March 30, 1943. A. W. KNUDSEN 2,315,340

PUNCH

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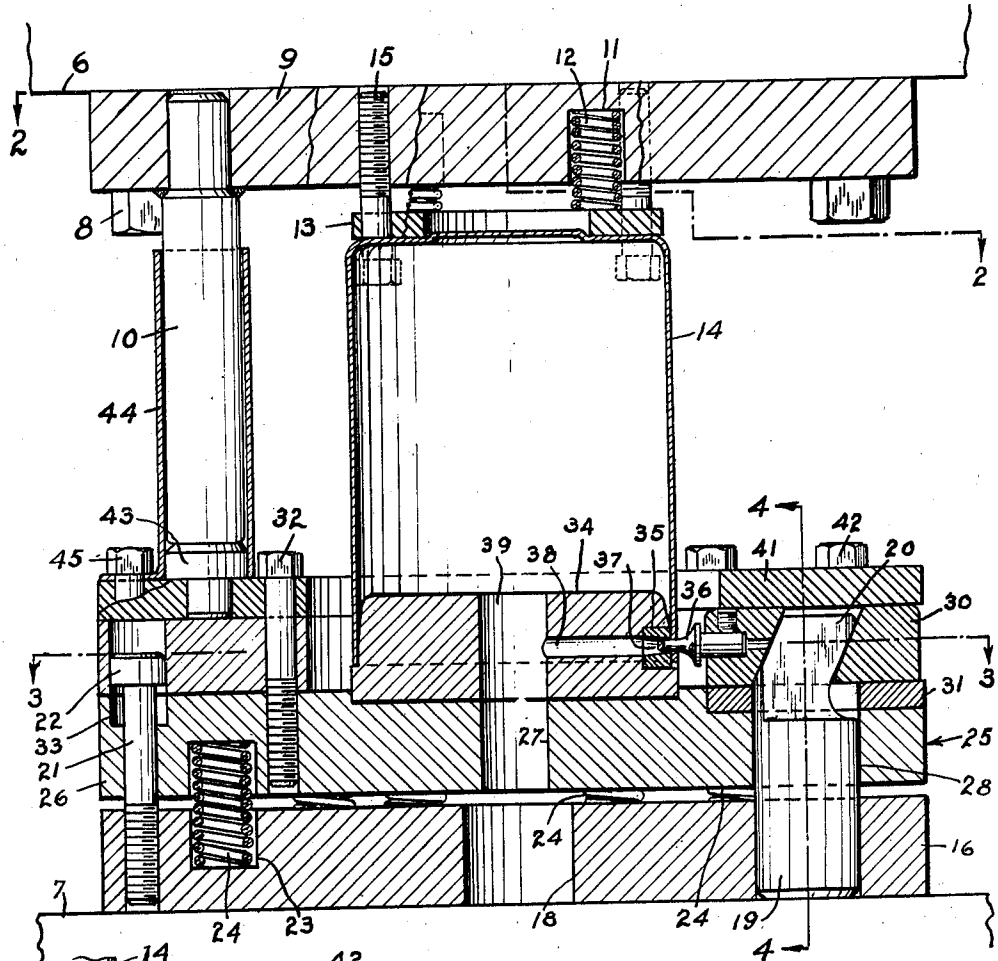
FIG. 1



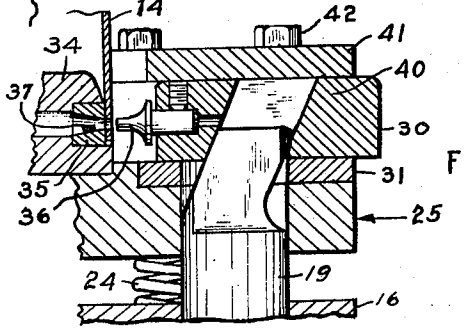


FIG. 5

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FIG. 2

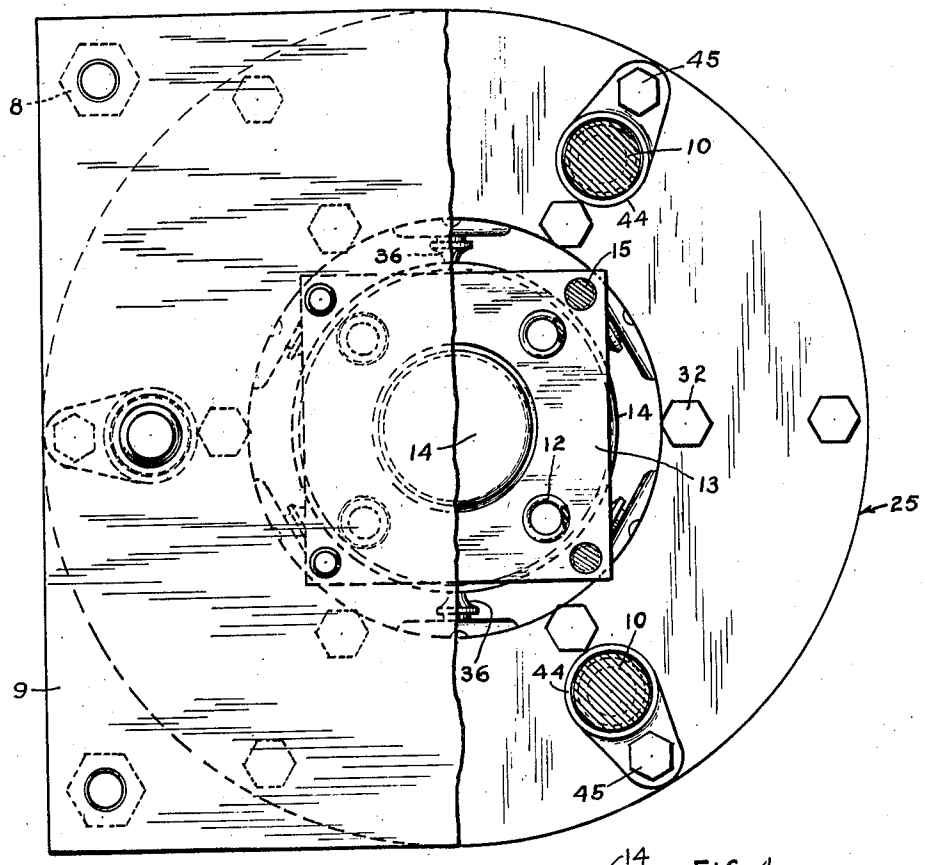

FIG. 4

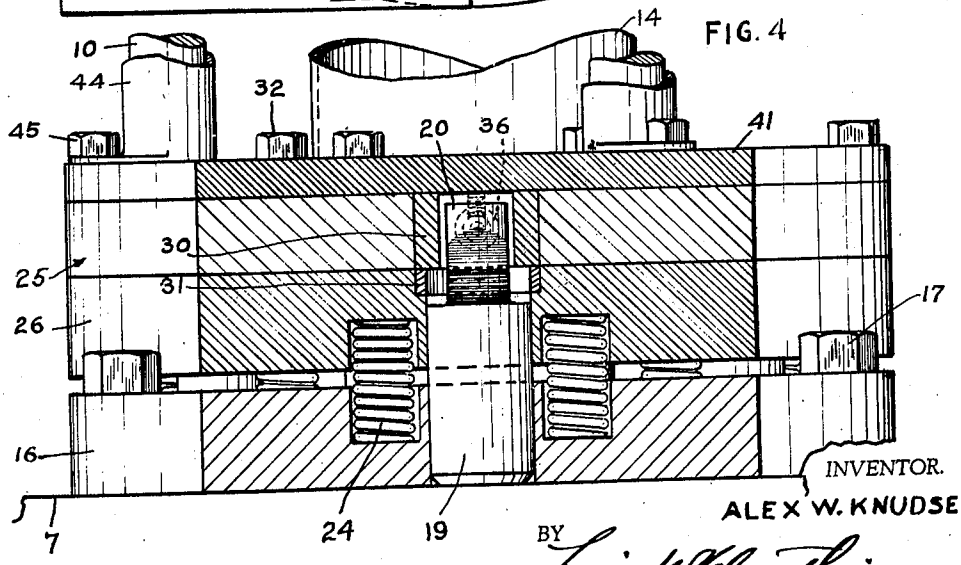

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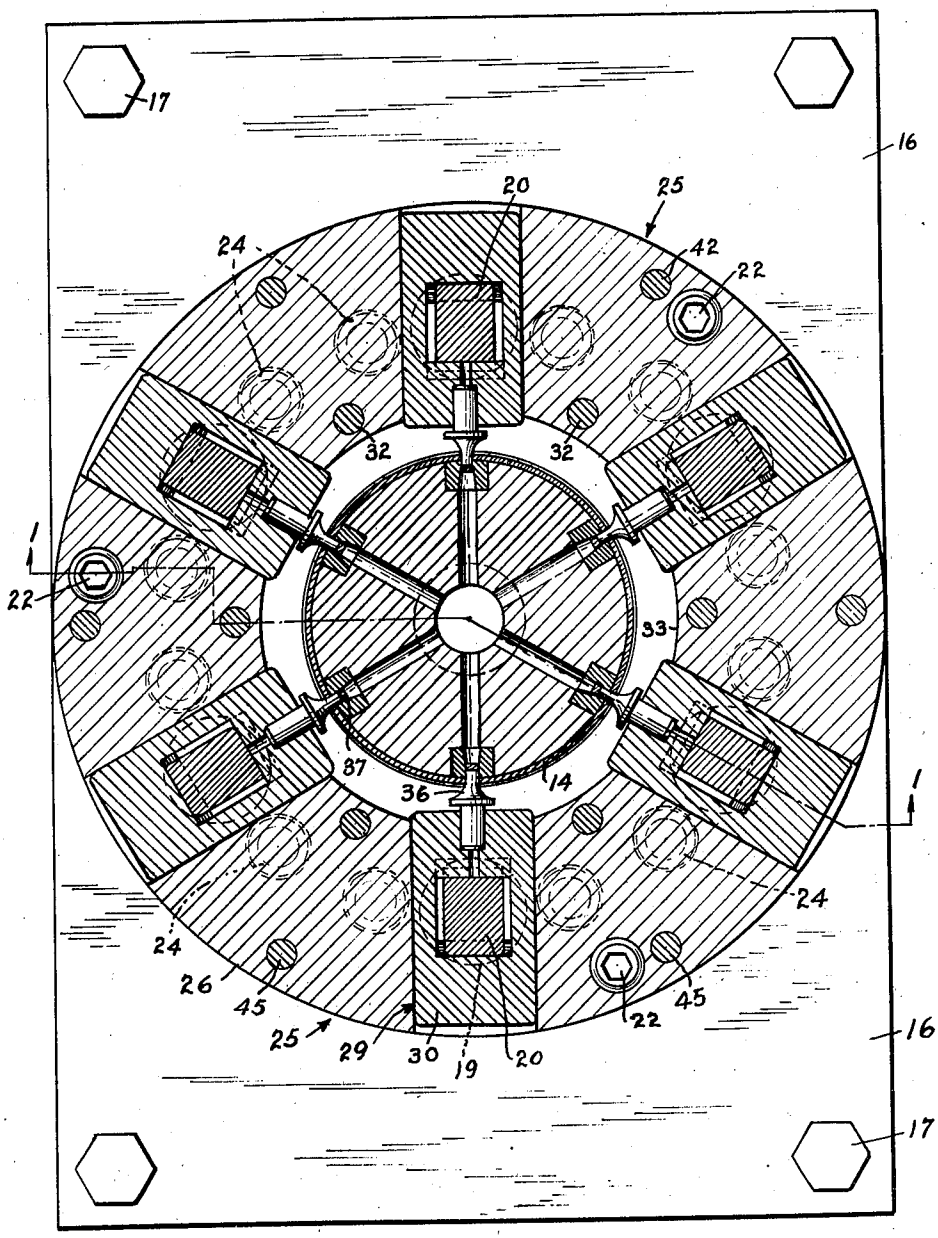
FIG. 3



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Patented Mar. 30, 1943 2,315,340

UNITED STATES PATENT OFFICE

2,315,340

PUNCH

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Application August 23, 1941, Serial No. 408,075

8 Claims. (Cl. 164—90)

This invention relates to new and useful improvements in punches and an important object of the invention is to provide a simple and durable multiple punch attachment for presses in which the punches are moved at right angles to the ram movement, by cam means located on the bed of the press and which means includes guide means on the bed for the punch carrier to insure positive projection and retraction of the punches without subjecting the punch operating means to shearing stress.

Another important object of the invention is to provide a floating combined work holder and punch carrier between the bed and the ram with multiple horizontal punches arranged radially about the center of the work holder with the provision of straight line thrust posts on the ram for moving the combined work holder and punch carrier downwardly toward the bed to simultaneously project the punches through the work and at the same time compress spring means for elevating the combined work holder and punch carrier to automatically simultaneously cause retraction of the punches from the work upon elevation of the ram.

Other objects and advantages of the invention will become apparent during the course of the following description.

In the accompanying drawings forming a part of the application and wherein like numerals are employed to designate like parts throughout the several views:

Fig. 1 is a vertical off-center section of the attachment secured to a power driven punch press illustrating the relative position of the parts with the multiple punches projected through the work, and for further reference is taken upon the line 1—1 of Fig. 3.

Fig. 2 is a horizontal section through the attachment taken on the line 2—2 of Fig. 1,

Fig. 3 is another horizontal section taken on the line 3—3 of Fig. 1,

Fig. 4 is a vertical section of the part of the device taken on the line 4—4 of Fig. 1, and

Fig. 5 is a fragmentary section of a portion of the combined work holder and punch carrier illustrating the relative position of parts when the punches are withdrawn by the cam means from the work.

Referring now more in detail to the drawings, the numeral 6 designates a plate attached to the ram of a power driven punch press and is adapted to reciprocate relative to a base or bed 7 of the press. Secured to the ram plate by means of bolts 8, is a top plate 9 depending from which are three vertical thrust posts 10. This plate 9 is provided with four cavities 11 in which are disposed compression springs 12 to engage a pressure pad 13 adapted to exercise the proper pressure upon the work 14 by reason of its being slidably mounted upon four screws 15 secured in the plate 9 arranged at the four corners of the pressure pad beyond the circumference of the work 14. The work in this instance is illustrated as a hollow cylindrical body having a closed end and an open end, the latter being adapted to have formed therein six equi-distantly spaced holes or perforations.

The bed plate 16 is secured to the bed 7 of the press by means of four bolts 17 and is provided with a central discharge opening 18 for the slugs punched from the work as will be hereinafter described. This bed plate 16 is provided with six circular openings radially of its center in which are disposed six cylindrical studs having their upper ends 20 formed into cams having opposed inclined faces to both project and retract punch holders which will be later described. Rising from the bed plate 16 are three limit screws 21 having enlarged heads 22 for limiting the upward movement of the combined work holder and punch carrier as will be presently described. The bed plate is also provided with a pair of cavities 23 between each pair of posts or studs 19 for the reception of compression springs 24, making a total of one-dozen springs 24 projecting above the plate 16 to be received in recesses in the bottom of the combined work holder and punch carrier 25 to elevate and to floatingly support the same. The combined work holder and punch carrier is composed of a disk 26 having a central vertical opening 27 and six radially disposed equi-distantly spaced circular openings 28 so as to be slidably received upon the six cam studs 19 and be normally retained or supported by the springs 24 in the elevated position shown in Fig. 5. Above each circular opening 28 the disk 26 is provided with a radial wide groove 29 to slidably receive a block shaped punch holder 30. A wear resisting plate 31 in the form of an insert in the disk 26 may be sunk into the bottom of each groove to reduce wear imposed by reciprocations of the punch holder 30. If desired, the radial grooves for the punch holders may be formed by bolting a plurality of equally spaced segmental blocks upon the disk 26 and fastening them thereto by means of bolts 32. The upper surface of the disk 26 is provided with a countersunk recess for each bolt 21 and in which the heads 22 of these bolts bottom when the springs

24 elevate the punch carrier upon elevation of the ram plate 6.

A punch carrier is provided with a central depression 33 to receive a circular work support 34 having an external shoulder upon which the cylinder 14 is disposed to be retained in position during the perforating operation of its rim adjacent its lower open end. The circumference of this work holder above the external shoulder is provided with six equi-distantly spaced perforating dies 35 into which project the punches 36, after they have punctured or perforated the work 14 to move a slug 37 into the perforating die. The work holder is provided with a radial passage 38 for each perforating die to receive the slugs as they are successively punched out to be deposited into the central opening 39 in the work holder where they pass down through the opening 27 in the punch carrier and on into the opening 18 of the base plate 16 to be suitably discharged therefrom.

Each punch holder is provided with a downwardly and inwardly inclined opening with opposed parallel inclined walls to engage and slide upon the opposed inclined walls of the cams 20 so that upon elevation of the punch carrier under the influence of the springs 24, all of the punch holders 30 are simultaneously moved outwardly to retract their punches 36 from the work and clear the same in order that the work can be readily removed from the holder 34 when the press ram has been elevated. The punch holders 30 are retained in their respective grooves by means of a cap plate 41 bolted by bolts 42 and 32 to the top of the carrier disk 26. This cap plate is provided with three pressure buttons 43 to receive the thrust of the ram through the three posts 10 and are housed in the bottom of three vertical guide tubes 44 bolted to the cap plate by means of the bolts 45.

After the work 14 has been placed with its open end circling the work holder 34, the press is tripped to cause the ram to descend with the pressure plate 13 while the thrust posts 10 engage the buttons 43 and move the combined work holder and punch carrier downwardly thereby causing the individual punch holders 30 to automatically and simultaneously move inwardly upon the cam heads 20 and force their punches 36 through the work 14 and into the perforating dies 35 to perforate the rim of the cylinder in six different places simultaneously. By supporting the cam elements on short studs from the base plate 16, the thrust posts 10 may exert their pressure in a straight line upon the work and punch holder thereby obviating much of the usual undesirable shearing stress upon the operating parts. As the cushioning springs 24 elevate the carrier 25, after the perforating operation, the heads 22 of the bolts 21 limit the upward movement of the carrier while the ram travels further upwardly until the pressure pad 13 comes to a stop against the heads of the bolts 15 and clears the top of the cam sufficiently for it to be lifted off of the work holder 34 and another work piece 14 can be readily positioned thereon as rapidly as the power press will operate.

It will be understood that various changes in the size, shape and relation of parts may be resorted to without departing from the spirit of the invention or the scope of the appended claims.

I claim:

1. A punch press attachment for punching a horizontal hole in a vertical work piece wall comprising stationary vertical guide pins secured to the bed of the press, a vertically movable punch carrier encircling said pins and being slidably mounted for limited vertical movement upon said pins, a cam on each pin, a punch holder operated by said cam and reciprocably mounted in said carrier, and thrust posts depending from the ram of the press and adapted to engage said carrier to move the same downwardly as the punch holder is moved inwardly by said cam.

2. A multiple punch comprising a plurality of stationary pins disposed radially about a center and each having a two-faced inclined cam, a reciprocable work and punch carrier encircling said pins and being mounted for reciprocation upon said pins, a punch holder reciprocably mounted in said carrier about each pin and having an inclined opening to receive said two faced cam to be radially reciprocated upon reciprocation of said carrier, and a work holder centralized with respect to said pins on said carrier and adapted to reciprocate with the latter as the punch holders move in and out as they are reciprocated by the carrier moving longitudinally upon said pins.

3. A multiple punch comprising a plurality of vertical pins radially arranged with respect to a center and having their upper ends provided with opposed inclined faces, a punch carrier mounted for reciprocation upon said pins, a cylinder support on said carrier, said support having a plurality of radially disposed openings opposite portions of the cylinder to be perforated, a plurality of radially disposed punches each having an opening with opposed inclined sides complementary to said opposed inclined faces of said pins to be moved in opposite directions upon reciprocation of said punch carrier to simultaneously move said punches radially relative to said cylinder.

4. A multiple punch comprising a plurality of stationary pins disposed radially about a center, a reciprocable work and punch carrier mounted for reciprocation upon said pins, spring means for normally elevating said carrier, said carrier having a plurality of radial grooves, the upper end of each of said stationary pins being formed into a double faced cam, each projecting into its respective groove, a punch holder reciprocably mounted in each groove and having an opening with opposed inclined faces for engagement with the double faced cam of its respective pin, a work holder mounted on said carrier and centralized with respect to said radially disposed punch holders, and means for moving said carrier against the tension of said spring means to cause the punch holders to simultaneously move inwardly toward said work holder.

5. A multiple punch comprising a base, a plurality of vertical guide and cam pins fixed in said base, and each having a two faced inclined cam, a vertically reciprocable work and punch carrier having portions encircling said pins and mounted for reciprocation upon said pins, a work holder mounted centrally upon said carrier and having radially disposed perforating dies, a punch holder reciprocably mounted in said carrier for each pin and having an inclined opening to receive said two faced cam and adapted to be reciprocated by said work and punch carrier moving longitudinally upon said pins.

6. A multiple punch comprising a fixed base, a plurality of stationary pins fixed thereto radially about the center thereof, said pins each having its upper end formed into a two-faced inclined cam, a resiliently supported punch carrier en-

circling said pins and mounted for reciprocation upon said pins and having openings into which said cams project, and a punch holder slidably mounted in each opening and having an oblique opening in which a portion of said double faced cam of a complementary pin is disposed at all times, and said cam being extended farther into said oblique opening when the punch holder is moved toward the work.

7. A vertical punch press comprising a ram and a base, a plurality of vertical pins fixed in said base and each having a two-faced inclined cam, a vertically reciprocable work and punch carrier encircling said pins and being mounted for reciprocation upon said pins, a work holder mounted centrally upon said carrier and having radially disposed perforating dies, a punch holder reciprocably mounted in said carrier and having an inclined opening to receive said two faced cam, said ram having depending pressure posts adapted to engage said work and punch carrier to move the same, and a spring pressure plate carried by said ram to yieldingly engage the work upon descent of the ram.

8. A power press having a ram and a base, a vertically movable die mounted thereon and having vertical guide sleeves, a work support mounted upon said die to be moved therewith, means carried by said die for operating upon the work as the die is moved relative to said base, depending posts secured to said ram and operating in said guide sleeves to move the die downwardly, and a work engaging member yieldingly mounted upon the ram to engage the work and to yield as the die is moving downwardly by said posts.

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