

## CHAPTER 10

# MAGNETIC MINESWEEPING

### LEARNING OBJECTIVES

Upon completing this chapter, you should be able to do the following:

1. State the basic principles of magnetic minesweeping.
2. Describe the different types of magnetic minesweeping equipment.
3. Describe the primary sweep configurations, including the basic components associated with each configuration.

### INTRODUCTION

Magnetic minesweeping involves creating a magnetic field in the water at a safe distance astern of a minesweeper strong enough to affect or destroy magnetic influence mines.

Most ships are surrounded by a magnetic field associated with their design and construction. As a ship moves, its magnetic field moves with it, causing a change in the Earth's magnetic field in the vicinity of the ship. Magnetic influence mines are designed to recognize this change in the Earth's magnetic field and to explode at the most appropriate time to damage the ship that produces the change. The mines' firing mechanisms respond to the change in magnetic field either by advancing a counter and exploding at a certain count or by exploding at first contact. Minesweepers counter these mines by generating an electrical current and applying it through insulated electrical cables to create a magnetic field over the mines. This magnetic field is strong enough to "fool" the mines into thinking a

ship is passing overhead and makes them react accordingly.

Magnetic sweeps may be streamed alone or in combination with an acoustic device. This chapter addresses magnetic sweeps only. Combination magnetic/acoustic minesweeping is discussed in chapter 11.

### MAGNETIC MINESWEEPING EQUIPMENT

Unlike other minesweeping gear, the designation of a particular magnetic sweep does not refer to a specific item of equipment. Instead, it refers to a particular combination of basic magnetic minesweeping cable components for use in certain circumstances against certain types of mines.

### MAGNETIC MINESWEEPING CABLE

The magnetic cable currently in service use is the quadded tail (figure 10-1). The quadded tail consists of

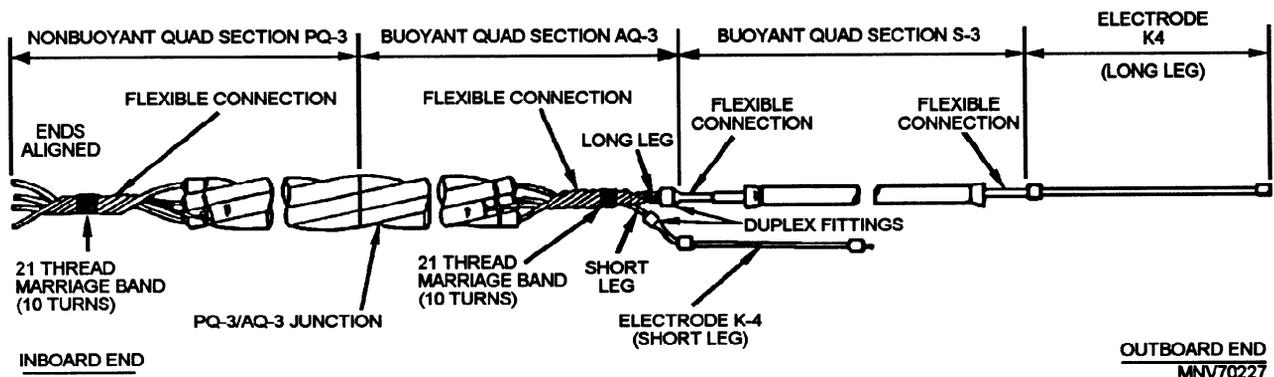


Figure 10-1.—Magnetic quadded tail assembly.

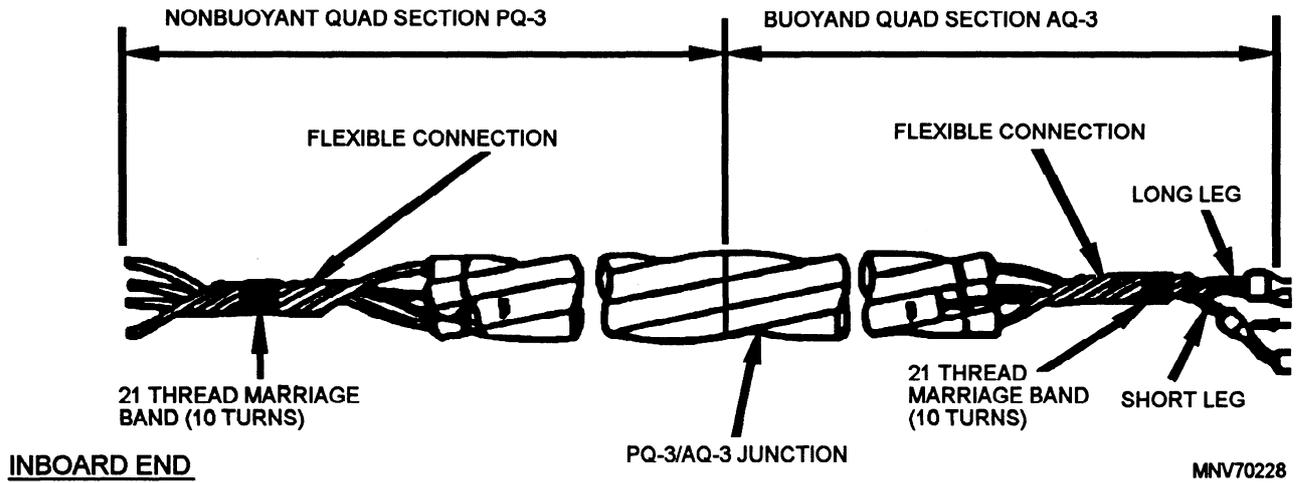


Figure 10-2.—Q-3 cable.

the following five sections, from which the standard M Mk 5(a), M Mk 6(a), and M Mk 6(h) sweeps are configured:

- PQ-3 quad section;
- AQ-3 quad section;
- S-3 section;
- CL-1 and CL-3 cables; and
- K-4 electrode.

### Q-3 Cable

The Q-3 cable (figure 10-2) consists of four insulated aluminum conducting cables wrapped together around a central core to form the quad. Two

diagonally opposite conductors, 3 feet shorter than the remaining two conductors, are connected at their outer ends and form the “short leg” of the Q-3 cable. To this short leg may be connected a K-4 electrode, a CL-1 cable, or a CL-3 cable. The remaining two conductors are connected at their outer ends and form the “long leg” of the Q-3 cable. To this long leg may be attached a 900-foot single section of S-3 cable or a CL-3 cable. These cables may be terminated with either a K-4 electrode or a CL-3 cable.

The Q-3 cable is divided into two sections, the PQ-3 section (air cooled) and the AQ-3 section (water cooled). The junction between the PQ-3 and AQ-3 sections is marked with a band of red rubber, and the cable should be towed so that the red band is in the water at all times.

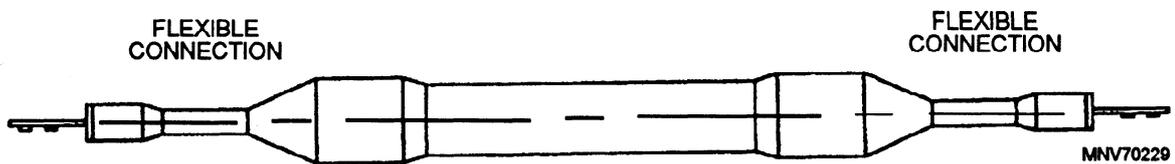


Figure 10-3.—S-3 cable.

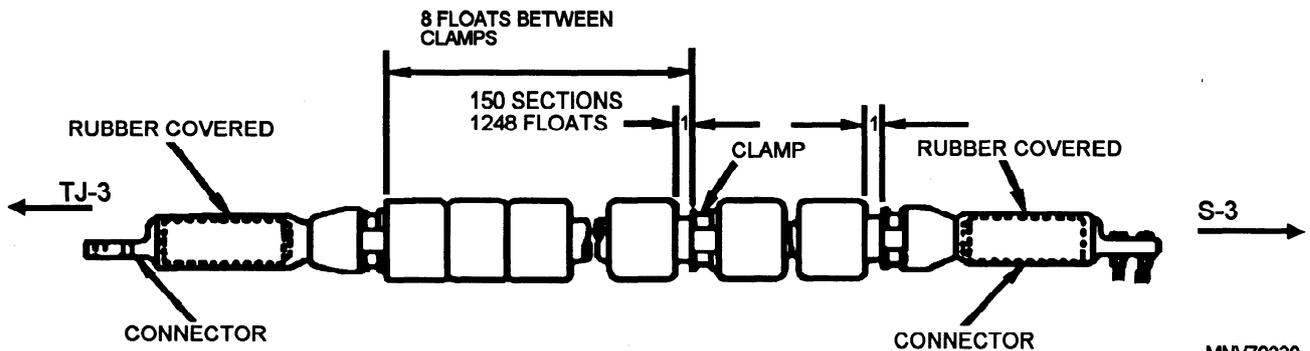


Figure 10-4.—CL-1/CL-3 cable.



Figure 10-5.—K-4 electrode.

### S-3 Cable

The S-3 cable (figure 10-3) is an aluminum single-conductor, buoyant cable terminated at both ends with flexible copper conductors and terminals.

### CL-1 and CL-3 Cables

The CL-1 and CL-3 cables (figure 10-4) consist of one 450-foot length of hard-drawn, rope-stranded aluminum conductor, core-sealed with an asphalt base sealing compound, and jacketed with reinforced synthetic rubber. Buoyancy is provided by shell-type cylindrical plastic floats filled with foamed plastic. The primary difference between the two cables is size. The CL-1 is approximately 1 1/2 inches in diameter; whereas, the CL-3 is approximately 2 1/2 inches in diameter. Either the S-3 or the CL-1 is carried on board MCM ships at all times. If the ship carries the S-3, it will not carry the CL-1 and vice versa.

### K-4 Electrode

The K-4 electrode (figure 10-5) consists of a concentric stranded copper conductor cable covered with cotton tape and seine braid. The K-4 electrode is 150 feet long and is terminated in flat lugs at both ends.

### MAGNETIC SWEEP CONFIGURATIONS

The magnetic field produced by a ship consists of a vertical component and a horizontal component. Each sweep configuration is designed to exploit one or both of those components. Therefore, the sweep configuration to be used depends on which component(s) must be exploited. The paragraphs below illustrate the primary sweep configurations and identify the magnetic component(s) associated with each configuration.

#### STRAIGHT TAIL SWEEP M Mk 5(a)

The M Mk 5(a) sweep (figure 10-6) is effective against vertical component magnetic mines in salt water.

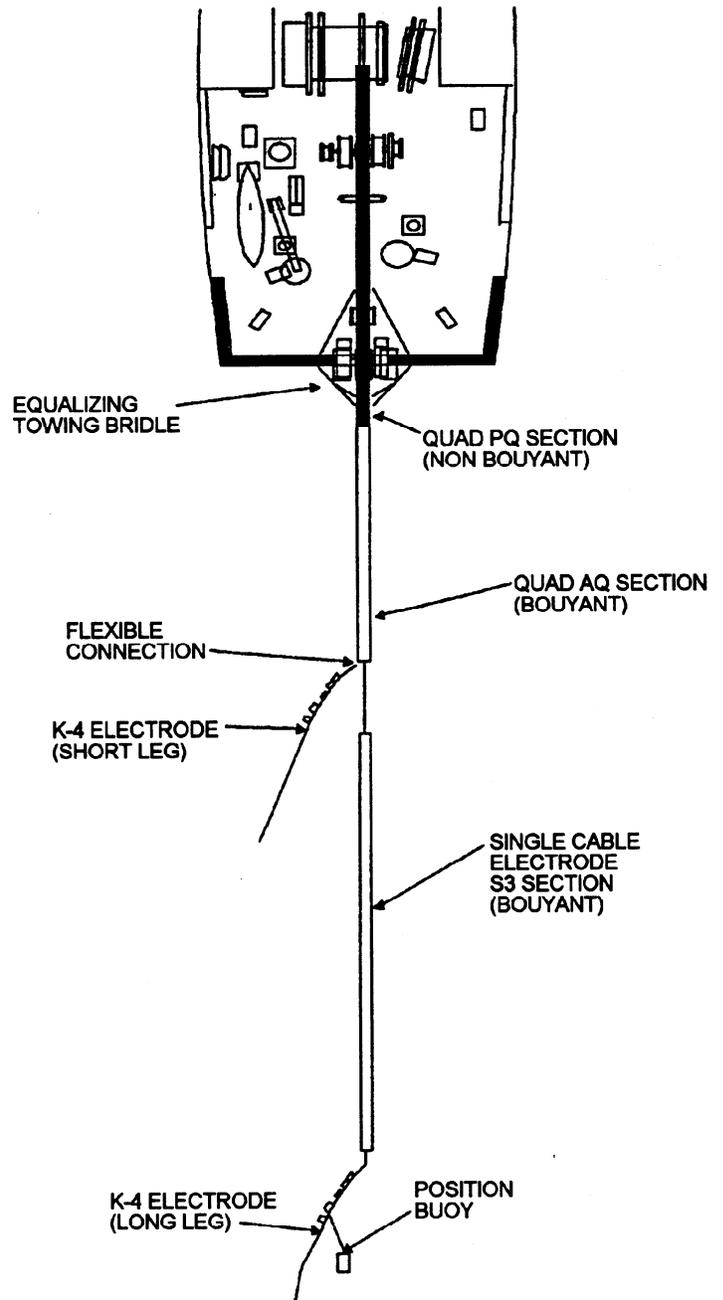


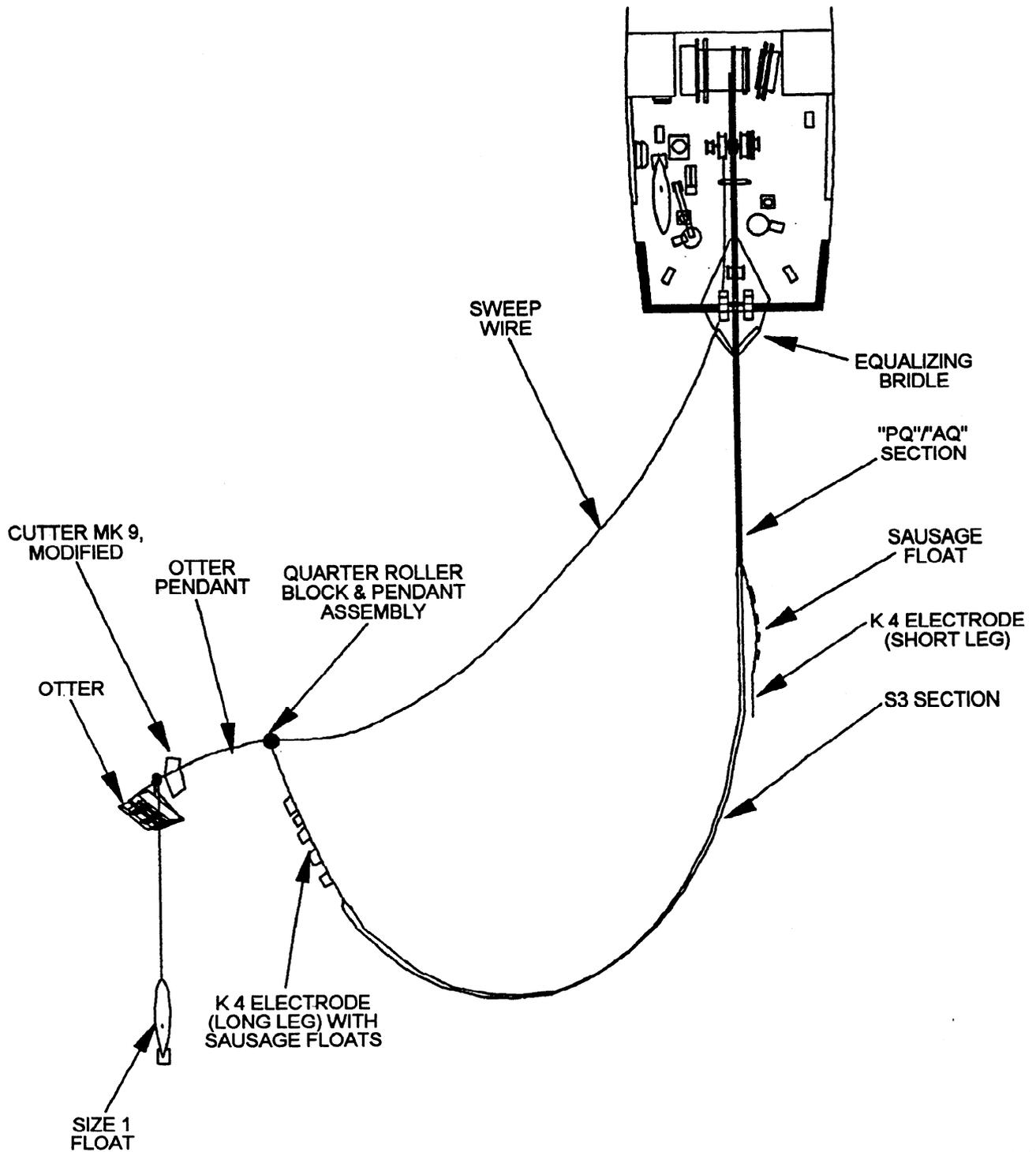
Figure 10-6.—Magnetic sweep cable configuration M Mk 5 (a).

### DIVERTED LOOP M Mk 6(a)

The diverted loop M Mk 6(a) sweep (figure 10-7) is used primarily to sweep horizontal component magnetic mines only in salt water. It is also referred to as a "jig sweep."

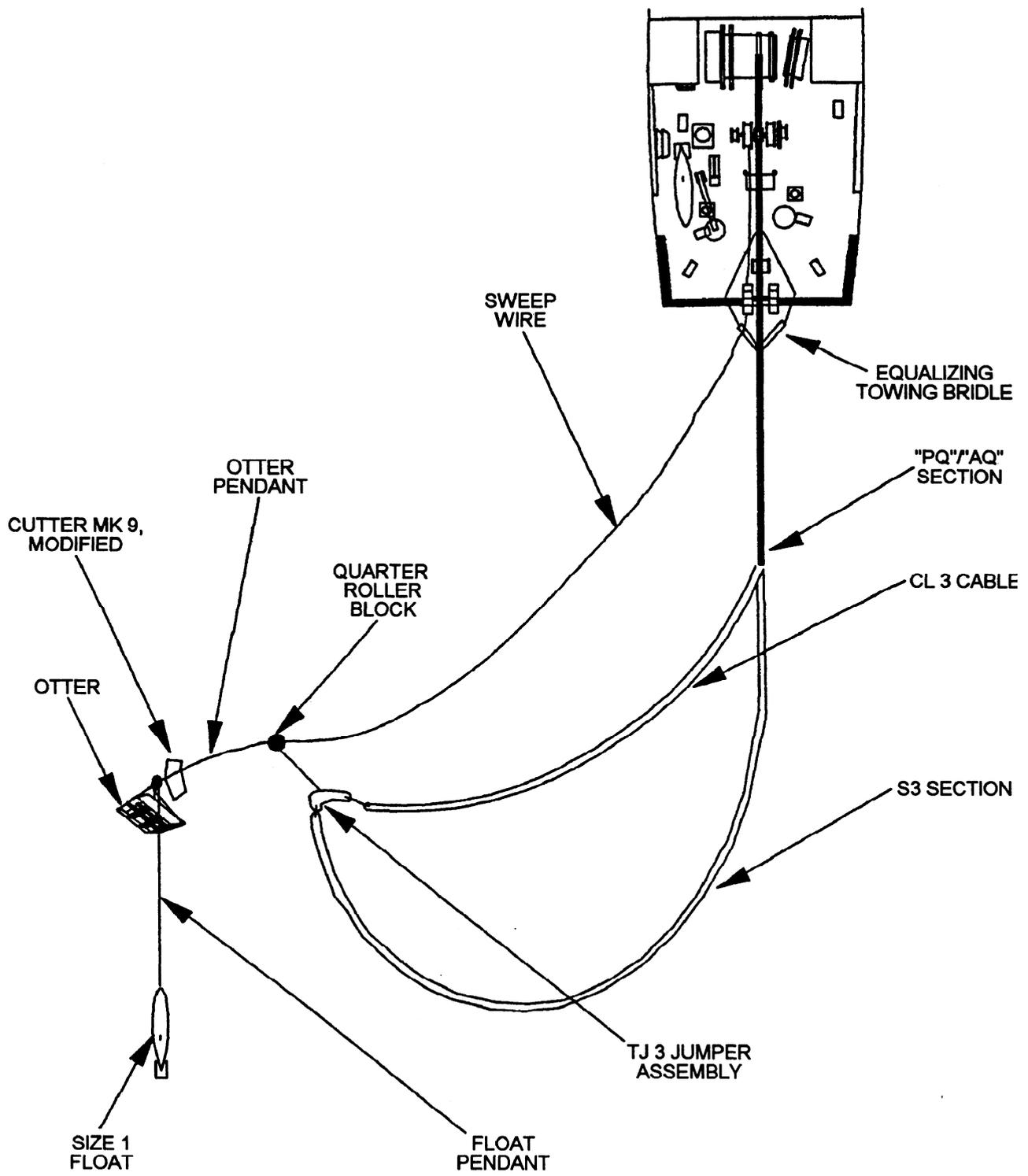
### DIVERTED LOOP M Mk 6(h)

The diverted loop M Mk 6(h) sweep (figure 10-8) is used primarily to sweep horizontal component magnetic mines in fresh or salt water. It is also referred to as a "jig sweep."



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Figure 10-7.—Magnetic sweep cable configuration M Mk 6(a) (diverted loop).



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Figure 10-8.—Magnetic sweep cable configuration M Mk 6(h) (diverted loop).

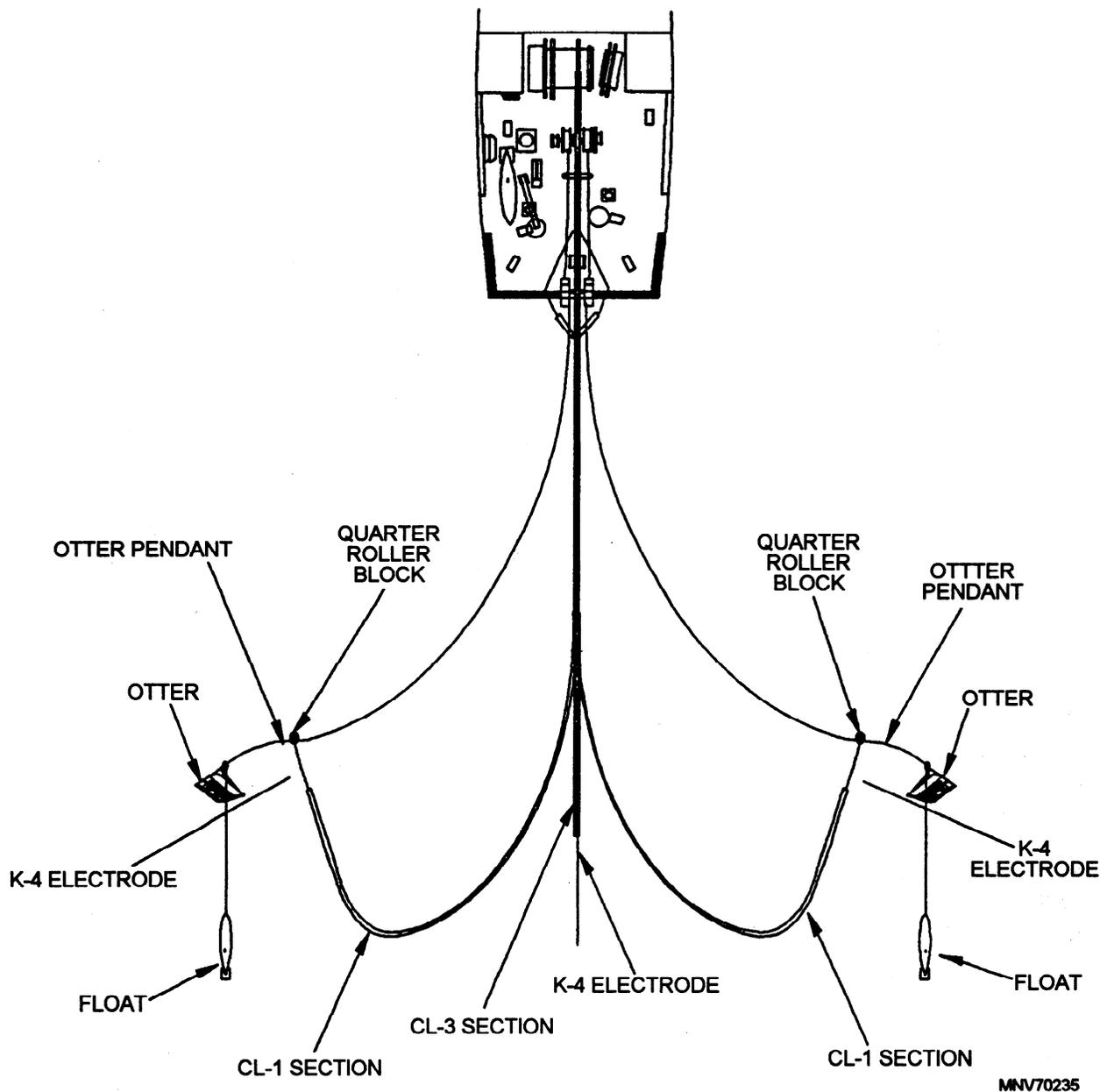


Figure 10-9.—Magnetic sweep cable configuration M Mk 7(b) (double diverted loop).

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### DOUBLE DIVERTED LOOP M Mk 7(b)

The double diverted loop M Mk 7(b) sweep (figure 10-9) is used to sweep both horizontal and vertical component mines in salt water. It is also referred to as an

“S”-type sweep. Use of this configuration requires the MCM to carry four CL-1 cables, each 450 feet long. In this configuration, the S-3 section is removed and replaced by the four CL-1 sections, connected as two CL-1 sections, each 900 feet long.