Dec. 9, 1941. T. E. MURRAY ET AL 2,265,652

HOLLOW SHELL

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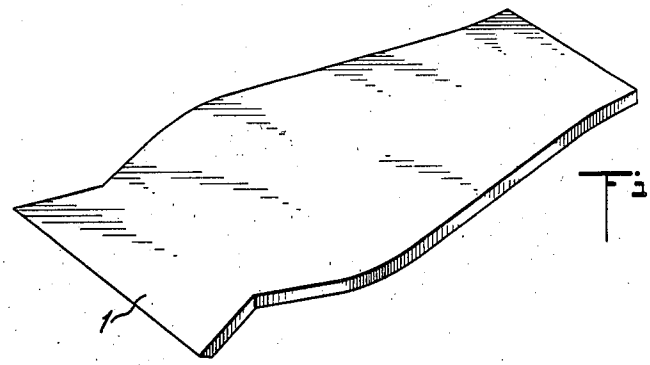


Fig. 1.

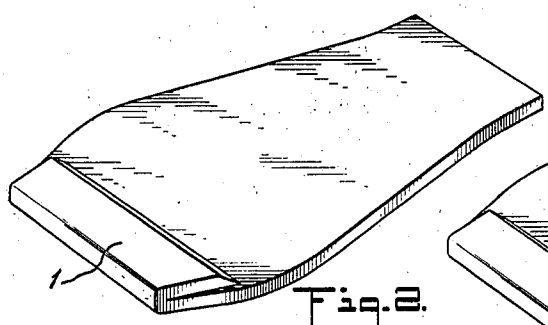


Fig. 2.

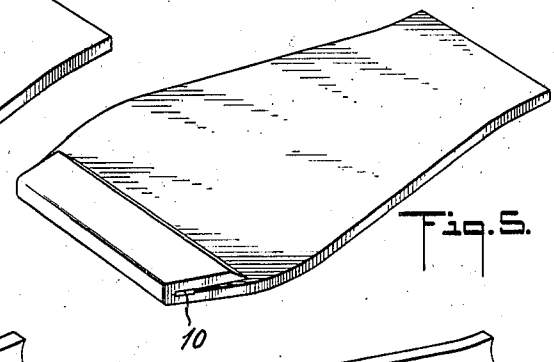


Fig. 5.

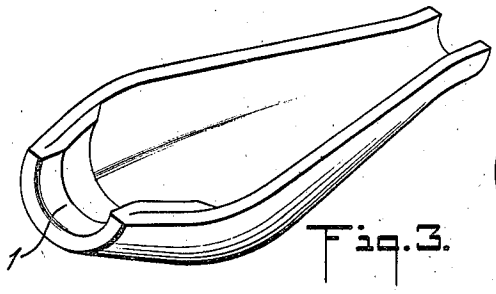


Fig. 3.

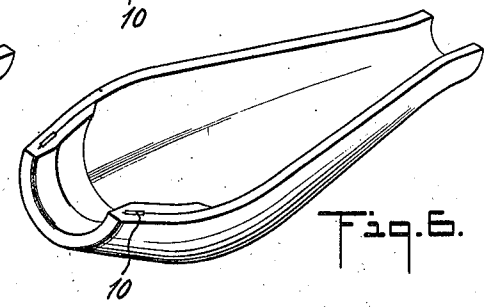


Fig. 6.

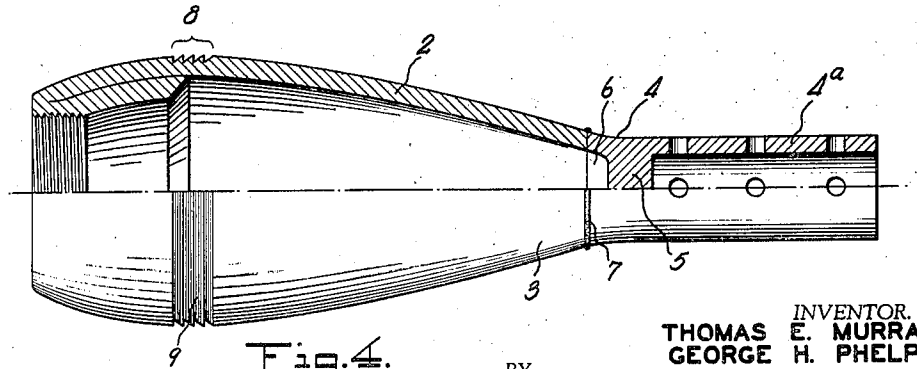


Fig. 4.

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HOLLOW SHELL

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Application November 29, 1939, Serial No. 306,632

5 Claims. (Cl. 29—1.21)

The invention herein disclosed relates to a hollow, streamlined shell or projectile of the type that is used in a mortar and to a method of making such a shell.

It has been found expedient to streamline mortar shells and to control the center of gravity of the shell through the distribution of the metal of the shell. In this way the shell is prevented from tumbling when projected and greater distance and accuracy is attained. To effect this desirable streamlining and distribution of metal, it has been thought to be necessary to forge the shell and such shells have heretofore been made as forgings. After the forging is completed considerable machining is required to obtain the requisite external configuration, wall section and accuracy. Such forging and machining is slow, laborious and expensive and unsuitable for rapid, quantity production.

By the invention herein disclosed, there is provided a shell of this type that, and a method for making such shells which, is suitable for rapid production in very large quantities and at greatly reduced cost as compared with the same shells and methods for producing them that have been in use prior to this invention. In accordance with the invention, there is provided a hollow, streamlined, mortar shell drawn from plate. The shell has a heavier wall section in the region of the nose for the proper distribution of weight in accordance with the desired location of the center of gravity of the shell. This shell is produced, in accordance with the method of this invention, by first forming the plate to provide a heavier section in the region of the plate that forms the nose of the shell. The plate so formed is drawn to form the shell and united electrically at the joint to effect an ingraining of the metal at the joint. A shell of this type, so constructed, is of uniform strength throughout.

In the accompanying drawing, there is disclosed the blanks and shell that are produced in constructing a shell in accordance with this invention. The drawing includes:

Fig. 1 which is an isometric view of a blank cut from plate;

Fig. 2 which is an isometric view of the same blank with the end to form the nose of the shell bent back upon itself;

Fig. 3 which is an isometric view of the blank shaped to form one of two interchangeable portions of the shell;

Fig. 4 which is a side elevation, half in section, of the shell;

Fig. 5 which is an isometric view of a modified form of blank with the end to form the nose bent back upon itself; and

Fig. 6 which is an isometric of the blank shaped to form one of two interchangeable portions of the shell.

The blank illustrated in Fig. 1 is of the configuration obtained by developing in a plane one of two interchangeable, longitudinal divided parts which together make up the shell. This blank is stamped from plate of a thickness suitable for the particular size of shell being produced. The end portion 1 of the blank is bent upon itself as illustrated in Fig. 2. In the finished shell this section of the blank is at the nose or forward end of the shell.

After the end of the blank is bent back upon itself, the blank is subjected to drawing operations between suitable dies and caused to assume the concave form illustrated in Fig. 3. Two such interchangeable parts 2 and 3 are placed in correspondingly recessed electrodes with the edges of the parts 2 and 3 in registering contact. A current of very great strength is employed for a brief period of time. While the current is passing, the two parts are pressed together and the contiguous edges are caused to embed one within the other and a coalescence and ingraining of the metal is effected. The parts are thus united integrally such that the shell is of uniform strength throughout.

The rear or tail end of the shell is closed by a perforated cartridge tube 4. This tube is preferably formed as a cylindrical piece on an automatic screw machine and includes the perforated, hollow cartridge chamber 4a which receives the cartridge that ignites the propelling charge, and a solid section 5 that forms the end wall of the cartridge chamber. This end wall is recessed as at 6 and the wall of this recessed portion is spread, after the tube is finished on the screw machine, to correspond to, and follow the curvature of, the end portion of the body of the shell. The body of the shell and the cartridge tube are placed in recessed electrodes and electrically united as at 7 by an ingraining of the metal at the contiguous edges. The external burr formed by the extrusion of metal during the weld is removed from the shell.

The shell so formed includes a cylindrical section between the indicating lines 8. It is important that this section accurately fit the bore of the gun to secure the maximum effect of the propelling charge. To insure that the shell properly corresponds to the bore of the gun, it is forced through a truing die, the diameter of which corresponds to the diameter of the trued shell or the bore of the gun. After the shell is drawn through the truing die, the grooves 9 may be machined thereon.

The folding back of the metal in the region of the nose of the shell provides a heavier wall section at this portion of the shell. By varying the length or thickness of the turned back portion

of the shell, the weight of the shell may be distributed to so locate the center of gravity of the shell along the longitudinal axis of the shell that the shell in flight will not tumble and will follow a course such as to secure the greatest range. The thickened wall section also serves to provide the proper internal diameter of the nose of the shell which is internally threaded to receive the fuse cap.

In Figs. 5 and 6 the blank for, and the drawn interchangeable part of, a modified construction is illustrated. This construction is especially advantageous where a lighter plate, a plate of lesser thickness than the plate of the blank of Fig. 2 is used to form a shell. It is, of course, necessary to maintain the same external diameter of the shell and the proper internal diameter at the nose for the fuse cap. It is also desirable to maintain the same longitudinal curvature of the outer surface of the shell. To this end the construction of Figs. 5 and 6 is directed. In this construction, the end section of the blank is folded over an insert 10 consisting of a strip of metal of suitable thickness. The blank with the end to form the nose folded over the insert is drawn in suitable dies to obtain the shell part illustrated in Fig. 6. Two such interchangeable parts are electrically joined along the contiguous edges as heretofore described. The insert 10 provides the necessary thickness at the nose to secure the requisite internal diameter while maintaining the same curvature of the shell. In this construction, the metal turned back and the insert at the nose are designed to proportion and distribute the weight and so locate the center of gravity.

In each of the embodiments of the invention disclosed in the drawing and described in detail above, the main body of the shell is made of two longitudinal similar half sections. The nose is thickened and weighted by reversely bending the metal. These two sections are welded together parallel to the longitudinal axis of the shell at their meeting edges. A single solid closing piece is then welded to the open end opposite the nose in a plane at right angles to the longitudinal weld, in other words, a circumferential weld is made. The purpose of the latter weld is not only to close the end of the main shell body but also to tie together, as it were, the two longitudinal halves.

From the foregoing description of the shell illustrated in the drawing and the method of making the shell, it will be seen that by the invention herein disclosed there is provided a shell which is readily made, in accordance with the method of the invention, rapidly, in quantity and less expensively as compared with similar shells and methods for making them that have been used prior to this invention. The shell is of uniform strength throughout, accurate in size and the weight is distributed to properly locate the center of gravity. It will be apparent that the body of the shell in the first instance may not be drawn or rolled to the precise, final shape of the shell. When made from thin metal of a thickness of sheet metal or plate, the shell may be given its streamlined contour by swaging.

It will be obvious that various other changes may be made by those skilled in the art in the steps of the method and the details of the shell illustrated in the drawing and described above within the principle and scope of the invention as expressed in the appended claims.

We claim:

1. The method of making a hollow shell having a heavier wall section adjacent one end thereof which method includes stamping blanks from plate, a blank constituting a development in a plane surface of a portion of the shell and an extension adjacent one end, reversely bending the blank to bring the extension into contact with the blank, and drawing the blank to form a portion of the shell.

2. The method of making a hollow shell having a heavier wall section adjacent one end thereof which method includes stamping blanks from plate, each blank constituting the development in a plane surface of a longitudinally divided portion of the shell and an extension at one end, reversely bending the blank to bring the extension into contact with the blank, drawing shell portions from the blanks, arranging the drawn shell portions with the longitudinal edges in contact and in the form of the shell, and effecting a coalescence and ingraining of the metal at the contacting edges.

3. The method of making a hollow, streamlined, mortar shell having an ogival front part with a heavier wall section in the region of the forward end thereof and a tapering part at the rear of the front part, which method includes stamping blanks from plate, each blank constituting the development in a plane surface of a longitudinally divided portion of the shell with an extension at the forward end, reversely bending the blank to bring the extension into contact with the blank, drawing the blanks so formed to form shell portions, arranging the drawn shell portions with the longitudinal edges in contact and in the form of the shell, and effecting a coalescence and ingraining of the metal at the contacting edges.

4. The method of making a hollow shell having a heavier wall section adjacent one end thereof which method includes stamping blanks from plate, each blank constituting the development in a plane surface of a longitudinally divided portion of the shell and an extension at one end, reversely bending the extension about an insert, drawing shell portions from the blanks so formed, arranging the drawn shell portions with the longitudinal edges in contact and in the form of the shell, and effecting a coalescence and ingraining of the metal at the contacting edges.

5. The method of making a hollow, streamlined mortar shell having an ogival front part with a heavier wall section in the region of the forward end thereof and a tapering part at the rear of the front part, which method includes stamping blanks from plate, each blank constituting the development in a plane surface of a longitudinally divided portion of the shell and an extension at the forward end, reversely bending the extension about an insert, drawing the blanks so formed to form shell portions, arranging the shell portions with the longitudinal edges contacting and in the form of a shell, and effecting a coalescence and ingraining of the metal at the contacting edges.

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