A fragmentation projectile having a plurality of telescoping hollow concentric cylinders, each having a scored, failure, grid pattern, forming the shell of the projectile filled with an explosive. The outer cylinders may be manually rotated in the field prior to firing so as to align or misalign the failure grids of one cylinder to another to produce various fragment size and patterns. Mating serrations on the shell base and the cylinders lock the cylinders in the selected position.

5 Claims, 5 Drawing Figures
FIG. 1.

SERRATIONS LOCKING ROTATABLE CYLINDERS TO BASE
FIG. 2.

FIG. 3.
VARIABLE SIZED FRAGMENT EXPLOSIVE PROJECTILE

BACKGROUND OF THE INVENTION

This invention relates generally to fragmentation projectiles and more particularly to a projectile that may be field adjusted to produce various fragmentation size and patterns.

Explosive fragmentation projectiles have been made and used against personnel and light vehicle targets to increase the zone of lethality. Typically the projectile is made of a cylindrical shell of metal having a scored failure grid pattern filled with an explosive which detonates on impact. The explosive force causes the shell to fracture at the failure grids to produce and disperse the individual fragments to the surrounding zone. The size and mass of the fragments determine the velocity and distribution of the fragments, which is fixed by the size of the failure grid pattern at the time of manufacture. However, it is desirable to use small and light fragments having a high velocity and a broad distribution against a personnel target. It is also desirable to use large, massive fragments having high penetration capability against vehicular target. In the past, this selectability has been achieved by provisioning the forces with a variety of projectiles having difference size and mass fragmentation capability. But this obviously leads to logistic problems of inventory, shipment, handling and storage.

A suggested solution to the logistics problem would be to supply projectiles having a plurality of different size failure grid patterns to produce various sized fragments from the one shell. But the use of this type of projectile is inefficient against both types of targets mentioned.

Another suggestion found in the prior art is to make a projectile having two telescoping concentric cylinders each having fracture grid patterns of the same size that may be superimposed or not at the time of manufacture. The two orientations produce difference sized fragments having different speed and trajectory. But again there is the logistics problem, because the projectile must be selected in the field for the intended target.

SUMMARY OF THE INVENTION

Accordingly an object of the present invention is to provide a new and improved fragmentation projectile.

Another object of the instant invention is to provide a fragmentation projectile having selectable fragment size capability.

A further object of the present invention is to provide a fragmentation projectile capable of field adjustment for fragment size.

Still another object of the instant invention is to provide a single fragmentation projectile for efficient use against various type targets.

A still further object of the present invention is to provide a fragmentation projectile for use against various targets and presents minimal logistics problems.

Briefly, these and other objects of the present invention are attained by the use of a fragmentation projectile comprising at least two hollow concentric cylinders, each having a failure grid pattern, telescoped together to form a shell that is connected to a projectile base. Serrations formed around one edge of each cylinder mate with corresponding serrations formed on the base of the projectile. Releasable securing means permit relative rotation of the cylinders to align or misalign the failure grid pattern and preclude further relative rotation to the base when secured.

BRIEF DESCRIPTION OF THE DRAWING

A more complete understanding of the invention and many of the attendant advantages thereof will be readily appreciated as the same become better understood by reference to the following detailed description when considered in connection with the accompanying drawings, wherein:

FIG. 1 is a pictorial view, partially cut away, of the projectile of the instant invention;

FIG. 2 is a cross-sectional view of the projectile having three cylinders with their failure grids in alignment before and after detonation;

FIG. 3 is a plan view from the inside of the cylinders showing the failure grids in perfect alignment;

FIG. 4 is a cross-sectional view of the projectile showing the three cylinders with their failure grids out of alignment, before and after detonation; and

FIG. 5 is a plan view from the inside of the cylinders showing the failure grids out of alignment.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings, wherein like reference numerals designate corresponding parts throughout the several views there is shown generally in FIG. 1 a fragmentation projectile 10 having an ogive nose 12 carrying a fuze 14. The ogive nose 12 is affixed to one end of an inner cylinder 16, the other end of which is affixed to a base 18. An explosive 20 fills the interior of the nose, inner cylinder, and base.

Surrounding the inner cylinder 16, is a first movable cylinder 22 fitting the inner cylinder snugly but rotatably. The top edge is contoured to smoothly conform to the ogive nose 12, and the bottom edge has serrations 24 all around. Surrounding the first movable cylinder 22 is a second movable cylinder 26, fitting the first cylinder snugly but rotatably. The top edge is also contoured to smoothly conform to the ogive nose and the bottom edge has serrations 28 all around. The base 18 of the projectile 10 has serrations 30 around its top edge outside the inner cylinder 16. A headless set screw 32, having an "Allen" socket or the like, is threadably engaged in the first movable cylinder 22, thus permitting it to be lifted out of engagement with the serration 24 and 30, rotated, and subsequently locked by the set screw to the inner cylinder 16. The second movable cylinder 26 also has a similar set screw 34 threadably engaged therein and an access slot 36 formed over the set screw 32 in the first movable cylinder 22. Thus, access may be gained to set screw 32 and set screw 34 may be set up against the first movable cylinder after the second movable cylinder is lifted out of engagement with the serrations 28 and 30 and rotation adjustment has been completed.

Referring now to FIGS. 2 and 3, in regard to the operation of the fragmentation projectile, a plurality of "V" grooves, arranged to form a diamond-shaped failure grid pattern 38 are scored, rolled, molded, electrochemically machined, or otherwise formed in any well-known manner in the inside surface of each of the cylinders 16, 22, and 26. As shown in FIGS. 2 and 3, these
failure grid patterns 38 are aligned radially from the inner cylinder 16 to the first movable cylinder 22 and the second movable cylinder 26. Immediately after detonation all the cylinders are shown ruptured at the failure grid into substantial equal sized fragments. This aligned arrangement produces the least number of fragments of the largest size.

Referring now to FIGS. 4 and 5, further showing the operation of the fragmentation projectile, failure grid patterns 38 are misaligned from one cylinder to another by one-third the grid pattern interval, the maximum possible misalignment. Immediately after detonation the inner cylinder 16 is shown ruptured at the failure grid 38. The first movable cylinder 22 is shown ruptured randomly over the inner cylinder's failure grid as well as at its own failure grid. The second movable cylinder 26 is shown ruptured randomly over both the inner and first movable cylinder failure grid as well as at its own failure grid. The relative number of fragments from cylinder to cylinder can be shown by the ratio 1:4:9, and thus this arrangement produces the most number of the smallest fragments.

Obviously many modifications and variations of the present invention are possible in light of the above teachings. For example only two movable cylinders or more than three may be used. The failure grid pattern may be of different size from cylinder to cylinder, and vary in the same cylinder. Further, other methods of locking the movable cylinders may be used. It is therefore to be understood that within the scope of the appended claims, the invention may be practiced otherwise than specifically described.

What is claimed as new and desired to be secured by letters Patent of the United States is:

1. A variable-sized fragment explosive projectile comprising:
   a base;
   a hollow inner cylinder having a failure grid pattern
   formed thereon affixed at one end to said base;
   a nose affixed to the other end of said cylinder;
   an explosive filling said cylinder between said base and said nose;
   at least one hollow rotatable cylinder having a failure grid pattern formed thereon concentric with said inner cylinder, whereby said rotatable cylinder may be rotated relative to said inner cylinder to place said failure grid patterns in alignment or misalignment; and
   means for locking said rotatable cylinder against relative movement to said inner cylinder.

2. The variable-sized fragment explosive projectile of claim 1, wherein said locking means comprises:
   a set of serrations on said base; and
   a serrated edge on the base end of said rotatable cylinder coacting with said set of serrations on said base.

3. The variable-sized fragment explosive projectile of claim 2, wherein said locking means further comprises:
   a set screw threadably engaged in said rotatable cylinder and contactable with said inner cylinder for maintaining said coacting serrations in releasable contact.

4. The variable-sized fragment explosive projectile of claim 3 further comprising:
   a second hollow rotatable cylinder having a failure grid pattern formed thereon concentric with said at least one rotatable cylinder; and
   means for locking said second rotatable cylinder against relative movement to said at least one rotatable cylinder and said inner cylinder.

5. The variable-sized fragment explosive projectile of claim 4 further comprising an opening in said second rotatable cylinder to provide access to said set screw.

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