device of FIGURE 1; and

FIGURE 3 is an enlarged cross-sectional view taken along line III—III of FIGURE 2.

As shown on the drawings:

The principles of this invention are particularly useful when embodied in a punching device such as illustrated in FIGURE 1, generally indicated by the numeral **10**. The punching device **10** includes a rigid frame having a lower arm **11** and an upper arm **12**, each of which is respectively provided with an aperture **11***a* and **12***a*. The apertures **11***a* and **12***a* are thus defined by means which are vertically spaced from each other by a relatively small amount sufficient to admit a workpiece.

Within the aperture **11***a*, there is disposed an annular



member **13**, and within the aperture **12***a*, there is disposed another annular member **14** concentric with the annular member **13**. The annular members **13** and **14** are each respectively rotatable within the apertures in the lower and upper arms, and are respectively supported by such arms. To this end, each annular member **13** and **14** is respectively provided with a peripheral flange **15** and **16**. Each of the annular members **13** and **14** is further respectively provided with one or more internally directed grooves **17** and **18**, which are receptive of keying of cooperating punch and die means having shaped or non-circular cross-section of a known type, not shown. Punch and die means of that type, are known in the art, and in place thereof, I have illustrated herein a simulated punch or calibrating tool **19** which has a key **20** received in the groove **18** for effecting corotation between the tool **19** and the annular member **14**. There is also illustrated a simulated die **21** having a key **22** received in the groove **17**. This keying precludes relative rotation between each annular member and the tool received by it, thereby insuring corotation therebetween. The simulated punch **19** and the simulated die **21** have external configurations which engage the annular members **14** and **13**, which external portions of their configurations are identical to the tooling for which this structure is provided.

The tool **19** has a grooved lower face which receives an upwardly extending structure on the tool **21**, the same having an interengagement which precludes relative rotation therebetween. By means of this type of simulated tooling, the annular members **13** and **14** can be rotated to any angular position about their common axis and there locked, thus readying the frame for receiving cooperating punch and die means of shaped cross-section, the angular relation between such shaped cross-section and the gaging of the punching machine thus being fixed.

The annular member **14** is locked in position by a number of setscrews **23**, shown in FIGURE 1, which are supported by the upper arm **12** and which act on the annular member **14**.

The lower annular member **13** is locked in position by a structure shown in FIGURE 3 which includes selectively effective locking means carried entirely by the annular member **13** and removable therewith. This structure includes a bearing member or ball **24** received in an aperture in the outside or outer surface of the annular member **13**, and a threaded camming member **25** which acts on an inner point on the bearing member **24** to cam the bearing member **24** outwardly by a preselected amount. As illustrated, it will be noted that the bearing member **24** is seated in a socket **26** which serves to provide or define a single predetermined angular position of the annular member **13**. When the bearing member **24** has been retracted, the annular member **13** may be rotated and the bearing member **24** squeezed into locking engagement with the lower arm **11** at any position selected. If desired, more than one bearing member **24** and camming member **25** may be employed, whereby the annular member **13** may be locked at positions almost in alignment with the detent **26** without inadvertently thereby becoming aligned therewith.

If desired, a spring-loaded ball assembly **27** may be provided in the annular member **13** to cooperate with a groove **28** in the tool **21** to keep the same from falling out during handling thereof when the device **10** is detached or removed from the press. This feature is known in the art and forms no part of this invention.

A pointer **29** is carried by the upper arm **12** for cooperation with a protractor **30**, shown in FIGURE 2, carried on the upper surface or flange **16** of the annular member **14**.

When the device **10** has been provided with appropriate punch and die means, it may be installed on or in a suitable press indicated in broken lines at **31** in FIGURE 1, for operation thereby. The upper surface of the arm **11** serves as a workpiece-supporting surface or table **33**, which is augmented by adjacent surface on the press **31** if desired. The workpiece (not shown) may be inserted in the punching device **10** and the press **31** operated, to perforate the workpiece. However, it is preferable that the workpiece be guided or located with respect to the centerline of the punch and die means. The particular apparatus disclosed here is adapted to accurately locate a workpiece so that a prospective aperture is positioned properly with respect to a preselected reference edge of the workpiece. To this end, structure is provided for accurately positioning or locating the workpiece with respect to a predetermined reference point, the reference point in this instance being the concentric axes of the rotatable annular members **13**, **14**, which may be referred to as the reciprocation axis of the tool and die means.

The gaging structure is described in detail in the parent application identified above. However, a brief description thereof is included herein for convenience. The gaging structure includes a movable gage bar assembly **34** which includes means **35** for guiding the same in slots in the lower arm **11** and for clamping the same to the lower arm **11**. The position of the gage arm assembly **34** is determined by precision gaging means generally indicated at **36** which directly indicate the distance from a reference surface **37** to the axis of the annular members **13** and **14**. The gage bar assembly **34** further includes an adjustable stop assembly **38** which has a reference surface **39** engageable with a further edge of the workpiece. Precision gaging means generally indicated at **40** are also provided and carried on the gage bar assembly **34** for accurately positioning or locating the adjustable stop **38** where it is locked.

During operation, the reciprocable punch is normally biased in an upward direction by structure generally indicated at **41**, details of which conform to the principles described in Patent No. 2,708,970.

Although various minor modifications might be suggested by those versed in the art, it should be understood that I wish to embody within the scope of the patent warranted hereon, all such embodiments as reasonably and properly come within the scope of my contribution to the art.

I claim as my invention:

**1.** A structure for accurately angularly orienting a shaped tool with respect to a workpiece, comprising in combination:

(a) a rigid frame constructed to be installed in and removed from a press as a unit and having relatively fixed upper and lower arms, said arms respectively having vertically fixed means defining a pair of spaced aligned apertures;

(b) a pair of vertically-spaced upwardly-open concentric annular members respectively supported by said arms in said spaced aligned apertures in vertically fixed positions and each rotatable therein, and each of said members having means respectively defining a bore slidably receptive from above of separate cooperating tools comprising punch and die means of noncircular cross-section, one of said bore-defining means further enabling one of said tools to be vertically reciprocated with respect to the associated vertically fixed annular member;

(c) said rotatable annular members each having radially inwardly extending keying structure operative between each annular member and the tool supported by it to effect corotation with such supported tool while enabling the relative vertical movement of the one of said tools and slidable reception of both of said tools; and

(d) selectively effective locking means for each of said annular members, said locking means being respectively operative between said frame and said annular members to lock said annular members in any selected rotational position with respect to said frame.



**2.** A structure for accurately angularly orienting a shaped tool with respect to a workpiece, comprising in combination:

(a) a rigid frame constructed to be installed in and removed from a press as a unit and having relatively fixed upper and lower arms, said arms respectively having vertically fixed means defining a pair of spaced aligned apertures;

(b) a pair of vertically-spaced upwardly-open concentric annular members respectively supported by said arms in said spaced aligned apertures in vertically fixed positions and each rotatable therein, and each of said members having means respectively defining a bore slidably receptive from above of separate cooperating tools comprising punch and die means of noncircular cross-section, one of said bore-defining means further enabling one of said tools to be vertically reciprocated with respect to the associated vertically fixed annular member;

(c) said rotatable annular members each having radially inwardly extending keying structure operative between each annular member and the tool supported by it to effect corotation with such supported tool while enabling the relative vertical movement of the one of said tools and slidable reception of both of said tools;

(d) selectively effective locking means for each of said annular members, said locking means being respectively operative between said frame and said annular members to lock said annular members in any selected rotational position with respect to said frame; and

(e) gaging means clamped to one of said relatively fixed arms of said frame at any selected position thereon, and operative on two adjacent edges of the workpiece to guide the workpiece into a predetermined relation with respect to said rotatable annular members for the workpiece to be worked on by the punch and die means supported by said annular members.


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# UNITED STATES PATENT OFFICE
# CERTIFICATE OF CORRECTION

Patent No. 3,190,165 Dated June 22, 1965

Inventor(s) A.K. Schott

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Col. 3, line 64 delete "from above";

Col. 4, line 26 delete "from above".

Signed and sealed this 15th day of August 1972.

(SEAL)
Attest:

EDWARD M. FLETCHER, JR.
Attesting Officer

ROBERT GOTTSCHALK
Commissioner of Patents