A cable cutter assembly which includes a support, a pair of blocks wherein each of the blocks has a cutting edge, and means mounting the pair of blocks on the support for slidable reciprocatory movement between a spaced apart position to a closed position which cuts a cable between the cutting edges. Each of the blocks has a curved surface opposite the respective cutting edge so that the cable can extend smoothly thereabout. The cable can be disposed within the cutter assembly in an S shape so that when a predetermined strain is taken on the cable the cutting edges of the blocks will sever the cable.

10 Claims, 5 Drawing Figures
CABLE CUTTER ASSEMBLY

STATEMENT OF GOVERNMENT INTEREST

The invention described herein may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

BACKGROUND OF THE INVENTION

Some torpedoes which are launched from a torpedo tube of a submarine have a cable which is connected through the breech door of the tube into the interior spaces of the submarine. This cable passes through a hermetically sealed connector which is usually centrally located in the breech door. When it is desired to fire the torpedo a water plug is inserted into the tube near the breech door for forcing the torpedo from the tube. The cable which is connected to the torpedo is severed at this time by a knife assembly or disconnect assembly which is a part of the rear portion of the torpedo. On occasion this knife or disconnect assembly has not operated properly and has caused an undue strain to be taken on the cable which is connected to the breech door. When this occurs, the hermetically sealed connector in the breech door is damaged and can allow seawater to penetrate the interior spaces of the submarine. This problem has identified a need for a failsafe device which will ensure severing of the cable when the cable cutter on the torpedo is not functioning properly.

Another function of the torpedo tube is to launch surveillance or detection devices, mines, or small torpedoes. Many of these devices are electrically connected by a cable which is connected to a launcher installed within the torpedo tube. An additional electrical cable attaches the launcher to the breech door of the torpedo tube. Since these devices normally have a diameter which is smaller than the diameter of the torpedo tube the self-contained launcher assembly is utilized within the tube to support the device and ensure guidance of the device from the torpedo tube. Upon leaving the tube it is necessary that the cable connected between the device and the launcher, or the breech door be severed so as to protect the hermetic seal of the device and the hermetic seal of the connector at the breech door. Accordingly, the use of any of these devices identifies the need for a cable cutter which will not cut the cable during ordinary handling of the device, or its launcher, but yet will cut the cable when a predetermined strain has been taken upon launching so as to prevent any damage to the submarine tube or to the hermetically sealed connector centrally located within the breech door of the torpedo tube.

SUMMARY OF THE INVENTION

The present invention has provided a reliable and efficient cutter assembly for a cable when a predetermined strain is applied to the cable. This has been accomplished by providing a support, a pair of blocks wherein each block has a cutting edge, and means mounting the pair of blocks on the support for slidable reciprocatory movement between a spaced apart position to a closed position which cuts the cable between the cutting edges. Each of the blocks has a curved surface opposite the respective cutting edge so that the cable can extend smoothly thereabout. This enables the cable to be disposed within the assembly in a generally S-shape so that when a predetermined strain is taken on the cable the cable is severed at the cutting edges of the blocks.

In order to prevent cutting of any of the cable prior to reaching the predetermined strain shear pins can be utilized for connecting each of the blocks to the support. In this manner, no cutting of the cable will take place until the pins are sheared at the predetermined design strain load for the cutting operation. The cutter is made reusable by repositioning cutter blocks, replacing shear pins (if desired), installing another cable, and rescoring the supports. It should be understood that the invention will have many commercial uses for severing a cable when the loading of the cable has exceeded a predetermined safe loading of any supporting structure. The invention acts like a fuse to ensure that overloading does not take place. Further, it should be understood that by omitting the shear pins the invention can be utilized generally as a cable cutter.

OBJECT OF THE INVENTION

An object of the invention is to overcome the aforementioned problems involved with launching devices from a torpedo tube.

Another object is to provide a reliable and efficient device for cutting a cable.

Another object is to provide an assembly which will cut a cable only after a predetermined strain has been taken on the cable.

These and other objects of the invention will become more readily apparent from the drawings when taken with the ensuing specification.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a cross-sectional side view of a torpedo tube with a small torpedo and launcher assembly disposed therein.

FIG. 2 is a top view of the cable cutter assembly with the cable removed and various portions cut away to illustrate the details thereof.

FIG. 3 is a view taken along plane III-III of FIG. 2. FIG. 4 is a top view of the cutter assembly with the top plate removed so as to show the positioning of the cable within the assembly prior to any cutting operation.

FIG. 5 is a top view of the cable cutter assembly with the top plate removed so as to show the cutting operation of the cable disposed therein.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings wherein like reference numerals designate like or similar parts throughout the several views there is illustrated in FIG. 1 a small torpedo 10 and a launching assembly 12 which are disposed within a torpedo tube 14. The torpedo tube 14 has a muzzle door 16 and a breech door 18. The breech door 18 opens into the interior spaces within the submarine (not shown), and the muzzle door opens for launching the torpedo into the ambient environment. The launcher assembly 12 is utilized for supporting and guiding the torpedo 10 during launch since the launching of a projectile 10 has a diameter which is considerably smaller than the interior diameter of the torpedo tube 14.

Power to the torpedo 10 and checkout leads are connected to the torpedo by multi-wire cable portions 20 and 21 which extend from an aft end portion of the tor-
A pedo 10 to a hermetically sealed connector 22 which is centrally located in the breech door 18. Cable portion 20 is located within the launcher assembly 12 and cable portion 21 extends aft thereof within the torpedo tube 14. The cable portion 21 has a degree of slack between the launcher assembly 12 and the breech door 18 so that the door can be opened and closed without taking any strain on the cable.

When the torpedo is fired the cable portion 20 must be severed so that the torpedo is released from the launcher assembly 12. This is accomplished by the cable cutter assembly 24 of the present invention which is mounted to the cable portion 20 and which will sever that cable portion when a predetermined strain has been applied thereto. Further, a cable cutter assembly 24 is mounted to the cable portion 21 to serve the function of severing that cable portion when the entire launcher framework 12 and torpedo 10 must be jettisoned, such as for an emergency requirement to insert and launch a full sized torpedo from the torpedo tube 14. The jettisoning operation is accomplished by inserting a slug of water rearwardly of the connector 22 which is not shown in the drawing. The launcher framework 12 enables the high water pressure rearwardly thereof to push the entire assembly out of the torpedo tube. When this occurs the strain on the cable portion 21 causes the cable to be severed by the cable cutter assembly 24. It should be understood that the cable can be utilized for other devices than the small torpedo 10, or the launcher 12. Full sized torpedoes, mines, and surveillance or detection devices also require electrical power and are connected by a cable similar to cable 21 through the breech door 18.

FIGS. 2 and 3 illustrate the details of the cable cutter assembly 24. The cable cutter assembly 24 includes a support which may consist of top and bottom plates 28 and 30 which are spaced apart by elongated side plates 32 and 34 so that a light squeeze is applied to the cable therebetween. These plates may be joined together by pins 36 which are fitted through the plates to make a rigid and accurate connection. Located between the plates 28 and 30 are a pair of blocks 38 and 40. Each of the blocks may be a plate which has a thickness substantially equal to, or slightly less than, the space between the plates 28 and 30 and may be shaped so as to provide a cutting edge 42 and 44 respectively. Each of the blocks is provided with a curved surface 45 and 46 which is rounded approximately 180° opposite the respective cutting edge 42 and 44. The curved surfaces 45 and 46 of the blocks 38 and 40 enable a cable to be smoothly extended therearound.

Means are provided for mounting the pair of blocks 38 and 40 between the plates 28 and 30 for slidable reciprocatory movement between a spaced apart position, as illustrated in FIG. 4, to a closed cutting position, as illustrated in FIG. 5. This slidable reciprocatory movement means may include each of the support plates 28 and 30 having a pair of spaced apart parallel slots 47 and 48 respectively, and pins 50 which extend from the blocks 38 and 40 and slidably extend into the parallel slots 47 and 48. The slots 47 and 48 are all parallel with respect to one another, and are preferably parallel to the elongated edge plates 32 and 34. It should be understood that the slots 47 and 48, and the pins 50 are only exemplary since alternatively the blocks could be provided with small projections which slide within elongated parallel recesses on the inside surfaces of the plates 28 and 30. The slots 47 and 48 and the pins 50 align the blocks 38 and 40 so that their cutting edges are aligned substantially coextensive with a common plane for ensuring a complete severing of the cable 20 or 21 during the cutting operation.

The apparatus as described up to this point could be utilized for simply cutting a cable when the cable is inserted around the blocks 38 and 40 and between the cutting edges 42 and 44 as illustrated in FIG. 4. The cutting operation would be implemented simply by taking the required strain on the cable until the cable is severed between the cutting edges. However, many applications require that the blocks 38 and 40 be restrained and that no cutting operation take place until a predetermined strain on the cable has been exceeded. This is the function which is envisioned for the operation of the torpedo 10, and the launcher 12 in FIG. 1 which requires that the cable 20 or 21 not be cut by the cutter 24 during normal handling and loading operations. This is accomplished by providing shear pins 52 and 54 which connect the blocks 38 and 40 respectively to each support plate, or to one of the support plates, such as the top support plate 28. These pins may be constructed of soft metal or elastomeric material, such as Delrin, so that they will shear at a desired load on the cable 20. When these pins 52 and 54 are sheared, the blocks 38 and 40 are free for closure to sever the cable.

It is desirable that the cable 20 or 21 be guided into an S-shape as illustrated in FIG. 4 for proper retention and severing of the cable. This may be accomplished by means which are mounted between the plates 28 and 30 for guiding the cable 20 or 21 approximately 180° about the curved portion 45 of the block 38, thence between the cutting edges 42 and 44 and then approximately 180° about the curved portion 46 of the other block 40. The guide means includes the elongated side plates 32 and 34 which generally retains the cable 20 between the plates 28 and 30. The guide means may further include sleeves 55 around a pair of pins 56 and 58 which are mounted between the support plates 28 and 30 in a spaced relationship from the rounded portion 45 of the block 38 for guiding the cable 20 or 21 180° thereabout, and sleeves 55 around another pair of pins 60 and 62 which are mounted between the support plates in a spaced relationship from the rounded portion 46 of the other block 40 for guiding the cable 20 or 21 180° thereabout. With this arrangement the cable may be placed in a snug S-shape about the blocks 38 and 40 so that the cable 20 or 21 is sufficiently contained and severed during the cutting operation.

In order to retain and reuse the cutting assembly 24 after the severing of the cable 21 a wire rope 64 may be utilized for connecting the assembly to the interior surface of the breech door 18. The wire rope 64 may be connected to the cutter assembly 24 by a bolt 66 which extends through both of the plates 28 and 30. A similar wire rope (not shown) may connect the other cutting assembly 24 to the launcher assembly 12.

OPERATION OF THE INVENTION

In the operation of the invention the top plate 28 is removed from the cutter assembly 24, as illustrated in FIG. 4, and the blocks 38 and 40 are positioned as illustrated in FIG. 4 in a spaced apart position by the shear pins 52 and 54. The cables 20 and 21 are then inserted in a generally S-shape about the blocks 38 and 40 of
each cutter assembly 24 with an intermediate portion of the cable disposed between the cutting edges 42 and 44. In this manner, the cable enters the cutter assembly from one direction and exits the assembly from the opposite direction. After the cable is in position the top plate 28 is reassembled to the cutter assembly. The cable can now be handled in a normal manner without any cutting of the cable taking place. When the torpedo 10 is fired, or should it become necessary to jettison the launcher framework 12 along with the torpedo, a high strain will be exerted on the cable portions 20 or 21 which will exceed the shear strength of the pins 52 and 54. This causes the pins 52 and 54 to be sheared and the strain on the cable to pull the blocks 38 and 40 toward one another to cut and sever the cable 20.

Obviously, many modifications and variations of the present invention are possible in the light of the above teachings, and, it is therefore to be understood that within the scope of the disclosed inventive concept, the invention may be practiced otherwise than as specifically described.

1 claim:
1. A cable cutter assembly comprising:
a support;
a pair of blocks, each of said blocks having a cutting 25 edge at a foremost end of the block;
each of said blocks having a curved surface at an opposite end of the block from the cutting edge with the curve of the curved surface being in a plane which is substantially perpendicular to the respective cutting edge so that the cable can extend smoothly about the curved surface on an end of the block which is opposite from the respective cutting edge;
means mounting the pair of blocks on said support 35 for individual slidable reciprocatory movement with the entire cutting edges located substantially coextensively in a single plane in a facing relationship and the curved surfaces facing in substantially diametrically opposite directions with respect to another; and
the slidable reciprocatory movement being from an open spaced apart position of the cutting edges to a closed cutting position of the cutting edges so that in the spaced apart position the cable can extend between the cutting edges and in the closed position the cutting edges will cut the cable, whereby upon placing the cable about the curved surfaces and between the cutting edges the cable will be cut when a predetermined loading of the cable has been exceeded.

2. A cable cutter assembly as claimed in claim 1 including:
each of said blocks being a plate; and

5 each curved surface extending substantially 180° about the respective end of the block.

3. A cable cutter assembly as claimed in claim 1 including:
means mounted to the support for guiding the cable approximately 180° about the curved surface of one of the blocks, between the cutting edges of the blocks, and then approximately 180° about the curved surface of the other of said blocks.

4. A cable cutter assembly as claimed in claim 3 including:
a shear pin connecting each respective block to said support.

5. A cable cutter assembly as claimed in claim 1 including:
the support being a pair of spaced apart plates with the pair of blocks slidably disposed therebetween.

6. A cable cutter assembly as claimed in claim 5 including:
each of said blocks being a plate and being rounded approximately 180° about each respective curved surface.

7. A cable cutter assembly as claimed in claim 6 including:
a shear pin connecting each respective block to said plates.

8. A cable cutter assembly as claimed in claim 7 wherein the slidable reciprocatory movement means includes:
each of said support plates having a pair of spaced apart parallel slots; and
pins extending from the blocks into said slots.

9. A cable cutter assembly as claimed in claim 8 wherein the guide means includes:
a pair of elongated plates mounted between the support plates on each side of the blocks in a spaced apart parallel relationship to said parallel slots; a pair of pins mounted between the support plates in a spaced relationship from the curved portion of one of the blocks for guiding the cable 180° thereabout; and
another pair of pins mounted between the support plates in a spaced relationship from the curved portion of the other block for guiding the cable 180° thereabout.  

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