

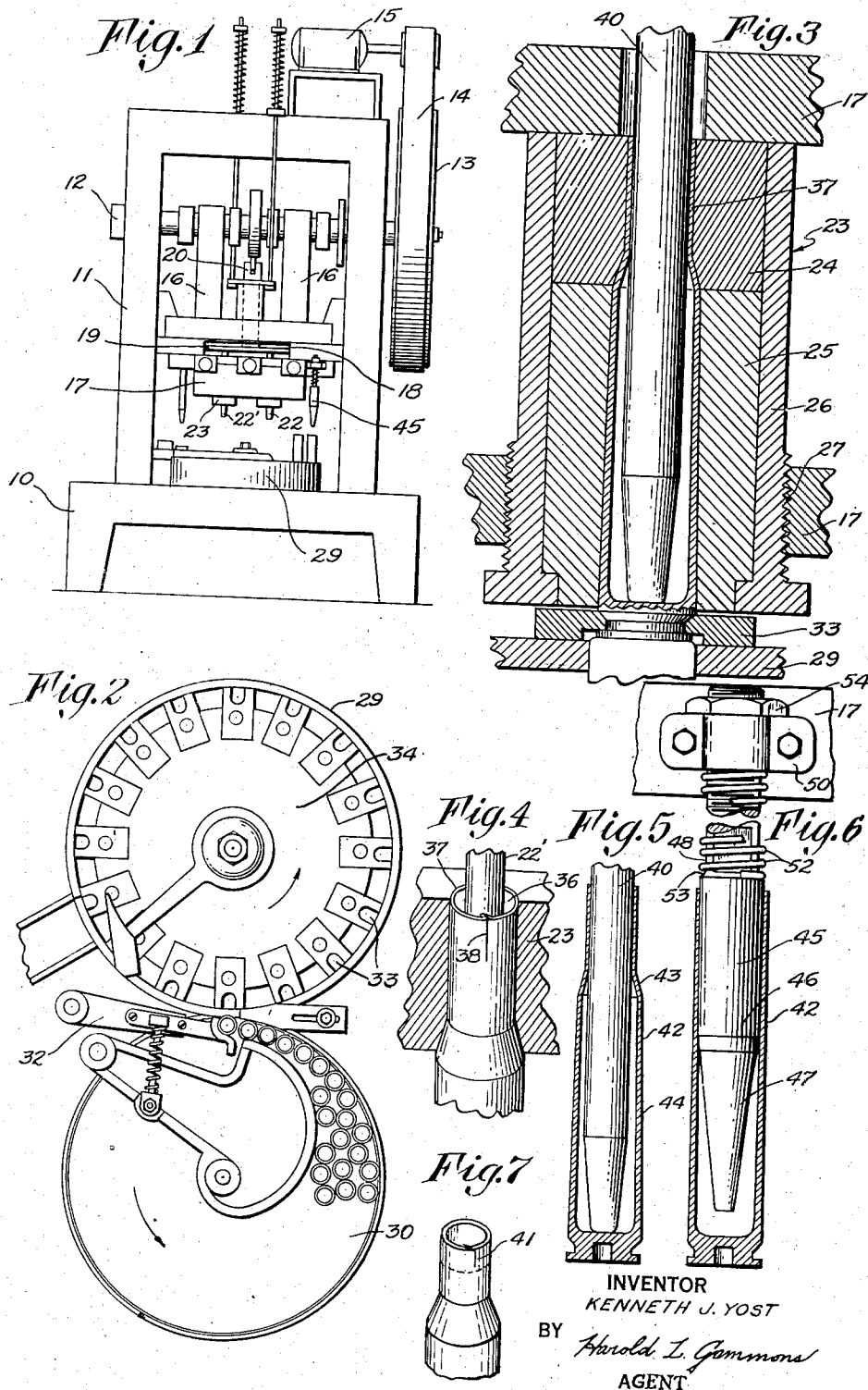
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AMMUNITION MANUFACTURING MACHINE

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AMMUNITION MANUFACTURING MACHINE

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1 Claim. (Cl. 29—1.3)

This invention relates, in general, to a machine for shaping tubular articles, and, in particular, to a method and means for tapering cartridge cases preferably without forming folds or wrinkles in the necks or bodies of the cases.

It is well known that the usual method of tapering cartridge cases consists in feeding the cases to a tapering machine mouth end up. The cases are fed onto an intermittently rotating transfer dial which carries each case successively to operating stations on the dial at which are located suitable cartridge case engaging tools. The tools are carried on a reciprocating head and include mouth ironing tool and tapering dies, the latter having punches movable axially therein relative to the reciprocating dies. It has been the function of these punches to enter freely into the case and to move down into engagement with the bottom thereof so that as the tapering dies are withdrawn or stripped off of the cases following the tapering operation, the cases will be held down positively on the transfer dial. Thereafter the punches are withdrawn from the cases and the latter are rotated to the next operating station. Following the discharge of the cases from the tapering machine, they are delivered to a mouth trim and burr machine which is adapted to trim the cases to an overall standard length.

It frequently happens, however, that, when the tapering dies are forced down over the open ends of the cases, folds or longitudinal wrinkles are formed in the necks or bodies of the cases thereby producing a defective case which must be scrapped. Moreover, these folds extend so far down the neck that to remove the defective portion by the subsequent trimming operation would form a case of substandard length. In actual practice, the frequency of occurrence of these adverse circumstances effect a relatively huge loss in the production of cartridge cases.

An object of the present invention is to provide improved means and method for shaping tubular articles. A further object is to support the walls of the open end of a tubular article so as to prevent folds or wrinkles from forming therein during the shaping operation. A still further object is to feed overlong cartridge cases to a tapering machine so that any superficial wrinkles formed in the neck portion of the tapered case will be confined near the mouth of the case and readily removed when the case is subsequently trimmed to its standard length.

Other objects, features and advantages of the invention will be more particularly described in the following specification. Although the present

invention relates particularly to a machine for tapering cartridge cases, it will be understood that the invention may be used in other suitable types of machines and embodies all modifications within the scope of the appended claims.

In the drawing:

Fig. 1 is a schematic front elevation of a cartridge case tapering machine.

Fig. 2 is a plan view of the feeding and transfer dial of the machine shown in Fig. 1.

Fig. 3 is a fragmentary vertical section of the gate shown in Fig. 1, showing a tapering die and punch.

Fig. 4 is a fragmentary view partly in section of the neck of a case having a fold formed therein.

Fig. 5 is a section of a tapered cartridge case showing the improved punch of this invention mounted therein.

Fig. 6 is a section of a cartridge case before being tapered showing an improved body ironing punch mounted therein.

Fig. 7 is a fragmentary view of the neck of a case having a lapped split to be removed when the case is trimmed to standard length.

Referring to the drawing, Fig. 1 shows a well known type of cartridge case tapering machine comprising a base 10 which supports a frame 11 adapted to rotatably mount a crank shaft 12 driven by a flywheel 13 connected by belt 14 to a suitable motor 15 or other source of power.

The crank shaft 12 carries a pair of crank arms 16 having a crank pin connection with a press gate 17 which is adapted to be reciprocated vertically in the frame 11 by the crank arms 16. Slidably mounted in an aperture 18 of the press gate 17 is a secondary gate 19 carried at the lower end of a rod 20 which is reciprocatingly mounted in the upper part of the gate 17 and actuated by a cam and roller drive means associated with the crank shaft 12. The secondary gate itself supports a pair of tools or punches 22 and 22' which, as shown in Figs. 1 and 3, extend down through suitable apertures in the press gate 17 axially of a pair of tapering dies indicated generally at 23 carried on the gate. Each tapering die comprises a shoulder die 24 and a body die 25 supported axially in superposed relation in the press gate by means of a suitable sleeve 26 threadedly secured as at 27 in an aperture in the gate 17.

The secondary gate driving means is adapted to reciprocate the punches 22 and 22' relative to the reciprocating dies 23 so that the punches will enter the cases prior to the tapering operation and hold the cases down positively on a transfer dial 29 during both the tapering operation and while

the dies are being stripped off of the tapered cases.

Cases are fed to the transfer dial 29 from a suitable table 30, see Fig. 2, by means of an oscillating feeding arm 32 which advances the individual cases from the table 30 forwardly into the bifurcated fingers 33 of a spider 34 adapted to rotate intermittently over the surface of the transfer dial 29, the latter being fixed to the frame 10.

As shown in Fig. 3, the fingers 33 of the spider engage in the extraction groove in the head of the cartridge case so as to hold the latter on the transfer dial 29 with its open end up and move the case around the dial to successive operating stations. The cases are tapered in two operations, namely, an initial taper under a die associated with punch 22 and a second or final taper under the die of punch 22'. The tapering machine described and illustrated herewith is widely used and doubtless well known to those skilled in the art, and hence a more detailed description thereof for the purpose of describing the present invention is believed to be unnecessary.

Heretofore the diameter of the punch 22' of the tapering die 23 has been considerably less than the inside diameter of the mouth of a standard tapered case as indicated in Fig. 4. That is to say, during the tapering operation, an annular space 36 existed between the periphery or profile of the punch 22' and the inside wall of the shoulder die 23, this space being greater in width than the thickness of the adjacent walls 37 of the case. Consequently, the walls 37 of the case were unsupported during the tapering operation, and hence if the mouth portion contained dents, irregularities, soft spots or lines or other local metallurgical defects, the application of the dies would tend to displace the weak metal inwardly, forming wrinkles or folds as indicated at 38.

The present invention proposes the use of an improved supporting punch designated at 40 adapted to be used instead of the punch 22' in the second or final tapering operation and which, as shown in Figs. 3 and 5, is of proper diameter to support the inside of the case neck 37 during completion of the tapering operation. The improved punch is also adapted to hold the case down on the transfer dial 29, as is done by the older form of punch, so as to facilitate stripping the tapering die from the finished case. In this connection, the nose of the punch is formed with a relatively long taper which reduces wear and chipping on the punch. The optimum diameter of the improved punch 40 is determined by the inside diameter of the shoulder die 24 less the thickness of the wall 37 of a standard case and less a slight clearance between the punch 40 and case neck to allow a smooth running fit between these members.

Thus, when the improved punch 40 is in operating position within the case, the periphery of the punch will effectively support the walls 37 of the case neck during completion of the tapering operation; the clearance between the punch and the walls of the case neck being insufficient to allow a fold or wrinkle to occur therein. Stated in other words, as the tapering die 23 is lowered onto the open end of the case, the walls of the case neck are shaped or tapered to conform substantially to the profile of the tool 40. As a result the occurrence of folds or wrinkles in the neck of the tapered case is substantially eliminated and any defects which may occur will be principally superficial wrinkles or lapped splits.

Although the description above has been of an improved punch 40 to be used during the second

tapering operation, it will be understood that a similarly shaped punch and appropriate tapering die may also be used in the first tapering operation.

As a further step in improving present methods of tapering cartridge cases, it is proposed to use cases which are somewhat longer than those which have customarily been used. Heretofore the cases were cut to length at second cutoff only long enough to provide sufficient neck material to insure a square mouth after the tapering and trimming operations. But it has been discovered that the greatest tendency to metal defects is adjacent the shell mouth, and, as shown in Fig. 7, incipient splits and wrinkles 41 in this location are, by the full mouth diameter punch 40, confined chiefly to the region of the mouth and hence can be removed in the subsequent mouth trimming operation. To this end, the preferred length of the case, from second cutoff, is such as to provide an over long neck which can be trimmed to standard length, see dotted line in Fig. 7, with substantial elimination of neck and mouth metal defects. Although the actual increase in length of the case is dependent to some extent on specific limitations of the tapering machine being used, an increase in length of the case, as delivered from second cutoff, up to one-quarter inch has been found to secure beneficial results.

As mentioned above, one other probable cause for wrinkling or folds during tapering has been the existence of dents or other irregularities in the walls of the case. In this connection, the adverse effect of dents in the neck portion of the case will be substantially frustrated by the supporting punch 40 described above. However, there may be dents in the case below the neck portion thereof and especially in that relatively soft region 42 between the shoulder 43 and lower annealing line 44, see Figs. 5 and 6.

The term "lower annealing line" will be understood to mean a line indicative of the extent of the first mouth anneal. As evidenced in Figs. 5 and 6, region 42 of the case will not be supported by the improved punch 40 during the tapering operation, and hence most dents or irregularities therein tend to be deepened by the stresses induced by the tapering dies. To provide against such occurrences, it is proposed to iron the body of each case in the region 42 prior to tapering so as to remove any dents or other irregularities.

Suitable means for ironing the body of the case comprises a tool 45, shown in Fig. 6, the profile of which conforms substantially to the shape of the inside walls of the case in the area to be ironed, that is, the entire softened area 42. Since the inner walls of the case gradually increase in thickness from its open end to its base or head end, the tool 45 has a correspondingly slight taper at 46 which is adapted to iron out the walls of the case. This slight taper blends into a smooth curve toward the nose or pilot portion 47 of the tool. As evidenced in the drawing, the pilot portion comprises a considerably longer taper than has heretofore been used on mouth ironing tools which serve admirably to guide the tool into the open mouth of the case. The unusually long pilot also facilitates the opening up of bent mouths with less wear and chipping of the tool.

The body ironing tool 45 is spring mounted on the reciprocating press gate 17, the upper end 48 of the tool being slidably supported in a suitable

sleeve 50 fixed to the gate. A coil compression spring 52 surrounds the shank of the tool and abuts at its lower end on a shoulder 53 of the tool, the upper end of the spring being drawn up against the bottom of the sleeve by means of the nut 54 threadedly secured on the upper end of the tool shank. This spring mounting allows some lost motion as the ironing tool 45 is driven down into the open end of the case, thus compensating for wear and insuring longer life for the tool.

In accordance with the above description, the present invention provides an improved method and means for tapering the cartridge cases embodying the steps of providing cases of such length that a considerable portion of the neck may be cut off during the final trimming operation to insure the removal of any superficial wrinkles in a case of standard length; of ironing the body of the case prior to the tapering operation by means of an improved body fold controlling tool and then tapering the neck of the

case to conform to the profile of the neck supporting punch.

What is claimed is:

5 A method of making cartridge cases comprising the steps of supporting a substantially cylindrical case closed end down on a base, ironing out deformations in said case throughout a substantial portion of the body thereof, tapering the case, moving a die down over the open end of said case to partially contract the neck portion thereof, inserting a punch into said case and engaging the end of said punch with the closed end of said case to hold the latter firmly on said base, and then moving a second die down over the partially contracted neck of said case while retaining said punch therein for completing the contraction of said neck, simultaneously rigidly supporting the inner walls of the partially contracted neck by said punch during completion of the contracting operation thereby to prevent wrinkling in the neck of the case.

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