DIE FOR SWAGING INDENTED SHAPES

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3 Claims.

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This invention relates to dies for indented shapes and more particularly to dies for swaging bullets with circumferential grooves. This application is a continuation-in-part of my copending application Serial Number 27,023, filed May 5, 1960.

Soft metal bullets ordinarily have circumferential grooves which hold both lubricant and the crimp formed on the mouth of the cartridge to hold the bullet in place. The grooves make it difficult to swage the bullets, so that grooved bullets ordinarily are cast from the molten metal. The market offers several dies for swaging bullets with straight cylindrical sides and without grooves, in which the finished bullet is simply forced out of the end of the cylindrical die. It is impossible to swage grooved bullets in these dies.

An object of this invention is to provide a simple die for swaging grooved bullets. The die is compact and is adapted for use in the hand operated presses used by sportsmen for making and loading ammunition. Such a press is described in U.S. Patent 2,847,965.

In its simplest form the invention consists of a die body split into halves about a plane including the axis of the die cavity. The die halves are mounted hingedly about a pin so they can be opened to remove the bullet. The die body has a conical outer surface which mates with the conical inner surface of the housing, thereby holding the die halves in coincidence while an article is being swaged, and absorbing the axial thrust imposed by the swaging punch. There is a push rod for ejecting the die halves from the housing and also a cam mechanism for opening the halves so the swaged article can be removed. A fuller understanding of my invention will be had from the following detailed description together with the drawings.

FIGURE 1 is a top view of one construction of the die as adapted for swaging bullets with the swaging punch removed.

FIGURE 2 is a partial sectional view of the housing 11 and pin 12. Spring 13 holds the die 10 in the closed position. A piece of bullet metal (not shown) is placed in the die cavity and the nose of the bullet is formed in the grooves 10b which forms a follower surface for the die cavity. The die is designed with the die cavity 10a as shown on the threaded section 11a. The press is usually designed to hold the die with the cavity aimed downward so that the punch is thrust upward to swage a bullet. After a bullet has been swaged, handle 23 is grasped in the hand to prevent the die halves from moving and punch 14 is retracted just enough to disengage it from the die cavity. Then the punch is advanced again to remate it loosely with the die. To remove the bullet from the die, handle 23 is depressed to start the die halves out of the housing while the punch is retracted simultaneously so that it remains mated with the bullet. As the die halves start from the housing they are parted by cams 19 acting in grooves 10b. The cams are secured to ring 24 in fixed relation to housing 11. The bullet is kept centered on the axis of the die by the punch so that the bullet is wedged away from the die halves as they are parted by cams 19. Next the punch is retracted fully and handle 23 is depressed all the way. The die halves are opened wide by spring 20 (FIGURE 3) and the bullet is removed with the fingers.

When the die halves are first parted by cams 19 the bullet is always wedged away from one of the die halves, but usually it remains stuck to the other die half. As the halves are opened wide, the bullet is acted on by the punch and is wedged away from the other die half by the centering action of the punch. This, however, exerts a considerable bending moment on the punch and requires that the punch be mounted rigidly in the movable portion of the press. There is also the danger of bending the punch, particularly a slimmer punch for small caliber bullets.

Key 25 rides in slot 16b in FIGURE 2 to prevent the die halves from rotating out of alignment with the housing 11 when the die halves are opened. Spring 20 is circular with projections which engage notches 21 in the die halves. Spring 20 passes through a hole 16a in push rod 16 but is not fastened to rood 16. Spring 35 retracts the die halves when handle 23 is released, and the sequence may be repeated.

Now referring to FIGURES 5, 6, and 7 which show the preferred construction of the die. Several parts have been eliminated and there is an improved sleeve cam which does not require a centering action by the punch, so that the bending moment on the punch is eliminated. The sleeve cam 30 replaces cams 19 and grooves 10b, and key 25 and slot 16b are eliminated because the sleeve cam does not require a precise angular alignment with the die halves. Cam 30 fits slidably over punch 14, on top of compression member 33.

In the following description some of the elements have functions similar to those previously described but are of modified construction. Prime suffixes have been added to the reference numerals of these modified elements.

The housing 11 has been shortened and can be screwed downward into the top of the press frame 35 and is secured with lock nut 56. Push rod 16' has been shortened.

FIGURE 5 shows one suitable method for securing punch 14' to the ram 31 which is actuated by the press. The enlarged section 14'a at the base of the punch fits into a well in the end of the ram and is held by pins 32 which protrude through the walls of the well and extend into circumferential groove 14'b. The punch can be inserted or removed by aligning vertical grooves 14'c with pins 32. There is a clearance between the punch 14' and...
the well, so that the punch can seek a perfect alignment when it is thrust into cavity 10a in the die halves. This clearance is permissible with the sleeve cam because the punch need not exert any centering action on the bullet while the bullet is being wedged free of the die halves.

To swage a bullet, a piece of bullet metal is placed in cavity 10a and punch 14’ is thrust full stroke up into the cavity. The nose of the bullet 34 is formed by the mating nose 14’d on the punch. At full stroke, the conical lips 30a on cam 30 are forced into the conical mouth 15 at the entrance to cavity 10a. Cam 30 is thrust downward along punch 14’, and compression member 33 is compressed. At full stroke lips 30a are tending to part the die halves but are prevented from doing so because the conical surfaces 11b on the housing exert an overwhelming force to keep the die halves together.

Next will be described the sequence for removing the bullet. Handle 23’ is grasped in the hand to prevent the die halves from moving and punch 14’ is retracted a short distance, so that its leading end remains inside cavity 10a. The conical lips 30a on cam 30 are disengaged from the conical mouth 10c of cavity 10a, and cam 30 rises as compression member 33, suitably a rubber grommet, expands to its free length. Now all parts of the die are in the positions shown in FIGURE 5. Next punch 14’ is held stationary in this position while handle 23’ is depressed to start the die halves out of the housing and force the conical mouth 10c over the conical lips 30a. The mating nose 14’d on punch 14’ remates with the nose 34 of the bullet and the die halves are wedged away from each other and away from the bullet. Even when compression member 33 is amply rigid to support the cam during this wedging action, the force required to compress it at full stroke of the punch is small compared to the force needed to swage the bullet.

The wedging action of the sleeve cam does not require any centering action by the punch because the cam wedges between the die halves and the punch itself. This permits use of a loosely mounted, self-aligning punch. When the punch is retracted fully and handle 23’ is depressed all the way, the die halves are opened wide by spring 20 and the bullet is removed with the fingers, as before. Excess metal extruded into vent 14’e adheres to the bullet and is removed with a knife.

An important feature of this die is the manner of securing the die halves to each other with a pin and snap rings. This construction permits the die halves to be symmetrical with flat mating surfaces, which simplifies their fabrication. Further, the snap rings provide a flexible joint which protects the die. If the die halves are thrust into the housing inadvertently with metal shavings lodged on the flat surfaces close to the pin, the snap rings will open slightly so there will be no stress tending to warp the die halves.

The operation of the snap ring is the same in the original and in the preferred construction of the die, and is best shown in FIGURES 2, 3, and 4. FIGURE 4 shows an end view of one of the two hubs which carry the snap rings, but the snap ring itself is not shown. Each die half is cut away just below the pin hole so that the die halves can open hingedly about the pin, as shown in FIGURE 3. FIGURE 2 shows the snap rings in cross section, secured in grooves cut around the circumference of the hubs.

Modifications which fall within the scope of the claims will be apparent to persons skilled in this art. Also, various forms and sizes of die halves 10 may be used to swage various objects in this die.

According to the provisions of the patent statutes, I have explained the principle, preferred construction and mode of operation of my invention and have illustrated and described what I now consider to represent its best embodiment. However, I desire to have it understood that, within the scope of the appended claims, the invention may be practiced otherwise than as specifically illustrated and described.

I claim:
1. A die comprising in combination a die body having an internal die cavity and a conical outer surface, said die body divided into halves about a plane including the axis of said conical surface, a housing having a conical inner surface to mate with said die body conical outer surface to hold said die halves together in coincidence when said halves are inserted into said housing, a movable punch to enter said cavity and having a nose mating with a workpiece formed within said cavity, a retractable cam on said punch operable to wedge between said punch and said die halves, said punch urging said die halves apart while said punch is mated with said workpiece and said die halves are not in contact with said housing, and a compression member under said cam to allow said cam to retract automatically when said punch is operatively mated with the workpiece to cooperate with said die halves to swage the workpiece.

2. A die comprising in combination a die body having an internal die cavity and a conical outer surface, said die body divided into halves about a plane including the axis of said conical surface, a housing having a conical inner surface to mate with said die body conical outer surface to hold said die halves together in coincidence when said halves are inserted into said housing, a movable punch to enter said cavity and having a nose mating with a workpiece formed within said cavity, a retractable cam on said punch operable to wedge between said punch and said die halves, said cam urging said die halves apart while said punch is mated with said workpiece and said die halves are not in contact with said housing, and a compression member under said cam to allow said cam to retract automatically when said punch is operatively mated with the workpiece to cooperate with said die halves to swage the workpiece.

3. A bullet swaging die comprising in combination a die body having an internal die cavity and a conical outer surface, said die body divided into halves about a plane including the axis of said conical outer surface, a hole near the small end of said conical surface with its axis lying within said plane, a pin within said hole, a housing having a conical inner surface to mate with said die body conical outer surface to hold said die halves in coincidence when said halves are inserted into said housing, a rod secured to said pin and operable to thrust said die halves out of said housing, a movable punch to enter said cavity and having a nose mating with a workpiece formed within said cavity, a retractable cam on said punch operable to wedge between said punch and said die halves while said punch is mated with said bullet and said die halves are not in contact with said housing, to wedge the die halves away from the bullet and away from each other, and a compression member under said cam to allow said cam to retract automatically when said punch is operatively mated with the bullet to cooperate with the die halves to swage the bullet.

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