Oct. 11, 1938. J. J. KEARNEY 2,132,853

CUT-OFF AND TRANSFER MECHANISM FOR METAL SWAGING MACHINES

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Fig. 1

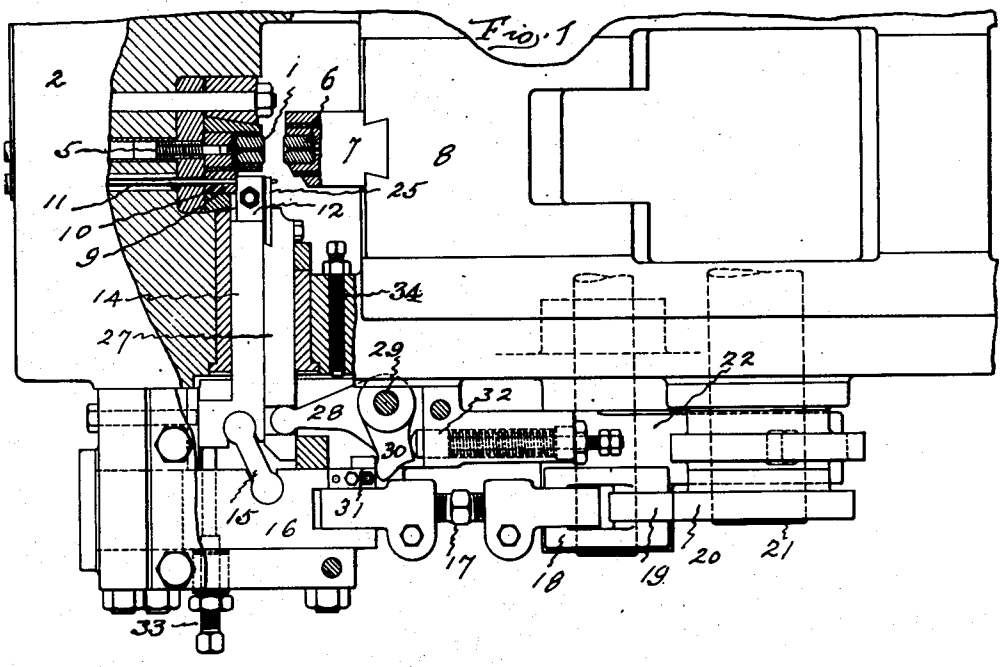


Fig. 2

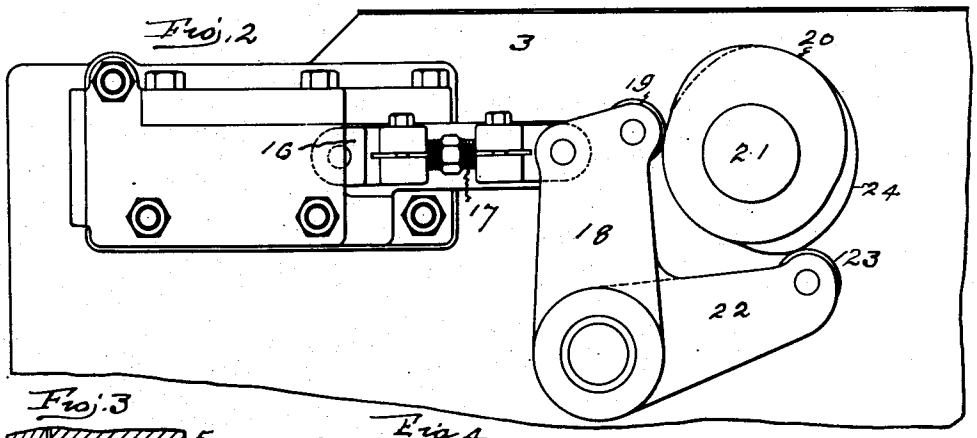


Fig. 3

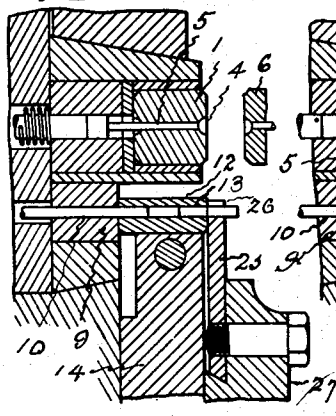


Fig 4

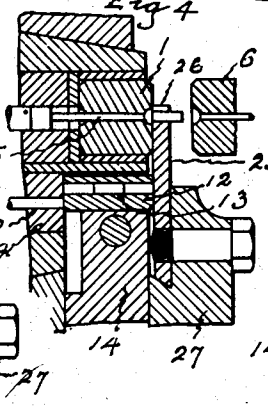
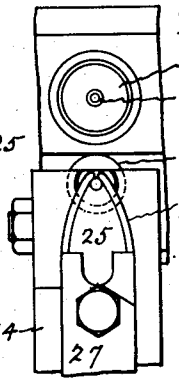


Fig. 5



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CUT-OFF AND TRANSFER MECHANISM FOR METAL SWAGING MACHINES

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9 Claims. (Cl. 29—34)

This invention relates to cut-off and transfer mechanisms of metal swaging machines of the type in which a rod is fed and blanks cut off and carried into line with a shaping punch and die, and as it is particularly adapted for machines for making metal balls it is herein described as designed for such machines.

With the prior mechanisms the side pressure of the cutter and drawing of the metal results in the cut end of the blank being somewhat rounded, or slightly oblique to the axis of the cut piece, or slightly fractured at one edge. When so deformed the blanks do not line accurately with, and the ends do not uniformly enter the semi-spherical cavities of a ball shaping punch and die, and consequently when the punch and die come together the balls produced are not perfectly spherical, or if spherical the balls are more dense at one sector than another, and furthermore irregularity of the blanks causes excessive wear on the walls of the punch and die cavities.

The object of the present invention is to provide means for machines of this nature, which will rapidly cut blanks from rod, with ends that are square and in planes at right angles to the axes of the blanks, and will quickly carry such blanks exact axial alignment with the punch and die, so that when the metal is compressed, balls will be formed that are not only spherical but of equal density throughout.

In attaining this object there is provided a solid fixed shearing die and a co-operating solid movable shearing die, the diameter of the openings through both of which are substantially the same as the diameter of the rod. Mechanism is arranged to give the movable shearing die a short quick but powerful movement across the face of the fixed shearing die. Adjacent to the movable shearing die and having an opening that registers with the opening in that die is a carrier. Means imparts to the carrier a rapid long movement from the severing die to the shaping punch and die, at the time the severing die moves to cut a blank. Blanks as they are cut from the rod are completely confined in the movable severing die, so that the metal is not drawn to one side by the movable severing die and the cut ends are exactly square. Subsequently cut blanks push previously cut blanks from the severing die into the carrier.

In the accompanying drawing Fig. 1 is a plan view, with parts broken away, of the cooperating related elements of a metal swaging machine having a cut-off and transfer mechanism which embodies the present invention.

Fig. 2 is a side view of the cut-off operating mechanism.

Fig. 3 is, on larger scale, a horizontal section through the dies and transfer means in the relative positions occupied when a blank is about to be severed from a rod.

Fig. 4 is a similar view showing the elements in the relative positions occupied after one blank has been cut and another blank has been transferred into line with the forming punch and die.

Fig. 5 is a face view of the elements shown in Fig. 3.

In the machine illustrated the fixed shaping die 1 is mounted in the end 2 of the frame 3 in the customary manner. This die has a cavity 4 outlined to impart a required shape to the blank. Extending into this die is the usual knock-out pin 5 for removing the finished article. The movable shaping die 6 is mounted in the punch holder 7 that is carried by the gate 8 which is reciprocated by the ordinary gate operating mechanism employed in metal swaging machines. The stationary shearing die 9 is fixed in the frame end and it has a bore 10 in line with the bore 11 through which the rod is intermittently advanced by common feed mechanism. The bore 10 has practically the same diameter and cross sectional shape as the rod from which the blanks are to be cut. The above mentioned mechanisms being well known and operating in the usual way need not be further specifically described.

The movable shearing die 12 has a bore 13 that is practically the same diameter and has the same cross sectional shape as the bore 10 in the fixed shearing die. The movable shearing die is secured to a slide 14 arranged to reciprocate in the frame transversely of the direction of the line of feed of the rod. The outer end of the slide 14 is engaged by the inner end of a toggle lever 15, the outer end of which lever is engaged by a toggle slide 16. The toggle slide 16 is connected by an adjustable link 17 with the upper limb of a lever 18 that is pivoted to the frame. The upper limb of the lever 18 has a roll 19 that is engaged by a cam 20 on the cam shaft 21 of the machine. This cam is designed to, at the proper time, force the toggle forward and carry the movable shearing die across the fixed shearing die. The lower limb 22 of the lever 18 has a roll 23 that is engaged by the cam 24. This cam is designed to retract the toggle at the proper time and draw back the movable shearing die so that its bore will align with the bore in the fixed shearing die.

At the side of the movable shearing die and

movable in the same direction is the carrier which transfers the cut blanks from the movable shearing die into line with the shaping dies. The carrier comprises a plate 25 with a recess in its end to receive the blanks, and fingers 26 for temporarily retaining the blanks in the recess while they are being transferred. Figs. 4, 5. The carrier is fastened to a slide 27 the outer end of which is engaged by the inner end of an angle lever 28 that is pivoted upon a stud 29 supported by the frame. The outer end 30 of this angle lever is held by a spring plunger 32 in engagement with a hardened plate 31 which is secured to the toggle slide 16. Fig. 1. When the toggle slide is moved forward for causing the movable severing die to cut off a length of the rod, the outer end of the angle lever follows the toggle slide and the inner end of the angle lever moves the inner end of the carrier slide from the movable shearing die into line with the shaping dies, and as the toggle is retracted and the shearing die is drawn back, the plate 31 engaging the outer end of the angle lever causes the withdrawal of the carrier slide against the thrust of the spring plunger.

The limbs of the carrier lever are so proportioned that a short movement of the outer end of the lever imparts a long movement to the inner end of the lever, thus while the movement of the toggle slide is short and powerful, for cutting off a length of rod, the movement of the carrier is much more rapid and longer for transferring the blanks from the severing die to the shaping dies. To ensure the exact alignment of the bores of the movable and fixed shearing dies, when the movable die is retracted, a stop screw 33, Fig. 1, is arranged to engage the outer end of the slide 14. A stop screw 34 is provided to limit the inward movement of the carrier so that the blank it carries will be exactly aligned with the openings in the shaping dies.

A length of rod is cut by the shearing dies and carried in the bore of the movable shearing die until it is pushed by subsequent cut pieces into the carrier. With the structure described the rod is closely confined on both sides of the point of severance by the walls of the fixed and movable shearing dies. As a result of this the blanks cannot bend and the metal will not be drawn or fractured but will be cut square by the powerful short movement imparted by the toggle and these blanks rapidly transferred by the quick movement of the carrier into exact line with the shaping dies. Burs, which require expensive grinding to remove them from the balls, are obviated. Blanks for articles of other shapes than balls can be sheared and transferred by the mechanism set forth herein, the only change necessary being in the outlines of the shaping dies.

The invention claimed is:—

1. In combination in a metal swaging machine, shaping dies, a fixed shearing die having a bore of substantially the same diameter and cross sectional shape as the metal to be swaged, a shearing die movable across the face of the fixed shearing die, said movable die having a bore of substantially the same diameter and cross-sectional shape as the bore of the fixed shearing die with the wall of said bore at the cutting edge of the shearing die completely surrounding the metal to be swaged, a reciprocatory carrier having means for receiving blanks from the movable shearing die means whereby cut blanks are transferred from the shearing die to the carrier, mechanism for reciprocating the movable shearing die, and mechanism for reciprocating said carrier in the same direction as but at greater speed than the movements of the shearing die.

2. In combination in a metal swaging machine, shaping dies, a fixed shearing die having a bore of substantially the same diameter and cross-sectional shape as the metal to be swaged, a shearing die movable across the face of the fixed shearing die, said movable die having a bore of substantially the same diameter and cross-sectional shape as the bore of the fixed shearing die with the wall of said bore at the cutting edge of the shearing die completely surrounding the metal to be swaged, a reciprocatory carrier having means for receiving blanks from the movable shearing die means whereby cut blanks are transferred from the shearing die to the carrier, mechanism for reciprocating the movable shearing die and mechanism for reciprocating said carrier in the same direction but further and faster than said shearing die.

3. In combination in a metal swaging machine, shaping dies, a fixed shearing die having a bore of substantially the same diameter and cross-sectional shape as the metal to be swaged, a shearing die movable across the face of the fixed shearing die, said movable die having a bore of substantially the same diameter and cross-sectional shape as the bore of the fixed shearing die with the wall of said bore at the cutting edge of the shearing die completely surrounding the metal to be swaged, a reciprocatory carrier having means for receiving blanks from the movable shearing die means whereby cut blanks are transferred from the shearing die to the carrier, mechanism imparting a short quick reciprocation to the movable shearing die, and mechanism for imparting in the same direction as the movements of the shearing die a long rapid reciprocation to said carrier.

4. In combination in a metal swaging machine, shaping dies, a fixed shearing die having a bore of substantially the same diameter and cross-sectional shape as the metal to be swaged, a shearing die movable across the face of the fixed shearing die, said movable die having a bore of substantially the same diameter and cross-sectional shape as the bore of the fixed shearing die with the wall of said bore at the cutting edge of the shearing die completely surrounding the metal to be swaged, a reciprocatory carrier having means for receiving blanks from the movable shearing die means whereby cut blanks are transferred from the shearing die to the carrier, mechanism for reciprocating the movable shearing die, and mechanism dependent upon and controlled by the movements of the shearing die for reciprocating said carrier.

5. In combination in a metal swaging machine, shaping dies, a fixed shearing die having a bore of substantially the same diameter and cross-sectional shape as the metal to be swaged, a shearing die movable across the face of the fixed shearing die, said movable die having a bore of substantially the same diameter and cross-sectional shape as the bore of the fixed shearing die with the wall of said bore at the cutting edge of the shearing die completely surrounding the metal to be swaged, a carrier having means for receiving blanks from the movable shearing die means whereby cut blanks are transferred from the shearing die to the carrier, toggle means for reciprocating the movable shearing die, and bell crank and spring means for reciprocating said carrier.

6. In combination in a metal swaging machine, shaping dies, a fixed shearing die having a bore of substantially the same diameter and cross-sectional shape as the metal to be swaged, a shearing die movable across the face of the fixed shearing die, said movable die having a bore which closely confines the metal to be sheared thereby, a reciprocatory carrier having means for receiving blanks from the movable shearing die means whereby cut blanks are transferred from the shearing die to the carrier, mechanism for reciprocating the movable shearing die and mechanism dependent upon the movements of the shearing die for reciprocating said carrier.

7. In combination in a metal swaging machine, shaping dies, a fixed shearing die having a bore of substantially the same diameter and cross-sectional shape as the metal to be swaged, a slide movable transversely of the bore of the fixed shearing die, a shearing die attached to said slide and movable across the face of the fixed shearing die, said movable die having a bore of substantially the same diameter and cross-sectional shape as the bore of the fixed shearing die, a slide movable transversely of the bore of said movable die, a carrier attached to said latter slide and having means for receiving blanks from the movable shearing die, toggle mechanism for reciprocating said die slide, and a bell crank engaged with said toggle mechanism and with the carrier slide for reciprocating said carrier.

8. In combination in a metal swaging machine, shaping dies, a fixed shearing die having a substantially cylindrical bore, a slide movable transversely of the bore of the fixed shearing die, a shearing die having a substantially cylindrical bore attached to said slide and movable across the face of the fixed shearing die, a slide movable transversely of the bore of said movable die, a carrier attached to said latter slide and having means for receiving blanks from the movable shearing die, toggle mechanism for reciprocating said die slide, and a bell crank engaged with said toggle mechanism and with the carrier slide for reciprocating said carrier.

9. In combination in a metal swaging machine, shaping dies, a fixed shearing die having a substantially cylindrical bore, a slide movable transversely of the bore of the fixed shearing die, a shearing die having a substantially cylindrical bore, attached to said slide and movable across the face of the fixed shearing die, a slide movable transversely of the bore of said movable die, a carrier attached to said latter slide and having means for receiving blanks from the movable shearing die, toggle mechanism for reciprocating said die slide, adjustable means for limiting the outward movement of said die slide, a bell crank engaged with said toggle mechanism and with the carrier slide for reciprocating said carrier, and adjustable means for limiting the inward movement of said carrier slide.

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