April 29, 1947 H. A. BURLESON 2,419,534

DEMOUNTABLE DEVICE FOR PUNCHING T[illegible]

Filed May 30, 1945 2 Sheets-Sheet 1

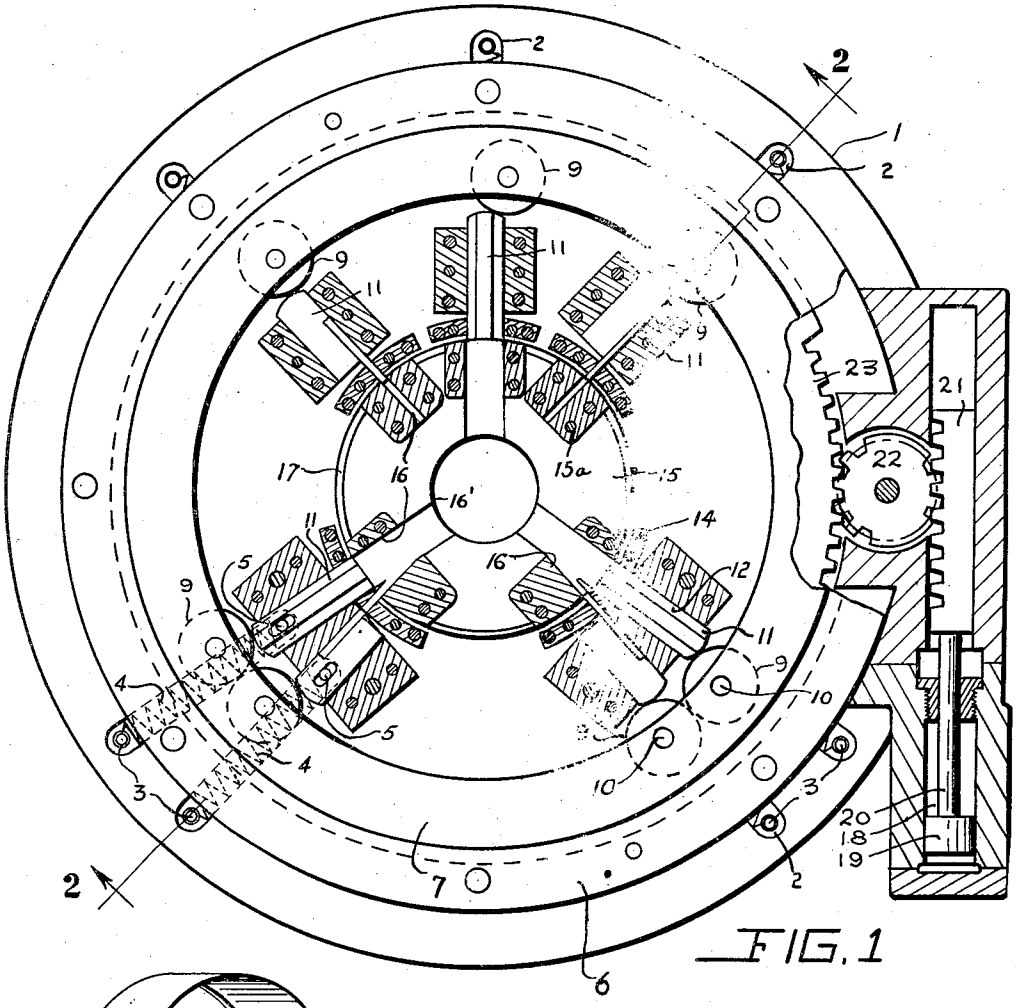


FIG. 1

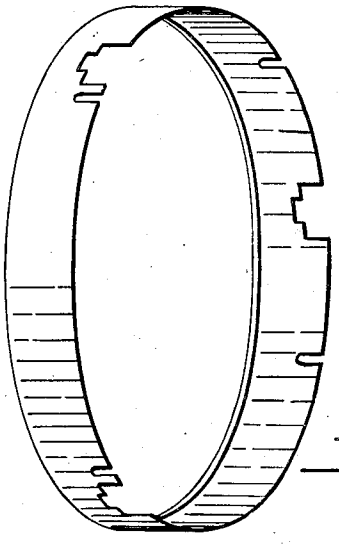


FIG. 3

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April 29, 1947. H. A. BURLESON 2,419,534

DEMOUNTABLE DEVICE FOR PUNCHING TUBES

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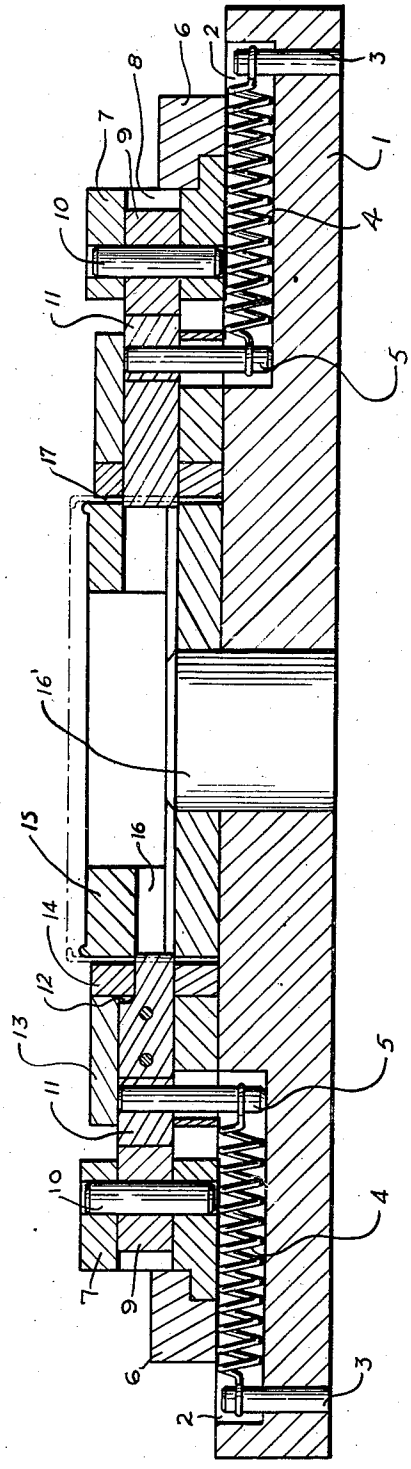


FIG. 2

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UNITED STATES PATENT OFFICE

2,419,534

DEMOUNTABLE DEVICE FOR PUNCHING TUBES

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5 Claims. (Cl. 164—108)

1

My invention relates to a method and apparatus of punching and shearing metal forms and shapes.

It is an object of my invention to provide an apparatus and method for rapidly and accurately punching and forming, as a result of the punching operation, a variety of shapes.

It is a particular object to provide mechanism that will eliminate the usual punch presses and other bulky and expensive mechanisms and to provide a mechanism that can be placed in restricted areas.

It is a further object to provide a mechanism that is fully automatic in operation requiring no skill on the part of the operator and with a minimum of danger to the operator in the management of the mechanism.

It is another object to provide a mechanism so nearly automatic that a person of the lowest type of skill can successfully operate at a high rate of speed the punch mechansm of this invention.

It is a further object of this invention to provide a mechanism that permits the punching of finished articles after they have been formed to the desired shape.

It is an additional object to provide a mechanism in which the positioning of the workpiece with respect to the punches is automatic.

It is a further object to provide a punching mechanism in which the set-up time is reduced to a minimum in placing the article in position to operate the punch.

It is a further object of this invention to provide a multiple punch mechanism adapted to punch portions from the workpiece of varying configurations and varying positions and accurate in position with respect to one another so that all parts so worked upon will be of uniform size and dimension and interchangeable.

In particular, it is the object of my invention to provide a relatively shallow, flat mechanism that can be placed upon a table or a wall that is simply operated by the rotation or reciprocation of an actuating ring and that has a plurality of punches of the required configuration that are moved inwardly against the workpiece held upon a central support so that the workpiece is firmly and accurately positioned.

It is a further object to provide means of potioning the workpiece so that it may be inserted and removed by a simple operation by anyone of minimum skill.

It is an additional object to provide means for providing interchangeable workpieces of

2

different configuration and size so that a wide variety of punchings may be effected upon a wide variety of workpieces. Large and expensive punch presses are thereby eliminated and the skill of the operator need not be of the high degree necessary for the operation of a punch press.

Referring to the drawings:

Figure 1 is a top plan view of the mechanism of my invention;

Figure 2 is a section on the line 2—2 of Figure 1 looking in the direction of the arrows; and

Figure 3 is a perspective of a typical workpiece which has been punched as the result of being placed in the mechanism of my invention shown in Figures 1 and 2.

Referring to the drawings in detail, 1 is a base plate having a plurality of radially disposed slots 2. Projecting into each of these slots is a spring retaining pin 3 supported by the base plate 2. This pin is connected to the actuating spring 4, the other end of which is connected to the pin 5 that is mounted in the punch. A retaining ring 6 is mounted upon the base plate 1. Internally disposed and partially beneath the retaining spring 6 is the actuating ring 7 having a plurality of slots 8 in which are mounted actuating cam rollers 9 carried on the pintle pins 10. The reciprocation or actuation of the ring 7 moves the rollers 9 into and out of engagement with the outer ends of the punches 11, to which the pins 5 are attached. The result is the actuation of the punches into and out of the workpiece as hereinafter described. The positioning of the roller 9 will determine the sequence of operation of the punches.

The punches reciprocate through apertures 12 in a punch supporting ring 13. Inwardly disposed of the punch supporting ring 13 is an annular apertured guide ring 14 adapted to guide the workpiece into punching position. Faced inwardly from this outer guide ring 14 is an inner supporting mandrel 15 which guides the workpiece into position and supports it during the punching operation. This mandrel is provided with punch receiving apertures 16 for receiving the inner ends of the punches as they pass through the metal supported on the mandrel 15. The mandrel 15 in turn is supported by the central column 16' or any similar mechanism in order to position the mechanism in accurate relationship.

In operation, the workpiece as shown in Figure 3, which in this case consists of an automobile lamp ring, is dropped into position between the

outer ring 14 and the mandrel 15 in the space designated 17. At this time the punches are in their withdrawn position so that the ring will extend over the space 16 or a portion thereof. Upon actuation of the actuating ring 7 the rollers 9 engage the rear or outer ends of the punches 11 and move them inwardly through the apertures in the outer supporting ring 14 and into the apertures 16 of the mandrel 15. This movement carries the ends of the punches through the side walls of the workpiece as indicated in Figure 3.

It will be observed that the punch retaining ring 13 may be in the form of a series of independent retaining plates or it may be formed into a ring. Likewise the member 14 may be formed into a ring or into a series of separate segmental members as indicated in the drawing. Likewise a series of segmental guides 15*a* may be employed in place of a continuous ring mandrel. These are all modifications that adapt my invention to various types of workpieces and different configurations and different types of punches. It will be understood that this invention is not confined to operating annular workpieces but may be utilized with strips that are intermittently moved through the punch mechanism. Square pieces or triangular pieces may also be employed.

One of the important results of this invention is the ability to punch workpieces that have already been formed and the ability to simultaneously punch the workpieces so that when they are in position the uniformity of results will come about from the fact that the workpieces are all worked upon under the same conditions with simultaneous operation of the punches. In this manner drawing, warping and other deformations of the workpiece is avoided.

A further object of the invention and the result that is accomplished by it is to employ a completely disassembled mechanism which can be assembled and disassembled readily in order to employ a variety of different types of punches thereby to provide for different types and sizes of openings in a workpiece. The only changes in the set-up in such cases is the replacement of the punches. The set-up time is, therefore, reduced to a minimum in connection with this invention as distinguished from the ordinary punch press.

Due to the fact that the wear upon the roller 9 and the outer ends of the punches 11 is at the minimum and the parts that engage one another may be hardened, there is little necessity for adjustment. Also, the fact that the movement of the punch is sufficiently far into the workpiece compensates for any wear between the rollers and the punches, so that uniform workpieces result over a long period.

With respect to the actuation of the actuating ring 7, it will be observed that there has been provided, as shown in the drawings, an actuating cylinder, a piston and a rack and pinion mechanism. The introduction of air or fluid into the cylinder 18 will actuate the piston 19 and piston rod 20 which in turn moves the rack 21 which is in engagement with the pinion 22 that in turn is in engagement with the semi-circular racks 23 on the actuating ring 7. It will be understood that any desired mechanism of this sort may be employed whether air, hydraulic, mechanical or electrical as the means of actuation is not important.

Amongst the various means of actuating the punches in and out other than the rollers rotating on pintles, is to have a connecting link mounted between two pins with one on the outer end of the punch slide and the other mounted in or on the actuating link. This latter arrangement optionally provides a toggle motion. Another method of actuation is to have the roller mounted on the outer end of the punch slide with cams mounted on the actuating link to force the punch inwardly and outwardly. In such an arrangement a spring can be omitted. It is also possible with this invention by using a cam arrangement to provide a forming punch that can be forced into a depression first and then followed up by a perforating punch.

It will be further understood that I desire to comprehend within my invention such modifications as may be necessary to adapt it to various conditions of usage without departing from the spirit of my invention and without departing from the scope of the hereinafter appended claims.

I claim:

1. In combination in a punching machine; a base plate; a mandrel on said base plate; a die detachably carried on said mandrel; punch guiding means detachably carried on said plate; a punch reciprocable in said punch guide toward and away from said die; yielding means continuously urging said punch away from said die; and means to actuate said punch toward said die for operating on a workpiece supported therebetween, said last named means comprising a circular member, anti-friction means mounted in said member adjacent to one end of said punch, and a retaining means for guiding said circular member.

2. In combination in a punching machine; a base plate; and mandrel on said base plate; a plurality of die means detachably carried on said mandrel; a plurality of punch guiding means detachably carried on said plate; a punch reciprocable in each of said punch guiding means toward and away from said dies; yielding means continuously urging said punches away from said dies; a ring rotatable on said base plate; and cam rollers carried by said ring and adapted for engaging the ends of said punches as said ring is oscillated and retaining means for detachably retaining and guiding said ring.

3. In combination in a punching machine; a base plate; a mandrel on said base plate; die means detachably carried on said mandrel and having punch receiving apertures therein; punch means radially disposed about said plate and movable to and from said die means; punch guiding means detachably carried on said plate for receiving said punches in reciprocation; a cam roller for each of said punches for moving the said punches in working movement toward said die means; yielding means continuously urging said punches away from said die means; and means of actuating all of said punches simultaneously comprising a ring supporting said cam rollers and guiding and retaining means on said base plate whereby said ring is guided on said base plate in limited oscillatory movements.

4. In combination in a punching machine; a base plate; a mandrel on said base plate; a ring guided on said base plate for oscillatory movements; and a plurality of sets of workpiece punching means carried on said mandrel, plate, and ring and each comprising, a die on said mandrel; a punch guide and a punch support on said plate; a punch reciprocable in said guide; a retracting spring connected between each punch and said plate; and an actuating roller carried by said ring and a retaining ring on said base

plate, said retaining ring and said ring first named having cooperating flanges to guide said last named ring in its oscillatory movements.

5. In combination in a punching machine; a base plate; a mandrel on said plate; a plurality of dies detachably carried on said mandrel and having their punch receiving faces substantially concentrically disposed; an arcuate punch support spaced from each die and detachably carried on said base plate, said dies and said punch supports defining an annular recess for receiving a workpiece; a punch reciprocable through each of said punch supports and into said dies; a punch guiding means for each of said punches detachably secured to said plate; actuating means for moving said punches toward said dies comprising arcuate ends on said punches and cam rollers reciprocable relative to said arcuate end portions; yielding means to urge said punches away from said dies; and spaced ring members guided for oscillatory movements on said base plate and having means for receiving and supporting said cam rollers and a retaining ring on said base plate, said retaining ring and one of said spaced ring members having cooperating flanges to guide said ring members in their oscillatory movements.

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