Dec. 19, 1933. W. H. WOODFORD 1,940,657

AMMUNITION

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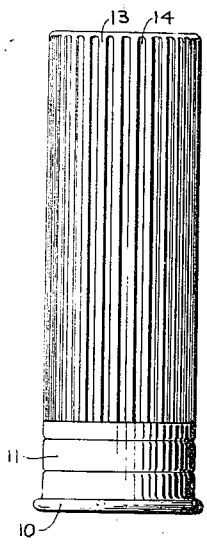

Fig. 1

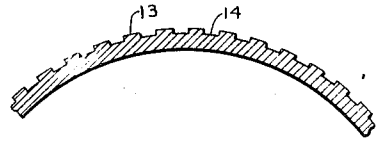

Fig. 2

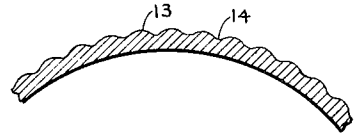

Fig. 3

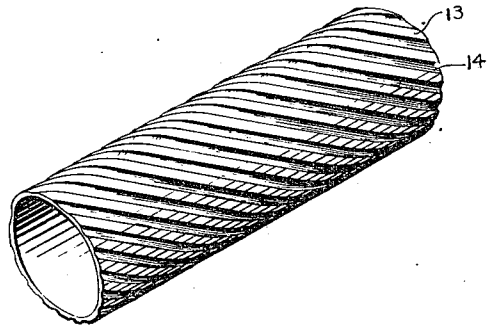

Fig. 4

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AMMUNITION

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12 Claims. (Cl. 102—16)

This invention relates to ammunition and particularly to the construction of the bodies of paper shot shells and tubes for the manufacture of such shot shell bodies.

Shot shells, as ordinarily constructed, comprise a body which is essentially a paper cylinder, having fitted thereto a head of brass or other suitable metal, which head comprises a cylindrical flange adapted to receive and fit closely about an end section of the paper body. A "base wad" is fitted inside the end of the paper body which is encircled by the flange of the metal head, and serves among other things to effect such a contact of the paper body and the metallic head as will prevent the escape of powder gas in the firing of the shell.

Since in firing a very high pressure is produced within the body of the shot shell, such paper bodies are prone to a variety of failures, a substantial fraction of which occur near the top of the metal flange. Various devices have been proposed for strengthening shell bodies, particularly at this vulnerable point, as well as for securing a more perfect gas seal between the shell body and the metal of the head.

It is an object of this invention to materially increase the mechanical strength of paper shell bodies by subjecting them to certain manufacturing operations hereinafter more fully described.

A further object of the invention is to substantially eliminate shell body defects by rendering the shell body and particularly the outer surface thereof somewhat elastic and less liable to failure under stress.

More specifically, the invention contemplates a shell body of greatly improved resistance to rupture under stress and of improved appearance, these results being secured by forming in the shell body or the tubes from which shell bodies are made of a series of alternate depressions and ridges.

In the drawing, Fig. 1 is a side elevation of a shot shell including one embodiment of the invention.

Fig. 2 is a fragmentary enlarged transverse section of a portion of a shell body such as is illustrated in Fig. 1.

Fig. 3 is a similar fragmentary transverse section, showing a slightly different form of ridging or corrugation.

Fig. 4 is a fragmentary perspective of a shell tube showing a slightly different arrangement of the ridges or corrugations.

The shot shell illustrated in Fig. 1 comprises the usual metallic head 10 having a cylindrical flange 11, which flange encircles the end section of a paper body 12. Such paper bodies are, prior to assembly with the metallic head, cut from tubes of a length of several shell bodies, which tubes are rolled from sheets of specially prepared paper. The wall of the tube comprises 4 or 5 layers of paper, secured together by a suitable adhesive such as starch. The tubes may also be treated either prior or subsequent to cutting with suitable heat absorbent and moisture proofing materials.

Prior to the present invention it has been universal practice to leave both the inside and outside walls of the tubes in a smooth condition, just as they are rolled from the paper or delivered from a sizing and burnishing die. The present invention comprises the discovery that by forming in one surface of the tube a series of grooves separated by comparatively narrow undepressed lines a very substantial increase in mechanical strength is secured. The proportions of the depressed and undepressed lines are such that the entire surface presents a corrugated or ribbed appearance. A shell body made from a tube thus corrugated is shown in Fig. 1, the undepressed lines or ridges being identified by the numeral 13 and the grooves between the ridges by the numeral 14. Such grooves and ridges may take a variety of shapes, thus Fig. 2 shows an enlarged section of a tube in which they are of angular configuration with substantially flat bases and tops; while Fig. 3 shows a modified V construction with curving bases and tops.

The corrugations may run in any desired direction with respect to the axis of the tube, thus in Fig. 1 they are illustrated as extending parallel to the axis of the tube, while Fig. 4 shows a construction in which the corrugations form a spiral about the tube. The pitch or spacing of adjacent depressed lines may be greatly varied, the typical or average arrangement comprising about 20 or 25 such lines to the inch, and they are preferably applied to the exterior surface. Their depth may be a comparatively small fraction of the thickness of the tube stock.

The corrugation of the surface of the tube may be effected in a variety of ways, a preferred method being to draw a smooth tube through a die provided with properly spaced and shaped projections for forming the desired number and shape of grooves. If the corrugations are to extend axially of the tube and shell body as shown in Fig. 1 the tubes are, during this operation, held against rotation. If a spiral corrugation, such as

shown in Fig. 4, is desired, the tubes are rotated while passing through the die at a rate depending upon the desired pitch of spiral.

A very remarkable increase in the mechanical strength of tubes is secured by thus corrugating one of their surfaces. Ordinary smooth bodied shot shells are never entirely free from firing defects. Firing of freshly prepared shells under ordinary conditions results in a number of casualties of the general order of 1%, whereas an extensive test of corrugated body shells resulted in casualties of one-tenth of 1%, all of which were slight and unimportant. A severe test to which shot shells are ordinarily subjected consists in first drying them in a vacuum for about 24 hours and then exposing them for several hours to a temperature of about −10° F. This test of ordinary tubes results in about 40% casualties, many of which are serious; whereas the casualties for the corrugated tubes of this invention are less than 5% and are all of a minor nature. The roughened surface likewise facilitates handling of the shells as well as enhancing their appearance. A very substantial advance in the art of shot shell manufacture has thus been made.

Since the method of strengthening shot shell bodies by corrugating their surface is broadly new, the appended claims are to be broadly construed.

What is claimed is:

1. The method of strengthening the paper bodies of shot shells which comprises the rolling of a sheet of paper into a smooth surfaced tube, and the forming of one surface of such tube into a series of alternate grooves and ridges.

2. The method of strengthening the paper bodies of shot shells which comprises the rolling of a sheet of paper into a smooth surfaced tube, and the forming of one surface of such tube into a series of alternate grooves and ridges by passing such tube through a suitable die.

3. The method of strengthening the paper bodies of shot shells which comprises the rolling of a sheet of paper into a smooth surfaced tube, and the forming of one surface of such tube into a series of longitudinally extending alternate grooves and ridges.

4. The method of strengthening the paper bodies of shot shells which comprises the rolling of a sheet of paper into a smooth surfaced tube, and the forming of one surface of such tube into a series of spirally disposed alternate grooves and ridges.

5. The method of strengthening the paper bodies of shot shells which comprises the rolling of a sheet of paper into a smooth surfaced tube, and the forming of one surface of such tube into a series of spirally disposed alternate grooves and ridges by passing said tube through a die during relative rotation of said tube and die.

6. In the manufacture of tubes for shot shell bodies, the method which comprises rolling a tube from a plain sheet, and subsequently passing said tube through a die to form in one surface of said tube a plurality of relatively small evenly spaced indentations.

7. A non-metallic shot shell body of substantial wall thickness having impressed in its exterior surface a series of regularly spaced relatively small longitudinally extending indentations which strengthen the body and facilitate handling.

8. In the manufacture of tubes for shot shell bodies, the method which comprises rolling a tube from a plain sheet, and subsequently forming in one surface of said tube a plurality of relatively small evenly spaced indentations.

9. In the manufacture of shot shell tubes the method which comprises forming in the tube body alternating lines or areas of compressed and uncompressed stock.

10. A shot shell comprising a base and a non-metallic body, said body comprising alternating lines of compressed and uncompressed stock.

11. A shot shell having a base and a non-metallic body, said body having a plurality of parallel longitudinally extending grooves impressed on the surface thereof, said grooves strengthening the body and facilitating handling.

12. A non-metallic shot shell body comprising a wall of substantial thickness having impressed in its exterior surface a plurality of relatively shallow lines or grooves which strengthen the body and facilitate handling.

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