This invention relates to jacketed projectiles and the method of applying the jacket to the core of the projectile.

One of the objects of the invention is an improved jacketed projectile more particularly of the type comprising a steel core and a jacket of softer metal, such as copper or nickel or the like, and to provide such core with a continuous one piece imperforate jacket in intimate contact with every point on the surface of the core.

Another object of the invention consists in providing a core with a jacket consisting of one piece of metal with which the rear end of the jacket about the rear end of the core is continuous metallically and imperforate and in which the pointed end of the core is provided with a line of cleavage or pipe in front of the penetrating point of the core.

Another object of the invention consists in an improved method of applying a jacket to a core and more particularly in applying a jacket having a rear closed end to a core and in intimate contact with every point on the surface of the core.

Other objects of the invention will appear from the following description taken in connection with the drawing in which—

Fig. 1 shows a cup or blank from which the jacket is made;

Fig. 2 shows in longitudinal section a blank after it has been reduced on a mandrel to the diameter of the core and to conform to the shape of the boat tail end of the core;

Fig. 3 shows the core inserted in the jacket;

Fig. 4 shows the core and jacket about to be pushed through a die to seat the boat tail end of the core against the end of the jacket and to compress the walls of the jacket into intimate contact with the surface of the body of the core;

Fig. 5 shows the core and jacket after they have been pushed through the die in Fig. 4;

Fig. 6 shows the jacket after it has been closed about the penetrating point of the core by a metal flowing operation; and

Fig. 7 shows the jacketed core forced through a qualitying die.

In Fig. 1 is shown a cup or jacket blank 10 of copper or other suitable soft metal which is preferably made by any well known drawing operation and which is of larger interior diameter than that of the core of steel or other suitable metal to be jacketed and which is of such length and of such wall thickness as to provide sufficient material so that a part of the wall may be thickened to fit the boat tail end of the core and the length of the blank may be increased to provide sufficient metal to close the open end of the jacket about the penetrating point of the core and to provide for the proper contour of the point of the jacket.

As disclosed in Fig. 2 the cup disclosed in Fig. 1 is placed over a mandrel 11 of the same diameter as that of the body of the core and is provided with a frusto-conical end as indicated at 13 of the same shape and diameter as the frusto-conical boat tail end 14 of the core. The cup 16 is then reduced in diameter upon the mandrel 11 by a metal flowing operation as by means of radially movable dies to produce the blank 15 disclosed in Fig. 2 whose main body portion has an interior diameter substantially the same as that of the body portion of the core 12 and whose closed end is provided with an interior seat 16 of the same taper and diameter as the boat tail end 14 of the core. In this operation the length of the blank is increased to substantially the length of the core and the wall thickness is decreased as appears from Fig. 2. The open end of the blank 15 is then squared and cut to the length in relation to the core indicated in Fig. 3.

The core is then inserted in the blank 15 with a substantially close fit as indicated in Fig. 3.

The assembled jacket blank and core are then pushed through a die 20 by means of a pusher 21 provided with a conical recess 22 in its end fitting the conical surface of the penetrating point 23 of the core. The end of the pusher 21 is also provided with a cylindrical recess 24 to receive the extreme end 25 of the penetrating point of the core to prevent injury thereto. The die 20 is of such diameter as to construct the jacket blank into intimate contact with the outer surface of the core and cause the boat tail end 14 of the core to seat against the closed end 16 of the jacket blank.

Fig. 4 shows the jacket blank and core at the beginning of this operation and Fig. 5 shows the jacket blank and core at the end of this operation as the jacket blank leaves the die. In this operation the length of the jacket blank 15 is but slightly increased as is apparent by comparing Fig. 5 with Fig. 4.

In the next operation as disclosed in Fig. 6 the open end of the jacket blank is closed about the penetrating point 23 of the core in a metal flowing machine of the type including radially movable dies indicated at 26, 28. These dies move radially inwardly and outwardly, are relatively
rotatable with respect to the jacket blank and flow the metal of the end of the jacket blank about and into intimate contact with the penetrating point of the core to produce the completed jacket shown in Fig. 6. It will be noted that the jacket is provided with a thick wall about the penetrating point of the core as indicated at 31 to provide for the proper contour of the point of the jacket. In the operation of swaging the open end of the jacket blank upon the pointed end of the core, a line of cleavage indicated at 32 extending generally axially of the core is left in the metal of the point of the jacket and when the jacket strikes a body such as armor plate, the penetrating point of the core will spread the point of the jacket apart without necessitating an actual penetration of the metal of the jacket as in the usual construction in which the pointed end of the jacket is the closed end of the jacket made by the usual drawing operation. It will be noted that as the pointed end of the jacket is made by flow-forming it upon the penetrating point of the core it will closely fit the penetrating point of the core and it will not be necessary to use a ball of lead or the like to adapt the point of the jacket to the penetrating point of the core. It will also be noted that every point of the inner wall of the jacket is in intimate contact with the outer face of the core and that there is no opening of any sort through which explosive gas could enter between the jacket and the core which might expand the jacket as it is passing through the rifle or expand the same and distort or rip it after the projectile has left the bore of the rifle which would greatly interfere with the correct travel of the projectile.

As disclosed in Fig. 7 as the last step in this operation the jacketed core is pushed first through a qualifying die 35 by means of a squared end pusher 35 which finally sizes the jacket, insures that the main body of the jacket is in intimate contact with the main body of the core and also squares up the closed end of the jacket as indicated at 37.

The advantages of the invention may be comprehended when it is explained that in constructions now in use the jacket is formed with a pointed end to receive the penetrating point of the core and it is the practice to place a small ball of lead between the penetrating point of the core and the jacket, and then to close the open rear end of the jacket about a disc placed against the rear end of the core so as to prevent gases of explosion from entering the jacket. This operation of closing the rear end of the jacket forces the core farther into the jacket and distorts the ball of lead to fill the space between the penetrating point of the core and the point of the jacket which is difficult to fit when they are not made and assembled as with the old method. It has been found that this old method does not always effect a gas tight engagement of the jacket with the disc and that gases of explosion have entered the jacket and ripped the jacket from the projectile as it left the bore of the gun or rifle which caused the projectile to divert from its normal course. By means of this invention, no gases of explosion can enter the jacket wall as the rear end of the jacket is an integral part of the body of the jacket and moreover there is a close fit of the jacket on the core. If desired a ball of lead can be placed against the point of the projectile and the jacket can be closed over the ball of lead by this method as is obvious.

We claim:

1. The method of jacketing a hard metal core provided with a penetrating point which consists in inserting the tail end of a core into and against the closed end of a soft metal jacket and in closing the open end of the jacket about the penetrating point of the core by a metal flowing operation.

2. The method of jacketing a hard metal core provided with a penetrating point which consists in inserting the tail end of a core into and against the closed end of a soft metal jacket and in closing the open end of the jacket about the penetrating point of the core by a metal flowing operation.

3. The method of jacketing a hard metal core provided with a penetrating point which consists in inserting the tail end of a core into and against the closed end of a soft metal jacket and in closing the open end of the jacket about the penetrating point of the core by a metal working operation.

4. The method of jacketing a hard metal core having a boat tail end and a penetrating point which consists in providing a soft metal jacket having a closed end with a conical inner surface adjacent said closed end conforming to the boat tail end of the core and in closing the open end of the jacket about the penetrating point of the core by a metal working operation.

5. The method of jacketing a hard metal core which consists in inserting the core into a soft metal cup-shaped jacket blank having a rear closed end and in pushing the assembled core and jacket blank through a constricting die to constrict the jacket blank on the core.

6. The method of jacketing a hard metal core provided with a penetrating point which consists in inserting the core into a soft metal cup-shaped jacket blank having a rear closed end and in pushing the assembled core and jacket blank through a constricting die to constrict the jacket blank on the core and in closing the open end of the jacket about the penetrating point of the core by a metal flowing operation.

7. The method of jacketing a hard metal core provided with a penetrating point which consists in inserting the core into a soft metal cup-shaped jacket blank having a rear closed end and in pushing the assembled core and jacket blank through a constricting die to constrict the jacket blank on the core and in closing the open end of the Jacket-blank about the penetrating point of the core by a metal flowing operation, leaving a line of cleavage in the jacket so formed extending axially of the core and the jacket.

8. The method of jacketing a hard metal core provided with a penetrating point which consists in inserting the core into a soft metal cup-shaped jacket blank having a rear closed end and in pushing the assembled core and jacket blank through a constricting die to constrict the jacket blank on the core, in closing the open end of the jacket blank about the penetrating point of the core by a metal flowing operation, and in pushing the jacketed core pointed end first through a qualifying die.

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