TURRET TYPE RELOADING PRESS

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This application in part is a continuation of my pending application S.N. 302,278, filed June 15, 1959, now U.S. Patent No. 3,054,322, for Turret Type Reloading Press. The general object of this invention is to provide an improved and simplified form of turret type reloading apparatus wherein a series of tools are carried by a turret at the upper end of the apparatus and are selectively adjustable to positions in alignment with the axis of the shell-holding carriage which is slideable vertically in response to lever actuation, to effect a series of shell reconditioning and reloading operations. For example, in reloading shot gun shells, the apparatus is adapted for use to successively decap and resize a bent shell, to then reprim the same, to then inject a load of powder into the shell, to then successively insert an over-powder wad and a filler wad, to then insert a load of shot into the shell and finally to effect successive stages of initial crimping and final crimping to close the end of the shell over the shot. The apparatus can also be used for decapping and repriming a bullet cartridge, to insert a load of powder therein, to then insert a bullet, and to seat the bullet into place closing the end of the cartridge.

The general object of the invention is to provide such a shell reloading apparatus which is of simplified construction yet versatile in its use.

Another object is to provide a turret type reloading apparatus embodying a construction that is compact, relatively lightweight, and of minimal dimensions.

Another object is to provide such a reloading apparatus having means for reinforcing the turret when the apparatus is used for bullet-swaging operations, and removable for other operations such as shotgun shell reloading, which do not require pressures of as high an order as those required for bullet-swaging.

A further object is to provide an improved shell reloading apparatus of relatively compact arrangement and reduced dimensions, embodying an improved novel combination powder dispensing nozzle and decapping die permitting both powder loading and decapping at a single station of the turret.

Another object is to provide such an improved combination powder dispensing nozzle and decapping die.

Another object is to provide a compact turret type reloading apparatus having an improved starting crimp die such that shot-loading and starting crimp operations can be performed in immediate succession at a common station.

A still further object is to provide an improved starting crimp die having center relief which provides a more sharply defined point structure on the crimps that are placed in the ends of the shell.

Other objects and advantages will become apparent in the ensuing specifications and appended drawings in which:

FIG. 1 is a side elevational view of a reloading apparatus embodying the invention;
FIG. 2 is a plan view of the same;
FIG. 3 is a front elevational view of the same;
FIG. 4 is a horizontal sectional view of the same taken on the line 4—4 of FIG. 3;
FIG. 5 is a detail sectional view taken longitudinally through the base of the apparatus;
FIG. 6 is a schematic view of a tool mounting member of the apparatus as viewed from the front, with a set of shot gun shell reloading tools mounted therein;
FIG. 7 is a detail sectional view of the combined powder dispensing nozzle and decapping tool; and
FIG. 8 is a sectional view, on an enlarged scale, showing my improved starting crimp die.

Referring now to the drawings in detail, I have shown therein, as an example of one form in which the invention may be embodied, a shell reloading apparatus comprising, in general, a base A, a pedestal B rising therefrom, a tool head in the form of a turret C rotatably mounted on the upper end of pedestal B, a removable thrust bearing cap D removably attached through the upper end of pedestal B and providing an end thrust bearing for supporting the turret C against the reaction thrusts imposed thereon during the operation of the apparatus, a carriage E vertically slideable on the pedestal B; a lever mechanism F for moving the carriage E upwardly and downwardly; a removable brace rod unit G for bracing the turret C in the use of the apparatus for bullet swaging operations; and suitable tools H (FIG. 6), adapted to be mounted in the apparatus for effecting its various operations (e.g., on a shotgun shell 1).

Detailed Description

The base A comprises a foot portion 9 having one or more apertures 10 (FIG. 4) for bolting it down to a bench or other support, a body block 11 projecting upwardly from the foot portion 9 and an integral toe portion 12 overhanging the forward end of foot portion 9 and provided with an internally threaded vertical bore 13 (FIG. 5).

The pedestal B may consist in a section of tubing having its lower end mounted in a cup or socket 14 in the rear end of base body 11 and welded thereto as indicated; having a vertical keyway 15 in its rear side; having at its upper end a reduced cylindrical trunnion 16 terminating in a threaded tip 17, having a bearing shoulder 23 at the base of trunnion 16, and having a smooth cylindrical external wall providing a bearing surface for the vertically slideable carriage E.

The turret C comprises a thick, rigid circular disc 21 having a cylindrical central bore 22 through which the trunnion 16 extends with a journal fit whereby the turret is rotatably mounted upon the pedestal B. The turret rests on the flat radial shoulder 23 defined by the upper end of pedestal B at the base of trunnion 16, and is thereby supported in a plane normal to the axis of the pedestal B. It is secured in this position by the cap D. The turret C is provided with one or more radial handles 24 secured thereto by threaded shanks threaded into radial bores 25 (FIG. 1) in the cylindrical rim of the turret. The turret further includes an integral ear 26 projecting radially from its periphery and provided with a vertical bore 27 therethrough, positioned at the same radial distance from the axis of pedestal B as the bore 13.

In the turret disc 21 are a plurality of internally threaded bores 28 and 29 disposed on vertical axes at a common radius from the rotational axis of the turret, the apertures 28 being of a relatively large diameter and the apertures 29 being of a relatively small diameter.

Apertures 28 are adapted to receive shotgun reloading tools and tool mounting dies, thread delivery means of devices such as powder and shot dispensers, etc. Apertures 29 are adapted to receive tools having threaded shanks of smaller diameter, such as bullet decapping, repriming and swaging tools and dies, etc.

The cap D comprises a substantially cylindrical skirt 31 which is internally threaded to mate with the thread.
3 of pedestal tip 17, and a crown portion 32 which has a central threaded bore into which is threaded a nut 33. Set screw 33 may be tightened against the upper end of the solid threaded tip 17 to lock the cap D in any position to which it may be adjusted by rotating it on its threaded connection with pedestal tip 17, thereby to adjust the end face of skirt 31 to a position where the turret C is snugly embraced between said end face and the shoulder 23 without being clamped, i.e. remains freely rotatable but restrained against tilting with respect to the axis of pedestal B.

The carriage E comprises a cylindrical collar 35 through which is threaded a screw type key 36 that has a tip engaged in the keyway 15 to maintain the carriage E in a properly oriented position with respect to the pedestal B. On its forward side, as thus oriented, the carriage E has an integral seat 37 which is provided with an internally threaded vertical bore 38. In the base body 11 is a threaded bore 55 which is coaxial with the threaded bore 38 of carriage E.

Lever mechanism F: On respective sides of the seat 37 and projecting therefrom, are a pair of bosses 39 which are aligned on a horizontal axis transverse to the vertical axis of bore 38. Pivoted on the respective ends of a pivot pin 40 extending through and projecting from the respective bosses 39 at the respective sides of the carriage E, are a pair of connecting links 41 of bar form. Extending through the forward portion of the base body 11, parallel to the pivot pin 40, is a fulcrum shaft 42 having, in one or both ends thereof, a radial socket or sockets 43 (FIG. 3) in which is mounted the lower end of an operating handle lever 44. Extending through another pair of bores in the fulcrum shaft 42, subtending an angle of approximately 120° relative to the handle lever 44, are the integral shanks 45 of a pair of bifurcated crank arms 46.

The lever mechanism is actuated by means for operating the respective arms 46 and is pivotally thereto by pivot pins 47.

Hand lever 44 and crank arms 46 are secured by fastener screws 48 each having a relatively short threaded portion secured in a threaded bore in the outer end of a respective projecting end portion of fulcrum shaft 42, and each having a smooth stem portion 49 which extends into a cross bore in a respective crank arm shank 50, aligned with the axis of the fulcrum shaft 42. On the side where the crank handle 44 is located, the stem 49 also extends through a similar cross-bore in the end of lever 44. This single fastener screw function to pin both the hand lever and the crank arm to a respective end of the fulcrum shaft 42. By removing the screw 48, the hand lever 44 can be shifted to the opposite end of the fulcrum shaft 42 if desired.

In the lower limit position of the carriage E, shown in FIG. 1, the hand lever 44 extends upwardly with a slight forward inclination, the crank arms 46 project rearwardly with a slight downward inclination, and the links 41 are inclined upwardly and forwardly as shown. By moving the handle lever 44 downwardly and forwardly through an angle of 60° or more, the crank arms 46 will be elevated to positions of a fairly steep upward and rearward inclination and the links 41 will be elevated to corresponding positions of quite steep upward and forward inclination, elevating the carriage E to a position approaching the underside of turret C as indicated in broken lines in FIG. 1. From this approach position, the carriage E can be further elevated a relatively short distance, and during this final movement, the crank arms 46 and links 41, with a toggle action, will develop a relatively high pressure derivative of the couple forces transmitted by the crank arms 46, as the crank arms 46 and links 41 approach alignment. This high pressure stage of actuation of carriage E is utilized for the decapping, shell crimping and bullet swaging operations which require higher forces than the other operations. For bullet swaging operations, the pivot pins 47 can be removed and the lower ends of links 41 can be attached to crank arms 46 in close coupled relation by inserting the pins 47 in apertures 47 in the forks of crank arms 46, at approximately half the radial distance of the pivots 47 from the axis of fulcrum shaft 42 in the outer positions thereof shown in FIG. 1. With the links 41 in the closer coupled relation, they will extend nearly vertically in the lower positions of E, as shown in FIG. 4 and the carriage will therefore have a lower limit position which is considerably higher than that shown in FIG. 1; its total range of vertical movement will be just a little more than half that it has in the normally coupled arrangement of links 41 shown in FIG. 1; and its upper limit position will be lower than the upper limit position of its normally coupled operation.

The brace rod assembly G comprises a rod 51 having respective threaded ends 52 and upper and lower lock nuts 53 and 54 threaded thereon. The lower threaded end 53 is adapted to be threaded into the internally threaded socket 13 of the toe portion 12 of the base A and locked therein by the lock nut 54. The upper end of the rod 51 is adapted to be extended freely through the bore 27 of turret ear 26 with the upper threaded end 52 projecting therethrough and the nut 53 threaded onto the上级 threaded end 52 until it is snugly seated against the upper face of ear 26 but without straining the same.

The invention is particularly characterized by the relatively small diameter of the turret disc 21, the closely grouped arrangement of openings 28 and 29 relatively close to the turret axis, and the ear 26 which projects a substantial distance beyond the periphery of turret disc 21 so as to locate the axis of brace rod assembly G sufficiently away from the tool axis (the common axis of threaded bore 38, 28, 29, 55) to provide ample radial spacing for manipulation of tools and work in the space between the brace rod 51 and the pedestal B. This arrangement also provides for the location of the axes of the pedestal B, the tool axis and the rod 51 in a common axial plane, with the pedestal B and brace rod 51 located on diametrically opposite sides of the tool axis during high pressure operations such as bullet swaging. Thus the reaction loads provided by the pedestal B and brace rod 51 during the application of high pressure between the turret disc and carriage E, are balanced with respect to the tool axis 38 so as to avoid any possibility of canting of the turret 21 in the space between pedestal shoulder 23 and cap 31, regardless of the extent of pressure that is applied between the tools and the work.

Operating tools H: FIG. 7 illustrates schematically an array of tools mounted in base A, carriage E and turret C respectively, such as may be used for a reloading operation on a shot gun shell I. Such tools may include a shell holder 60 having a threaded shank 61 for threaded reception in the bore 38 of seat 37 of carriage E; a priming rod 62 having a threaded shank 63 for mounting the same in the bored bore 55 of base A; a plurality of dies 64, 66, 70, 71 externally threaded for mounting in the threaded openings 28 of turret G and internally threaded for reception and mounting of respective tools; a combined resizing die, decapping and power nozzle 66, embodied in the lower end of die 64 at a first station; a powder dispenser 65 mounted in the upper end of this same die; die 67 being a wad holder located at a second station and having a mouth 68 for insertion of wads thereinto; a shot dispenser 69 mounted in the upper end of die 70 at a third station; die 70 being a crimping and bullet die; and die 71 being a final crimp die, located at a fourth station.

Combined powder nozzle and decapping unit 66 (FIG. 7) is of novel construction and has the improved function of enabling it possible to mount the powder nozzle 65 and the decapping unit at the same station, thus requiring only four of the large openings 28 in turret unit G. The diameter of the turret disc 21 is correspondingly...
reduced, the radius of the openings 28 and 29 is closer to the turret axis, and the reaction forces developed in the turret, tending to tilt it away from its proper position, are of correspondingly lower intensity. Referring now to FIG. 7, for a detailed showing of unit 66, it comprises a tubular powder nozzle and sizing body 75 formed integrally with and projecting downwardly from the die 64, constituting the head portion thereof, and having an integral cylindrical skirt 76 projecting downwardly from said head portion in spaced coaxial relation thereto, having a male thread for reception in a threaded bore 28 of turret body 21; having a conical bottom member 77 provided with three powder dispensing apertures 78 extending downwardly therethrough with a slight outward flare; and having an integral decapping stem 79 projecting downwardly from the apex of the bottom member 77. The nozzle body 75 is of the proper diameter to snugly enter a shot gun shell so as to resize it and seal the open upper end thereof while powder is being discharged into the shell; and so as to permit the decapping stem to move downwardly through the head of the shell to force out the spent primer cap of a discharged shell that is to be reloaded. Skirt 76 receives the shell with an external sizing action. The open upper end of tubular nozzle body 75 communicates with the discharge throat in the lower end of the powder dispenser 65, the latter being mounted with its lower end threaded into an internally threaded socket in die 64.

The starting crimp die 70 (FIG. 8) likewise has improved novel features. It comprises a shank 81 which is externally threaded for mounting in a turret bore 28, and internally threaded to receive and mount the neck of shot dispenser 69; a cylindrical skirt 83 to receive the upper end of the shell; and a star-crimp die ring press-fitted in the upper end of skirt 83. Ring 84 has jaws 84' radiating downwardly and outwardly in frusto-conical array from the lower end of a shot delivery opening 82. The inner ends of the jaws 84' are defined by saw tooth portions of the wall of opening 82 at the lower end thereof, and the jaws are of maximum depth at these ends and are feathered to points at their outer extremities in accordance with conventional practice. The opening between the inner ends of the saw teeth accommodates the inner extremities of the crimps that are impressed into the upper end of the cylindrical shell wall as it is partially closed by the crimping die. The inward points of the crimps in the shell wall thus avoid being blunted by contact with a closed shank which is a customary occurrence in crimping dies of the closed type. I find that by thus avoiding the blunting or rounding of the points of the crimps at the center of the closed end of the shell, that the final closing operation which is performed by the closing die (it may be conventional) produces a cleaner and tighter closure of the end of the shell, the points of the closed end of the shell coming together in a more sharply defined interfitting relationship.

The apparatus provides for the further improvement of a starting crimp die 70 which has the bore 82 functioning both to provide relief at the center of the crimping jaw structure, and, in addition, to provide a nozzle through which shot may be loaded into a shell. It also provides for the coaxial mounting of the starting crimp die 70 and the shot dispenser 69 in the same bushing so that a shot loading operation may be immediately followed by a starting crimp operation without requiring an indexing movement of the turret.

Another improvement embodied in the starting crimp die 70 resides in its one piece investment molded tool steel structure of die ring 84. Initially it is investment molded as a single casing of annealed tool steel, using dental molding techniques (such as the lost-wax-plaster mold process). After molding, the die is hardened and tempered and is then peripherally ground with a true cylindrical periphery for accurate concentric mounting in counterbore sleeve 83.

Operation
To illustrate the operation of the apparatus, the steps of reloading a shot gun shell, using the setup shown in FIG. 6, will now be described. The shell I is inserted into the holder 60 with its head flange engaged by the jaws of holder 60. The primer cap is inserted over the tip of primer rod 62. Grasping one of the handles 24, the turret is then rotated to station No. 1 where the combined powder nozzle and decapping unit 66 is located on the tool axis immediately above the open upper end of shell I. At this point it may be noted that in order to save space, the various parts of FIG. 6 are shown in vertically telescoped relationship, closer than in the actual spacing which may be seen in FIG. 5. The handle lever 44 is held in a partially raised position to position the carriage E in an intermediate position clearing the primer rod 62. In the first operation, the handle 44 is lowered to raise the carriage E causing the decapping stem 79 and powder nozzle 75 to enter the shell A, the nozzles 75 and skirt 76 resizing the shell, and the stem 79 punching the spent primer cap downwardly out of the shell and dropping it through the shank 61 of holder 60, said shank being tubular. With the turret still at the No. 1 station, the handle lever 44 is then raised to move the carriage E downwardly over the repriming stem 62 which pushes the repriming cap upwardly into the aperture in the head of the shell, and sets it therein. The operator then raises the carriage E back to the raised position in which the shell I is telescoped over the powder nozzle 66. The powder dispenser 65 is then actuated to discharge a measured charge of powder downwardly through the nozzle 66 and through the apertures 78 thereof into the shell. The carriage E is then moved back to the neutral or intermediate position and the turret G is then indexed to station 2 (shown in FIG. 6) in which the wad holder sleeve 67 is located at the tool axis. An over-powder wad is then inserted into the holder 67 through the mouth 68 and the carriage E is then raised to cause the wad to be pushed downwardly into the shell and against the upper surface of the powder charge with the right amount of compression as provided for by a spring-loading plunger (not shown) of the wad holder unit 67.

The carriage E is then moved back toward the neutral position sufficiently to permit the insertion of a filler wad through mouth 68 into the holder 67 and the carriage is again raised, with gentle pressure this time just sufficient to seat the wad against the over-powder wad, but without compressing the filler wad.

The carriage E is then moved back to the neutral position and the turret is indexed to station 3, bringing the shot dispenser 69 and starting crimp die 70 to the tool axis. The carriage E is then raised gently to insert the upper end of shell I into the die 70 (here functioning as a loading nozzle) and the shot dispenser 69 is actuated to discharge a load of shot through the die 70 into the shell.

As soon as the charge of shot has dropped into the shell, the carriage E is moved further upwardly under sufficient pressure to crimp its upward end against the crimping jaws 84 of the starting crimp die 70. The necessity for shifting either the turret or the carriage to a new position between the shot loading and starting crimp operations is thus eliminated.

The carriage E is then moved back to the neutral position and the turret G is indexed to a final indexing movement to station 4 which brings the finished crimp die 71 to the tool axis. The carriage E is then forced upwardly forcing the upper end of the partially crimped shell I into finished crimp die 71 (of conventional construction) and against the crimping jaws thereof to flatten the crimped end of the shell into a flat end wall wherein
the points of the crimps come together at the center in a star pattern of improved geometrical regularity and with the aperture closed right up to the center thereof, due to the improved pointing of the crimps which has taken place in the starting crimp die 70. This completes the reloading operation. The carriage E is then moved back to a neutral position and the finished shell I is removed from the holder 60.

I claim:

1. In a shell-reloading apparatus, in combination: a support; a turret rotatably mounted on said support and having a plurality of circumferentially spaced vertical tool-mounting bores the axes of which are located at a common radial distance from the axis of rotary indexing movements of said turret; a combined powder-delivery nozzle and shell-resizing and decapping tool comprising a die mounted in one of said bores, said die having in its upper end an internally threaded socket for mounting the lower end of a powder dispenser therein, a cup-shaped powder-delivery nozzle integral with and projecting downwardly from the bottom of said die, having an open upper end communicating with said socket for receiving powder from said dispenser, having a cylindrical outer wall for internal sizing of the shell, and having a downwardly tapered bottom provided with powder-delivery apertures, a decapping stem secured to and projecting downwardly from the center of said nozzle bottom, and a cylindrical skirt integral with and projecting downwardly from the bottom of said die at the periphery thereof and spaced radially outwardly from said cylindrical outer nozzle wall by a cylindrical annular space adapted to receive the lateral wall of the shell, said skirt having an internal cylindrical wall for external sizing of said shell.

2. A combined powder delivery nozzle and shell reloading apparatus, comprising a die having an external male thread for mounting the tool in a threaded bore in a support, said die having in its upper end an internally threaded socket for mounting the lower end of a powder dispenser therein, a cup shaped powder-delivery nozzle integral with and projecting downwardly from the bottom of said die, having an open upper end communicating with said socket for receiving powder from said dispenser, having a cylindrical lateral wall for internal sizing of the shell, and having a downwardly tapered bottom provided with powder-delivery apertures, a decapping stem secured to and projecting downwardly from the center of said nozzle bottom for decapping the shell simultaneously with said internal sizing, and a cylindrical skirt integral with and projecting downwardly from the bottom of said die at the periphery thereof and spaced radially outwardly from said cylindrical outer nozzle wall by a cylindrical annular space adapted to receive the lateral wall of the shell, said skirt having an internal cylindrical wall for external sizing of said shell.

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