METHOD OF MAKING BOMB HEAD SHELLS

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1 Claim. (Cl. 29—1.3)

The present invention relates to improvements in drop bombs adapted to be conveyed to the target by bombing planes, and is more particularly concerned with improvements in the construction of low drag bombs of this type.

An important object of the present invention is to provide improvements in the head portions of low drag bombs produced by drawing metal into the head shell form.

Another object is to provide an improved method of making the head shells for low drag bombs.

A further object of the invention is to improve the longitudinal compression resistance of the walls of the head shells of low drag bombs.

Still another object of the invention is to improve the longitudinal compression resistance of elongated drawn shells wherein the external surface must be maintained uniformly free from air resistance projections.

Yet another object of the invention resides in the provision of a light-weight elongated, streamlined shell structure of substantially improved longitudinal compression resistance.

A still further object of the invention is to provide an improved bomb head structure with novel carrying lug or loop anchoring means.

Other objects, features and advantages of the present invention will be readily apparent from the following detailed description of certain preferred embodiments thereof in conjunction with the accompanying drawings in which:

Figure 1 is a longitudinal sectional view through a partially drawn bomb head shell;

Figure 2 is an enlarged transverse sectional view through the shell of Figure 1 showing in place therein a drawing punch of novel structure for effectuating certain features of the invention;

Figure 3 is a transverse sectional view similar to Figure 2 but showing the relationship of the shell wall to the punch after drawing has progressed or been completed;

Figure 4 is a vertical sectional view through the shell following completion of the drawing with the use of the punch structure shown in Figures 2 and 3;

Figure 5 is a transverse sectional view through a modified form of the drawn shell;

Figure 6 is a vertical sectional view through the shell following back taping and nosing operations;

Figure 7 is a side elevational view of the tapered and nosed shell, partially broken away and in section to show the provision of carrying lug or loop anchoring sockets in the wall of the shell;

Figure 8 is an enlarged sectional view taken substantially on the line VIII—VIII of Figure 7; and

Figure 9 is a fragmentary transverse sectional view through a further modified form of the shell.

Since the head shells of drob bombs must be as light in weight as practicable but yet of as large an explosive load carrying capacity as feasible the longitudinal walls of the shell must be quite thin in proportion to the size of the projectile. For penetration of the target such a drop bomb is guided to strike pointed nose first, which at impact with the target imposes great compression strains upon the longitudinal walls of the head shell. Where the head shell wall is too thin, there is a tendency to buckle on impact with target and thus retard or thwart penetration.

According to the present invention, a bomb head shell 10 for a low drag bomb is drawn to provide the longitudinal wall thereof with great compression resistance strength while nevertheless affording an unusually light-weight structure. In Figure 1, the shell 10 is shown in partially drawn state, it being understood that a slab or disk of suitable grade material such as steel has been cupped and possibly coined, and passed through a preliminary series of draws through suitable drawing die structure to attain the cylindrical, closed bottom shell form shown, including a cylindrical side wall 11 and a thicker closed bottom wall 12. At this stage, the side wall 11 may be appreciably one-half inch thick, as provided in a practical example of a low drag bomb head shell, although shown on a much reduced scale in Figure 1.

Thereafter, the shell 10 is subjected to one or more drawing operations or passes wherein the wall 11 is elongated to the desired extent, accompanied by some contraction. In this final drawing, however, while the outside surface of the wall 11 is formed smooth, the inside surface of the wall is formed with a plurality of preferably uniformly circumferentially spaced longitudinal stay-like reinforcing ribs 13 formed thereon as an incident to the final drawing. This is accomplished, as more or less schematically illustrated in Figures 2 and 3, by passing the shell through one or more drawing dies (not shown) of the desired circumference and of any known or preferred construction, while a punch 14 is utilized within the shell for creating the reinforcing ribs 13 as an incident to the final drawing of the shell.

For this purpose, the drawing punch 14 is provided with an appropriate series of longitudinal rib-forming grooves 15 providing in negative or die form the shape desired for the ribs 13. Intervening between the rib-forming grooves 15 on the longitudinal surface of the punch are respective ribs 17 which are on the diameter to which the maximum internal diameter of the drawn shell is to be formed. In the drawing operation, as the thickness of the shell wall is contracted in outside diameter, the ribs 17 on the punch prevent inward contraction of the inside diameter of the shell wall 11 and therefore are effective in reducing the thickness of the shell wall opposite the respective punch ribs. At the same time, material displaced from the shell wall 11 as an incident to drawing reduction in thickness of the shell wall opposite the punch ribs 17 is displaced laterally and combines with the material of the shell wall opposite the punch matrix or negative grooves 15 pressed inwardly during the contraction incident to the drawing to fill in the punch grooves and thus provide the longitudinal shell wall reinforcing ribs 13 as seen in Figure 3.

In a typical example, the shell wall 11 may be reduced in thickness from one-half inch to approximately three-eighths inch in the longitudinal areas opposite the punch ribs 17, while the shell wall ribs 13 formed into the punch grooves 15 attains a thickness of approximately five-eighths inch, that is, thicker than the wall thickness before the final drawing operation. The relationship attained between the internal rib and groove formation of the fully drawn shell 10 is preferably such that within the permissible weight allowance for the shell wall 11, the distribution of material into the thicker reinforcing ribs...
15 is compensated for by a corresponding reduction in thickness of the wall in the internally grooved, thinner wall portions intervening between the reinforcing ribs. For maximum efficiency, the shell wall reinforcing ribs 15 are preferably equidistantly spaced and equally proportioned as to mass. This not only maintains proper balance in the shell for flight, but also assures a balanced impact resistance about the entire circumference of the shell.

While in a preferred form the internal longitudinal reinforcing ribs 13 of the shell may take the form of segmental sections of substantial width and uniform thickness transversely arcuate conforming to the circumferential periphery of the shell, as best seen in Figures 3 and 4, other specific transverse shapes may be provided for the reinforcing ribs as shown, for example, in Figures 5 and 9. In Figure 5, a shell 20 having a longitudinal side wall 21 is provided with a smoothly circular exterior circumference or outside diameter while the inside surface of the shell 20 is provided with a series of longitudinal reinforcing ribs 32, uniformly spaced and of identical mass formed as regular inwardly projecting undulation sections of the inside surface of the shell wall with intervening generally complementary grooves 33, affording in cross-section a generally corrugated internal affect for the shell wall. In the form of Figure 9, the shell 30 has a longitudinal wall 31 provided with an outside diameter of uniform circular shape while the inside surface is provided with a uniform series of scallop-like ribs 32 of generality ridge-like shape, with intervening concave grooves 33.

In all forms of the internal surface rib formations, it will be observed that the side surfaces defining the ribs slope toward the peaks or crowns of the ribs, that is, toward the maximum inward projecting portions of the ribs. This is highly desirable to facilitate metal flow or displacement from the thinner sections of the shell wall toward and into the thicker mass sections of the ribs in the drawing operation or steps during which the internal reinforcing ribs of the shells are formed. This construction also results in a smoother internal surface formation for the shell.

Following the drawing and internal ribbing of the shell 10, or the shell 20 or 30, it is back tapered as shown at 35 in Figure 6 from the dash line position to the full line position, and it is further nose tapered as at 37 to afford the desired ogival nose effect. The shell is now ready for certain machining operations at the base 12 and at the tip of the tapered nose for reception or cooperation with other components of a bomb assembly for which the head shell provides the principal component.

For handling purposes, drop bombs are customarily provided with hanger studs or loops secured to one side at a mid-point properly balanced with relation to the mass of the bomb to enable suspension lifting of the unit in a horizontal position. According to the present invention, provision for attachment of the handling bracket, stud or loop devices is made in an improved manner. To this end, advantage is taken of the increased rib thickness at uniform sections of the wall of the bomb head to coin a plurality of sockets 38 into the outer surface of the bomb head into one of the ribs 13, substantially as shown in Figures 7 and 8, by displacing the material at each of the sockets 38 into an inwardly projecting node 39. The outwardly opening socket may then be internally threaded as at 40 to receive a mating threaded end of a supporting eye or loop member or stud or bracket. An important advantage of this arrangement is that the sockets 38 are thus provided without any joint or opening from the outside of the bombhead shell to the interior through which leakage might occur. Moreover, the necessity for making and machining and assembling separate socket structure or parts is thereby avoided.

It will be understood that modifications and variations may be effected without departing from the scope of the novel concepts of the present invention.

I claim as my invention:

In a method of making bomb head shells for low drag aerial drop bombs, partially drawing a steel shell into elongated tubular form, thereafter further elongating the shell and forming alternate reduced thickness and increased thickness longitudinal areas in said wall coincident with elongation of the wall, and then pressing a socket into one of the increased thickness areas with a node projection inwardly to enable attachment of a handling device to the shell.

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