



NONRESIDENT TRAINING COURSE

November 1994



Mineman, Volume 5 (MN 3 & 2)

NAVEDTRA 14158

Although the words “he,” “him,” and “his” are used sparingly in this course to enhance communication, they are not intended to be gender driven or to affront or discriminate against anyone.

PREFACE

By enrolling in this self-study course, you have demonstrated a desire to improve yourself and the Navy. Remember, however, this self-study course is only one part of the total Navy training program. Practical experience, schools, selected reading, and your desire to succeed are also necessary to successfully round out a fully meaningful training program.

COURSE OVERVIEW: In completing this nonresident training course, you will demonstrate a knowledge of exercise and training mines, including actuation, laying, handling, shop, hunting, and mechanical sweep mines.

THE COURSE: This self-study course is organized into subject matter areas, each containing learning objectives to help you determine what you should learn along with text and illustrations to help you understand the information. The subject matter reflects day-to-day requirements and experiences of personnel in the rating or skill area. It also reflects guidance provided by Enlisted Community Managers (ECMs) and other senior personnel, technical references, instructions, etc., and either the occupational or naval standards, which are listed in the *Manual of Navy Enlisted Manpower Personnel Classifications and Occupational Standards*, NAVPERS 18068.

THE QUESTIONS: The questions that appear in this course are designed to help you understand the material in the text.

VALUE: In completing this course, you will improve your military and professional knowledge. Importantly, it can also help you study for the Navy-wide advancement in rate examination. If you are studying and discover a reference in the text to another publication for further information, look it up.

*1994 Edition Prepared by
MNCM M.D. Femrite*

Published by
NAVAL EDUCATION AND TRAINING
PROFESSIONAL DEVELOPMENT
AND TECHNOLOGY CENTER

NAVSUP Logistics Tracking Number
0504-LP-026-8120

Sailor's Creed

"I am a United States Sailor.

I will support and defend the
Constitution of the United States of
America and I will obey the orders
of those appointed over me.

I represent the fighting spirit of the
Navy and those who have gone
before me to defend freedom and
democracy around the world.

I proudly serve my country's Navy
combat team with honor, courage
and commitment.

I am committed to excellence and
the fair treatment of all."

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SUMMARY OF THE MINEMAN TRAINING SERIES

This series of training manuals was developed to replace the *Mineman 3 & 2* and *Mineman 1 & C* manuals. The content is directed toward personnel working toward advancement in the Mineman rating.

The five volumes in this series are based on major topic areas with which the Mineman should be familiar. Their topics include the following areas:

Volume 1: Mine warfare, operations, and organization.

Volume 2: Mine shop administration and supply.

Volume 3: Mine maintenance and explosive materials.

Volume 4: Mines and mine components.

Volume 5: Exercise and training mines.

INSTRUCTIONS FOR TAKING THE COURSE

ASSIGNMENTS

The text pages that you are to study are listed at the beginning of each assignment. Study these pages carefully before attempting to answer the questions. Pay close attention to tables and illustrations and read the learning objectives. The learning objectives state what you should be able to do after studying the material. Answering the questions correctly helps you accomplish the objectives.

SELECTING YOUR ANSWERS

Read each question carefully, then select the BEST answer. You may refer freely to the text. The answers must be the result of your own work and decisions. You are prohibited from referring to or copying the answers of others and from giving answers to anyone else taking the course.

SUBMITTING YOUR ASSIGNMENTS

To have your assignments graded, you must be enrolled in the course with the Nonresident Training Course Administration Branch at the Naval Education and Training Professional Development and Technology Center (NETPDTC). Following enrollment, there are two ways of having your assignments graded: (1) use the Internet to submit your assignments as you complete them, or (2) send all the assignments at one time by mail to NETPDTC.

Grading on the Internet: Advantages to Internet grading are:

- you may submit your answers as soon as you complete an assignment, and
- you get your results faster; usually by the next working day (approximately 24 hours).

In addition to receiving grade results for each assignment, you will receive course completion confirmation once you have completed all the assignments. To submit your assignment answers via the Internet, go to:

<http://courses.cnet.navy.mil>

Grading by Mail: When you submit answer sheets by mail, send all of your assignments at one time. Do NOT submit individual answer sheets for grading. Mail all of your assignments in an envelope, which you either provide yourself or obtain from your nearest Educational Services Officer (ESO). Submit answer sheets to:

COMMANDING OFFICER
NETPDTC N331
6490 SAUFLEY FIELD ROAD
PENSACOLA FL 32559-5000

Answer Sheets: All courses include one “scannable” answer sheet for each assignment. These answer sheets are preprinted with your SSN, name, assignment number, and course number. Explanations for completing the answer sheets are on the answer sheet.

Do not use answer sheet reproductions: Use only the original answer sheets that we provide—reproductions will not work with our scanning equipment and cannot be processed.

Follow the instructions for marking your answers on the answer sheet. Be sure that blocks 1, 2, and 3 are filled in correctly. This information is necessary for your course to be properly processed and for you to receive credit for your work.

COMPLETION TIME

Courses must be completed within 12 months from the date of enrollment. This includes time required to resubmit failed assignments.

PASS/FAIL ASSIGNMENT PROCEDURES

If your overall course score is 3.2 or higher, you will pass the course and will not be required to resubmit assignments. Once your assignments have been graded you will receive course completion confirmation.

If you receive less than a 3.2 on any assignment and your overall course score is below 3.2, you will be given the opportunity to resubmit failed assignments. **You may resubmit failed assignments only once.** Internet students will receive notification when they have failed an assignment--they may then resubmit failed assignments on the web site. Internet students may view and print results for failed assignments from the web site. Students who submit by mail will receive a failing result letter and a new answer sheet for resubmission of each failed assignment.

COMPLETION CONFIRMATION

After successfully completing this course, you will receive a letter of completion.

ERRATA

Errata are used to correct minor errors or delete obsolete information in a course. Errata may also be used to provide instructions to the student. If a course has an errata, it will be included as the first page(s) after the front cover. Errata for all courses can be accessed and viewed/downloaded at:

<http://www.advancement.cnet.navy.mil>

STUDENT FEEDBACK QUESTIONS

We value your suggestions, questions, and criticisms on our courses. If you would like to communicate with us regarding this course, we encourage you, if possible, to use e-mail. If you write or fax, please use a copy of the Student Comment form that follows this page.

For subject matter questions:

E-mail: n311.products@cnet.navy.mil
Phone: Comm: (850) 452-1548
DSN: 922-1548
FAX: (850) 452-1370
(Do not fax answer sheets.)
Address: COMMANDING OFFICER
NETPDTC N311
6490 SAUFLEY FIELD ROAD
PENSACOLA FL 32509-5237

For enrollment, shipping, grading, or completion letter questions

E-mail: fleetservices@cnet.navy.mil
Phone: Toll Free: 877-264-8583
Comm: (850) 452-1511/1181/1859
DSN: 922-1511/1181/1859
FAX: (850) 452-1370
(Do not fax answer sheets.)
Address: COMMANDING OFFICER
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NAVAL RESERVE RETIREMENT CREDIT

If you are a member of the Naval Reserve, you may earn retirement points for successfully completing this course, if authorized under current directives governing retirement of Naval Reserve personnel. For Naval Reserve retirement, this course is evaluated at 2 points. (Refer to *Administrative Procedures for Naval Reservists on Inactive Duty*, BUPERSINST 1001.39, for more information about retirement points.)

Student Comments

Course Title: Mineman, Volume 5 (MN 3 & 2)

NAVEDTRA: 14158 **Date:** _____

We need some information about you:

Rate/Rank and Name: _____ SSN: _____ Command/Unit _____

Street Address: _____ City: _____ State/FPO: _____ Zip _____

Your comments, suggestions, etc.:

<p>Privacy Act Statement: Under authority of Title 5, USC 301, information regarding your military status is requested in processing your comments and in preparing a reply. This information will not be divulged without written authorization to anyone other than those within DOD for official use in determining performance.</p>
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NETPDTC 1550/41 (Rev 4-00)

CHAPTER 1

INTRODUCTION TO EXERCISE AND TRAINING (ET) MINES

LEARNING OBJECTIVE

Upon completing this chapter, you should be able to describe the Exercise and Training Mine Material Program.

As a Mineman, you will, at some time during your career, work or come in contact with the Exercise and Training Mine Material Program. With today's changing Navy, more and more emphasis is being placed on mine countermeasures and training. This means more mine exercises and more training in the assembly, delivery, and sweeping of mines. This chapter discusses the Exercise and Training Mine Material Program and the responsibilities that go with running the program.

EXERCISE AND TRAINING MINE MATERIAL PROGRAM

The Exercise and Training (ET) Mine Material Program replaces the Non-Service Mine Program. Established to support fleet training in all areas of underwater mine warfare, the ET program is concerned principally with making sure that material is available to fill the exercise and training requirements of the fleet.

ET mines, for the most part, look and act like their service counterparts and provide activities with the means to improve their mine assembly, delivery, and countermeasures capabilities. They use inert-loaded or empty mine cases; however, initiating explosive devices and pyrotechnics are contained in some mines to provide realism in mine delivery or firing simulations and to aid in recovery operations.

PROGRAM RESPONSIBILITIES

The Commander, Mine Warfare Command (COMINEWARCOM) has directed the Commander, Mobile Mine Assembly Group (COMOMAG) to monitor the use of ET assets and to submit a quarterly usage report to the fleet commanders-in-chief to assist in monitoring their non-combat expenditure allocation (NCEA). The NCEA for mines is issued by the Chief of Naval Operations (CNO) annually and is based on fleet requirements and asset availability. To ensure accurate reporting, Mobile Mine Assembly Group (MOMAG) activities supporting ET exercises report their ET mine usage to COMOMAG quarterly.

ET MINE BASIC ALLOWANCE

Exercise and Training (ET) Mine Material Program, OPNAVINST 8550.9, establishes the basic allowances for ET mines. *Information Concerning Mine Warfare Exercise and Training (ET) Material Allowance and Reporting Criteria*, COMOMAG/MOMAGINST 8550.9, expands upon the allowance requirement in OPNAVINST 8550.9 by establishing specific ET allowances for MOMAG activities. With these two instructions, each activity is required to maintain various ET mines and to develop and maintain appropriate stocks of ET material used to support fleet training requirements.

Activities requiring the use of ET mines in support of training requirements must submit a request for the mines, via the appropriate chain of command, to the nearest MOMAG activity that stocks the mines and in accordance with *Procedures for Requesting Mine Warfare Exercise and Training Material and Services*, COMINWARCOMINST 8550.1. MOMAG activities receiving such requests must verify the availability of the requested assets and respond accordingly.

RECORDS AND REPORTS

MOMAG activities involved in ET mine operations are required to maintain records and submit appropriate reports. Several reports, readiness and operational, concerning the available assets or operational performance of ET mines must be submitted by MOMAG activities. The format and reporting requirements for these reports are tailored to the types of mines employed in the mine exercises.

An ET mine case inventory report indicates an activity's capability to support the ET program. This report is submitted in message format and in compliance with COMOMAG/MOMAGINST 8550.9.

A preliminary post-analysis report is required for exercises employing actuation mines and versatile exercise mines (VEMs). The preliminary message report must be submitted by MOMAG activities within 48 hours after the mine recovery phase of an exercise. This report is intended to aid the officer conducting the exercise (OCE) with a quick-look critique of the counter-measures operation/exercise. An exercise operational report for actuation or laying mines is also required in connection with the preliminary post-analysis message report. The contents of the exercise operational report will depend on the type of ET mines used during the exercise. *Mine Warfare Exercise and Training (ET) Post Exercise Reporting*, COMOMAG/MOMAGINST 8550.1, outlines the requirements and procedures for preliminary and operational reports.

Final preparation teams will submit a situation report upon arrival at supporting activities by using enclosure (5) of *Guidance for Personnel Assigned*

in Support of Mine Warfare Exercise and Training (ET) operations, COMOMAG/MOMAGINST 3120.2, only if problems arise that might jeopardize the success of the mission.

Trip reports will be submitted at the completion of an exercise and within 5 days upon return of the observer or the final preparation team. A trip report will provide operational data to the commanding officer or the officer-in-charge and will consist of a summary of events that occurred, problem areas encountered, and corrective actions taken during the operation, as well as general comments and recommendations. Information concerning requirements, procedures, and format of trip reports are contained in COMOMAG/MOMAGINST 3120.2.

IN-WATER RELIABILITY EVALUATION MINE

Another means of evaluating the operational reliability of the service stockpile is the in-water reliability evaluation (IRE) mine. The IRE mine is identical to its service mine counterpart, except that it is assembled with an inert-loaded mine case and a minimum of explosive devices. Special instrumentation such as a sonar transmitter (to ease recovery operations) and a time fire recorder (to record time of actuation) are installed. IRE mines are assembled by using only serviceable (Code A) components, except for the mine case and the arming device. (Explosive-loaded cases may be used for special test purposes.)

ET MINE TYPES

ET mine types are described in chapters 2 and 3 of this volume, with the exception of the Mk 74 Mod 0 versatile exercise mine (VEM). The VEM is used to assess the effectiveness of surface and airborne mine countermeasure systems (sweeping and hunting) and the tactics and techniques employed by those systems. The Mk 74 Mod 0 VEM system is comprised of the versatile exercise mine, a mine actuation indicator, an over-the-side transducer, a mine programmer/analyzer, a data transfer unit, a mine computer program, and special test and support equipment.

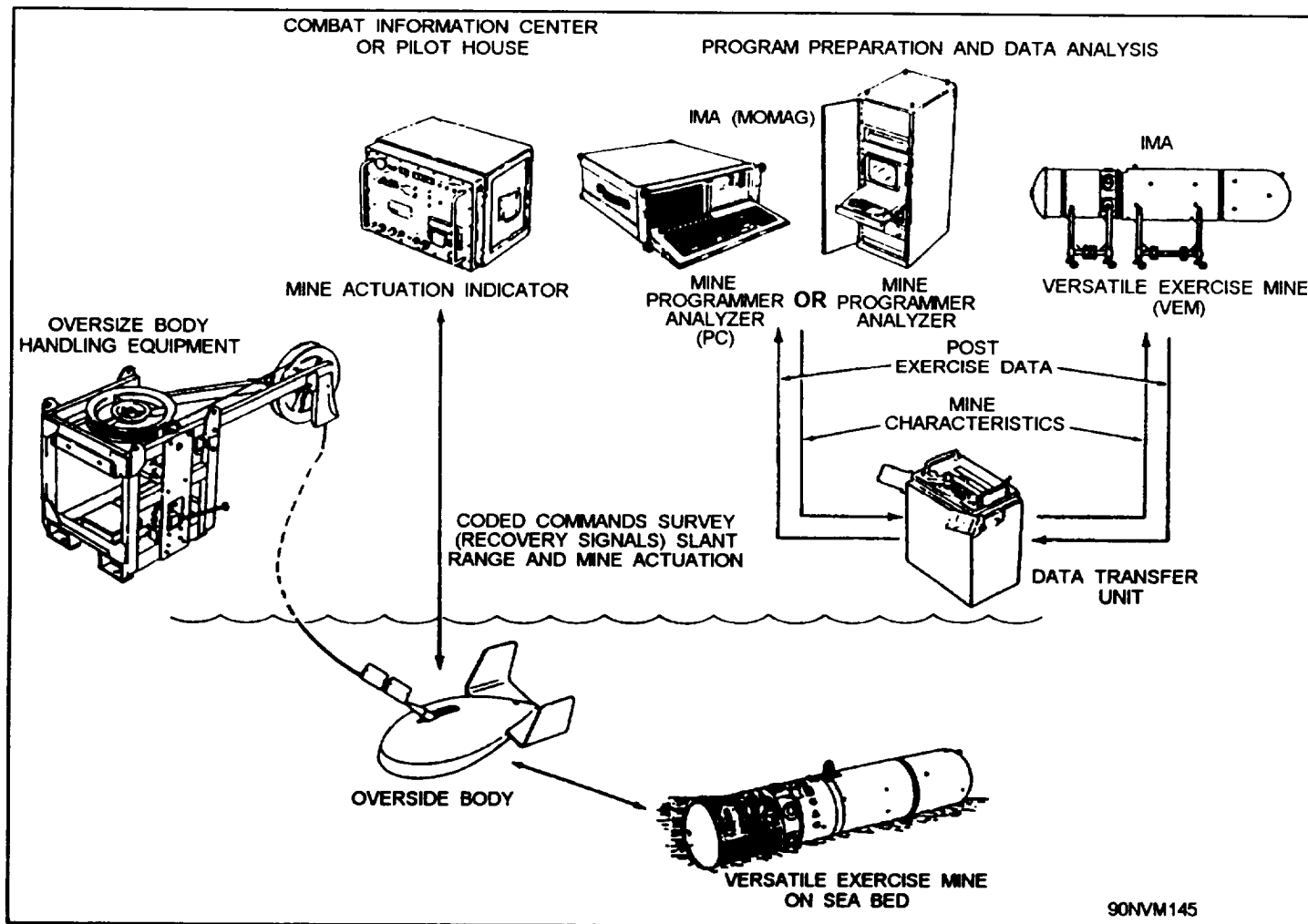


Figure 1-1.—System layout.

The system, shown in figure 1-1, can simulate the actuation system of most known bottom mines. In addition to assessing the effectiveness of mine countermeasures, the Mk 74 Mod 0 VEM can assist in the development of new mine sensors and mine sweeping tactics.

For further information concerning the VEM, refer to *Versatile Exercise Mine Mk 74 Mod 0 (VEM); Description and Maintenance*, NAVSEA SW550-AE-MMI-070; and *Versatile Exercise Mine Mk 74 Mod 0 (VEM), Organizational Level Procedures; Rigging, Deployment, and Recovery*, NAVSEA SW570-FO-MMO-050.

AUTHORIZED CONFIGURATIONS, CONFIGURATION DATA, AND MAINTENANCE

Unlike their service counterparts, ET mines are NOT assembled and stored in various degrees of assembly configurations (A, B, C, E, and F). ET mines may be assembled in one of two configurations: all-up assembly or subassembly.

● **ALL-UP ASSEMBLY:** The term *all-up assembly* is used to designate a completely assembled ET mine. Configuration data for all-up assemblies are contained in the appropriate ET mine

assembly manuals, which list the assembly-level items required for all authorized operational assemblies (OAs).

● **SUBASSEMBLY:** The term *subassembly* is used to designate an ET mine storage and shipping configuration, which commanding officers or officers-in-charge may elect to use at their option.

The maintenance policy for service mines imposes programmed maintenance on assembled mine configurations to ensure mine readiness. The maintenance policy for ET mines imposes maintenance only on assembly-level items to make sure that intermediate mine assembly activities can expeditiously support fleet training requirements.

Unlike service mines, maintenance on ET mine material is performed only when necessary or after an ET mine is recovered. Since MOMAG activities have custody of all ET material, they are responsible for all aspects of maintenance, except maintenance on handling mines.

When an activity other than a MOMAG activity has subcustody of handling mines, that activity is responsible for all minor maintenance of the mines. However, major maintenance or refurbishment must be performed by the MOMAG activity having custody of the mines. Refurbish-merit is the process by which assembly-level items are restored to acceptable operational conditions after they have been used in a mine exercise.

RECOMMENDED READING LIST

NOTE: Although the following references were current when this TRAMAN was published, their continued currency cannot be assured. Therefore, you need to ensure that you are studying the latest revision.

Exercise and Training (ET) Mine Material Program, OPNAVINST 8550.9, Chief of Naval Operations, Washington, D.C., 1989.

Guidance for Personnel Assigned in Support of Mine Warfare Exercise and Training (ET) Operations, COMOMAG/MOMAGINST 3120.2, Mobile Mine Assembly Group, Charleston, S.C., 1987.

Information Concerning Mine Warfare Exercise and Training (ET) Material Allowance and Reporting Criteria, COMOMAG/MOMAGINST 8550.9, Mobile Mine Assembly Group, Charleston S.C., 1994.

Mine Warfare Exercise and Training (ET) Material Maintenance and Refurbishment, COMOMAG/MOMAGINST 8550.14, Mobile Mine Assembly Group, Charleston, S.C., 1993.

Mine Warfare Exercise and Training (ET) Post Exercise Reporting, COMOMAG/MOMAGINST 8550.1, Mobile Mine Assembly Group, Charleston, S.C., 1988.

Procedures for Requesting Mine Warfare Exercise and Training Material and Services, COMINEWARCOM-INST 8550.1, Mine Warfare Command, Corpus Christi, Tex., 1992.

Versatile Exercise Mine Mk 74 Mod 0 (VEM), Description and Maintenance, NAVSEA SW550-AE-MMI-070, Naval Sea Systems Command, Washington, D.C., 1993.

Versatile Exercise Mine Mk 74 Mod 0 (VEM), Organizational Level Procedures Rigging, Deployment, and Recovery, NAVSEA SW570-FO-MMO-050, Naval Sea Systems Command, Washington, D.C., 1990.

CHAPTER 2

ACTUATION MINES

LEARNING OBJECTIVES

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

1. Describe the Mk 52 and Mk 55 actuation mines.
2. Describe the detection system employed in the actuation mines.
3. Describe the different operational assemblies of the Mk 52 and Mk 55 actuation mines.
4. Identify the proper planting depths for the Mk 52 and Mk 55 actuation mines.
5. Describe the operational description of the Mk 52 and Mk 55 actuation mines.
6. Describe the various mine components used to assemble the Mk 52 and Mk 55 actuation mines.

Exercise and training (ET) mines, for the most part, look and act like their service counterparts. ET mines provide activities with the means to improve their mine assembly, delivery, and countermeasures capabilities. Actuation mines are one type of ET mines, used primarily to support the total weapon concept training in exercises and in war games at sea.

ACTUATION MINE TYPES

Actuation mines are reusable configurations that are used primarily for training exercises, using an inert-loaded mine case and small explosive devices and/or pyrotechnics that are contained in the mines to provide a realism in mine delivery, for firing simulation, and as an aid in recovery operations. They provide target response characteristics identical to those of service mines of equal Mark and Mod.

Designed for testing mine countermeasures equipment and for training countermeasures personnel, actuation mines contain sensing and actuation systems identical to those in service mines but which, instead of exploding the mine, operate accessories that provide for visual indication of mine actuation, and for self-locating and recovery without recourse to divers. The different types of actuation mines are discussed in this section.

FLIGHT ACTUATION MINE

The flight actuation mine is identical to the air-laid service mines of like Mark and Mod with the additional externally attached float. The mine consists of an inert-loaded standard mine case containing service mine detection components, firing assemblies, and safety devices. The float releases a smoke signal when actuated and surfaces itself at a

preset time to allow mine location and recovery. Actuation mines use a sonar transmitter to aid in the location for recovery.

NONFLIGHT ACTUATION MINE

The nonflight actuation mine is identical to the flight actuation mine except that it does not use flight gear and is planted by surface craft.

MK 52 MODS 2 AND 5 ACTUATION MINES

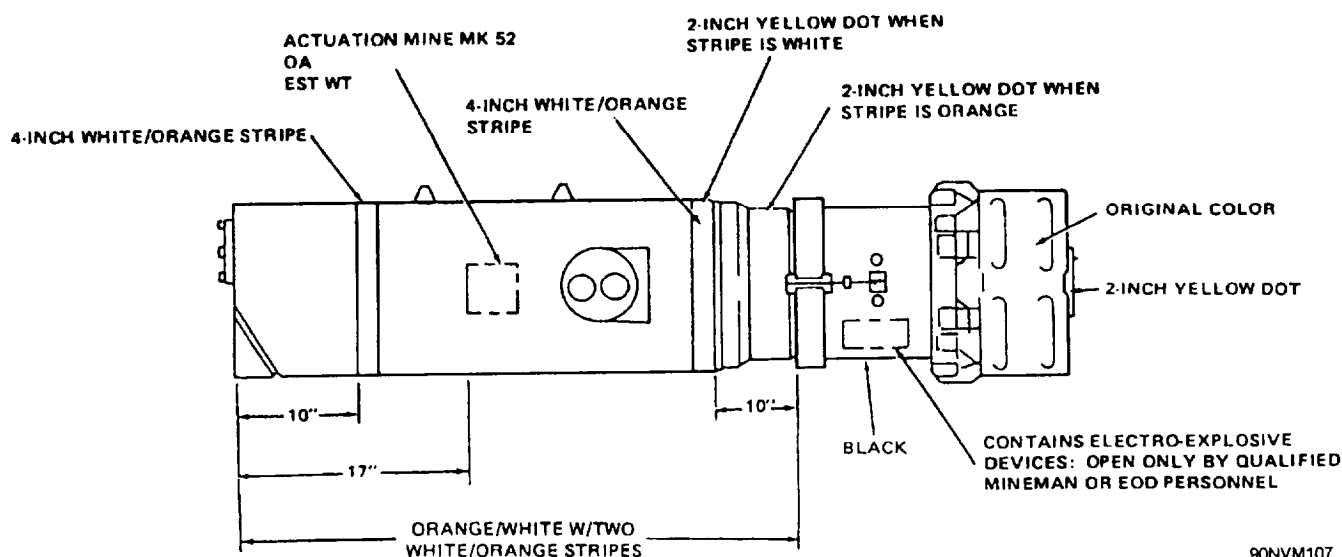
Mk 52 Mods 2 and 5 actuation mines, shown in figure 2-1, are 1,000-pound, aircraft-laid, bottom, inert-loaded mines. Each Mod employs one or more detectors that respond to acoustic or magnetic influence fields of a passing ship. The Mk 52 Mod 2 mine employs a magnetic detection system, and the Mk 52 Mod 5 employs a combination of acoustic/magnetic detection systems.

The same structural, planting, arming, and detonating components are used in each Mod, with the

basic difference among Mods being the type of detector or the combination of detectors used.

The mine consists of an inert-loaded mine case, tiring assembly and safety devices, and an external drill section attached to the tail of the mine case. The mine case is loaded with cement or a similar inert substance in place of the service mine's explosive main charge and does not incorporate explosives in the arming device.

Instead, the firing current (which initiates such explosives in the service mine) in the actuation mine actuates a pyrotechnic signal that surfaces to indicate mine actuation. The tail cover of the mine provides a watertight passage for the electric cable that carries the firing current that ejects the signal. A float shield on the tail of the mine houses a drill float that contains the signal. At a preset time, the float itself is freed to rise to the surface, paying out recovery line as it rises. Thus, it provides visual location of the mine with a line made fast to the mine, and enables its recovery by surface craft.



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Figure 2-1.—Mk 52 actuation mine.

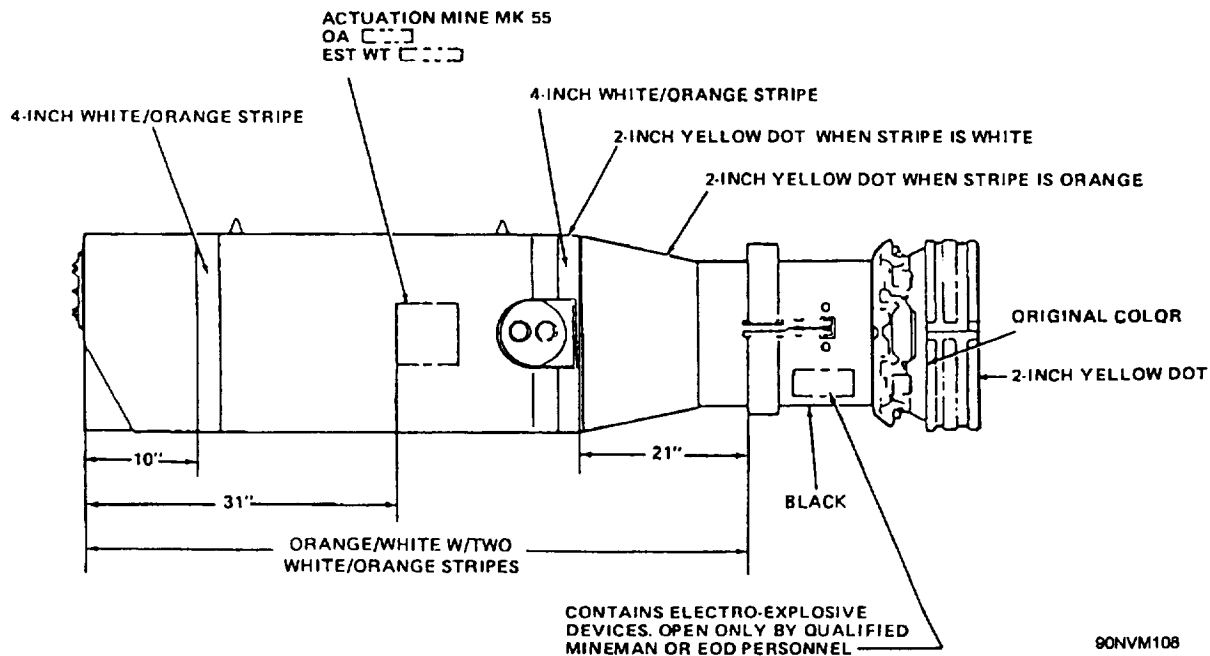


Figure 2-2.—Mk 55 actuation mine.

MK 55 MODS 2 AND 5 ACTUATION MINES

The Mk 55 Mods 2 and 5 actuation mines, shown in figure 2-2, are 2,000-pound, aircraft-laid, bottom, inert-loaded mines. The Mk 55 actuation mine is identical to the Mk 52 except that the Mk 55 is larger.

DETECTION SYSTEMS

The Mk 52 and Mk 55 actuation mines employ two detection systems. Each of the mines can be assembled with either magnetic (Mod 2) or acoustic/magnetic (Mod 5) detection systems.

MOD 2 DETECTION SYSTEM

The Mk 20 Mod 1 firing mechanism, shown in figure 2-3, is used in the Mk 52 and Mk 55 Mod 2 actuation mines. The Mk 20 is a magnetic-influence mechanism housed in a red aluminum case 4 1/2 inches high, 6 inches long, and 5 1/2 inches wide.

Externally, it has two screwdriver-operated controls (balance and sensitivity) and three connectors. The J401 and J402 connectors connect the mech-

anism to the other mine components. The J403 connector accommodates an attenuator plug. The attenuator plug (a separate component) receives the signal from the mine's search coil and reduces the strength of the signal going to the firing mechanism amplifier so that the mechanism does not produce looks when a small vessel passes nearby or when a target passes at a distance beyond the effective range of the mine. This reduces the chance that a mine firing will be wasted. Any one of the six different attenuator plugs can be used to produce different amounts of attenuation, ranging from no attenuation with a No. 1 plug to the maximum attenuation with a No. 6 plug. Attenuator plugs are not furnished with the Mk 20 firing mechanism, but one must be installed or the mechanism will not operate.

Internally, the mechanism consists of an amplifier and a look relay. The amplifier, which increases the strength of the input signal to close the look relay, has two main parts: an oscillator and a bridge network. The oscillator converts direct current from a battery in the mine into 115 Hz. This alternating current powers the bridge network. The bridge network is a circuit that permits the small signal received from the search coil (through the

attenuator plug) to control the large signal produced by the oscillator. In this way, a signal is produced that is strong enough to operate the look relay. The oscillator signal is put onto and removed from both sides of the bridge at exactly the same time; therefore, the bridge stays balanced. The bridge becomes unbalanced when a ship's magnetic field causes the search coil to send a signal to the bridge and is subtracted from the oscillator signal on the other side. This causes the bridge to be unbalanced. The larger the signal from the search coil, the more unbalanced the bridge becomes. When the bridge is balanced, no signal is sent to the look relay. But, when the bridge becomes unbalanced, a part of the oscillator signal is fed into the look relay. The more unbalanced the bridge becomes, the larger the oscillator signal that is applied to the look relay. In this way, the comparatively small signal from the search coil controls the amplitude of the large signal from the oscillator that is fed into the look relay.

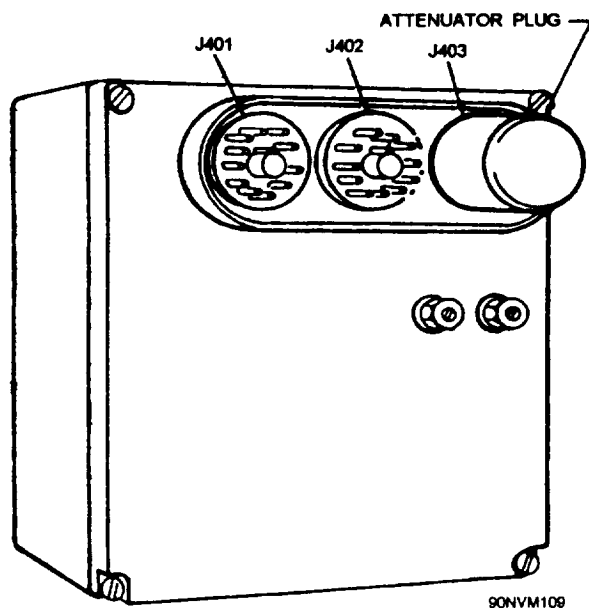


Figure 2-3.—Mk 20 Mod 1 firing mechanism.

The look relay is a switch that operates like an electrical meter in that it has a needle that is moved by an input. In this case, the input is from the amplifier. If the input from the amplifier is strong enough, it moves the needle far enough to cause it to touch an electrical contact. When this occurs, the switch closes and the firing mechanism “takes a

look.” When the magnetic field near the mine starts to decrease, the current from the search reverses.

When this happens, the bridge is unbalanced in the opposite direction and the signal from the amplifier reverses. This causes the look-relay needle to move in the opposite direction. When it moves far enough, it touches a second electrical contact and a reverse look is taken. Both the initial look and the reverse look are required for an actuation count or to fire the mine.

The Mk 20 firing mechanism's operation is as follows:

1. A change in the magnetic field at the mine causes a small search-coil current.
2. The attenuator plug reduces the current to one that will actuate the firing mechanism only if the ship is of the desired class and is within damage radius.
3. The amplitude of a weak signal from the attenuator is increased by the mechanism amplifier until it is strong enough to operate the look relay.
4. The look relay closes one of its two sets of contacts.
5. As the strength of the ship's magnetic field begins to decrease, the search coil current reverses direction.
6. The attenuator plug reduces the reverse current to the amplitude that will actuate the firing mechanism only if the ship is of the desired class and is within damage radius. The look relay receives a second current, which closes the second set of contacts.
7. The mine detonates (or counts an actuation) unless more than one firing mechanism is used in the mine; in which case, the mine may not be ready to detonate or to count an actuation. Under these conditions, when the look relay of the Mk 20 firing mechanism closes for the reverse look, the circuit that caused the mine to detonate or to count an actuation is only partially completed. The look

relays in all other firing mechanisms in the mine must also be closed to complete the circuit.

MOD 5 DETECTION SYSTEM

The Mk 21 Mod 0 firing mechanism, shown in figure 2-4 and used with the Mk 20 Mod 1 firing mechanism, is an acoustic detecting device used in the Mk 52 and Mk 55 Mod 5 actuation mines. The mechanism is housed in a blue aluminum case measuring 5 inches high, 6 inches long, and 3 inches wide. Externally, the mechanism has two male and two female connectors and a screwdriver-operated switch (S301).

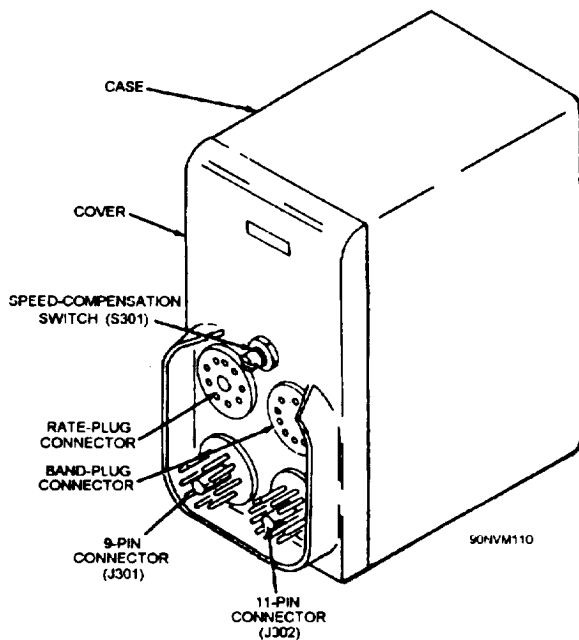


Figure 2-4.—Mk 21 Mod 0 firing mechanism.

The Mk 21 firing mechanism uses two other components: the Mk 3 Mod 0 depth compensator and the Mk 6 Mod 1 hydrophone. They are installed in the tail cover and are connected by a cable assembly.

Mk 3 Mod 0 Depth Compensator

The Mk 3 Mod 0 depth compensator, shown in figure 2-5, is used in the Mk 52 and Mk 55 Mod 5 actuation mines. It is a hydrostatically operated, electromechanical switching device that automatically adjusts the sensitivity of certain firing mechanisms by changing resistances in the detecting circuit. The compensator consists of a frame-and-bellows assembly, a switch-bracket assembly, a lever arm assembly, a stud (inlet port), a housing (cast iron), and associated electrical components.

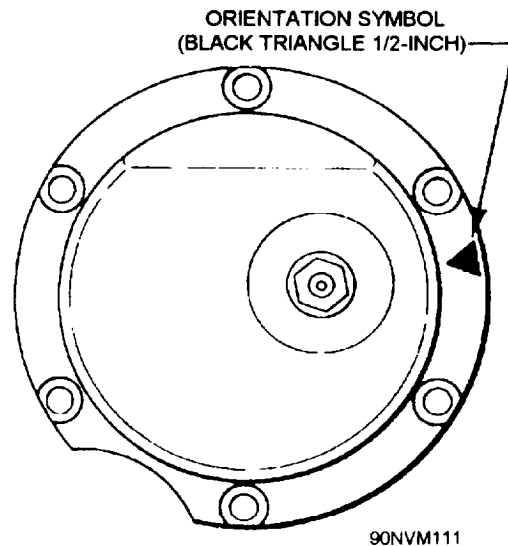


Figure 2-5.—Mk 3 Mod 0 depth compensator.

Mk 6 Mod 1 Hydrophone

The Mk 6 Mod I hydrophone, shown in figure 2-6, is connected to the Mk 21 firing mechanism by a cable assembly.

Because of the classification of the Mk 21 firing mechanism and the Mk 6 hydrophone, for further information, refer to *Mine Components D through F; Description and Class-B Criteria*, NAVSEA SW550-AA-MMI-020; and *Mine Components G through W; Description and Class-B Criteria*, NAVSEA SW550-AA-MMI-030.

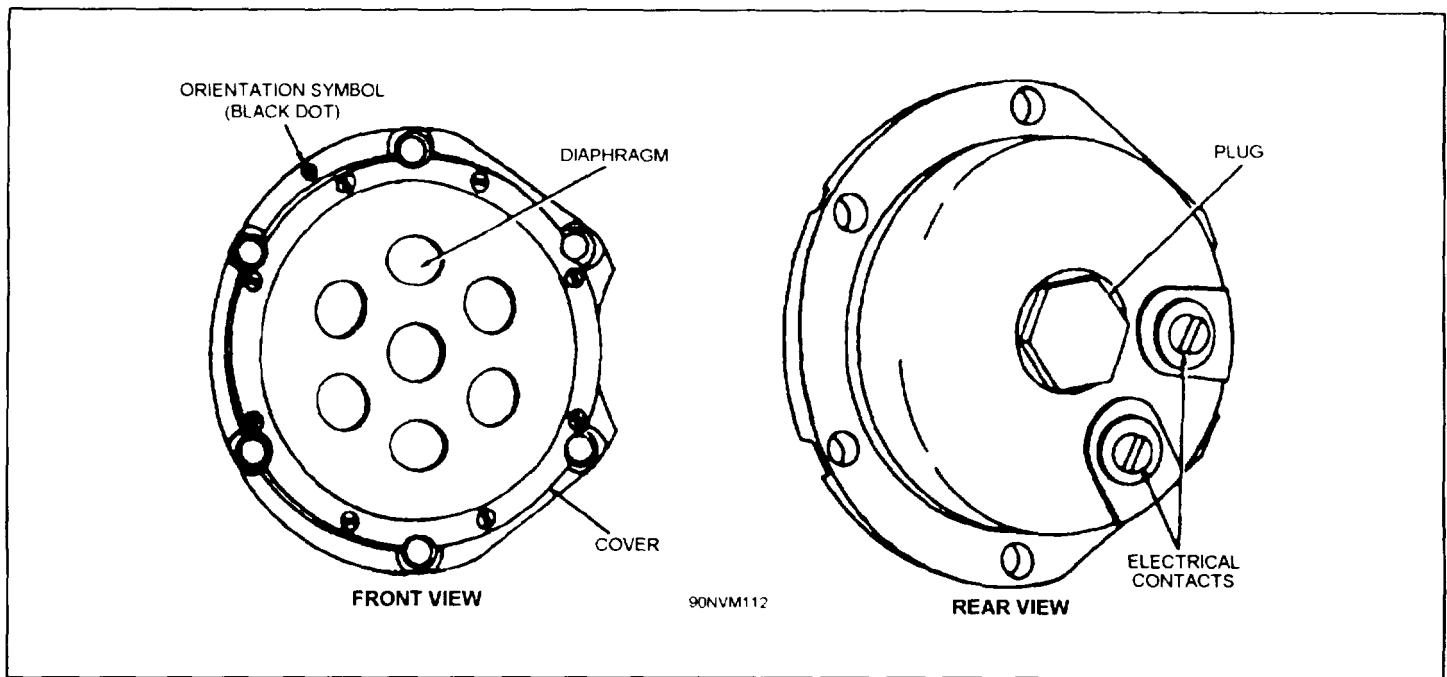


Figure 2-6.—Mk 6 Mod 1 hydrophone.

OPERATIONAL ASSEMBLIES

Whereas the Mark designation of a mine is generally distinguished by the differences in the shape of the mine case and the Mod by the difference in the firing mechanisms, the operational assemblies (OAs) denote differences in the use of flight gear. In practice, the OA to be assembled is chosen by the assembly activity, according to the planting agent, personnel, and conditions under which the mines will be planted. That OA is then specified in assembly orders that are issued to the mine assembly activity in support of the mission plans.

AUTHORIZED CONFIGURATION DATA

Actuation mines may be assembled to either one of two configurations: an all-up assembly, or a sub-assembly. They are discussed in chapter 1 of this volume.

AUTHORIZED OPERATIONAL ASSEMBLIES

Variations in the use of assembly-level items within an authorized mine configuration are called *operational assemblies* (OAs). An abbreviated list showing components that distinguish the authorized

OAs for Mk 52 and Mk 55 actuation mines can be found in *Mines, Underwater: Actuation, Description, Assembly, and Tests*, NAVSEA SW550-AE-MMI-040.

PLANTING DEPTHS

The water depth in which an actuation mine can be planted is determined by the depth that the signaling gear will operate and the depth at which the mine can be recovered without the use of divers. Bottom conditions are also a factor in determining this depth. If the water is less than 40 feet, the bottom must be hard or have less than 1 foot of sediment or the signaling and recovery gear may fail to operate. Even in greater water depths, the maximum sediment depth on the bottom must be less than 4 feet if the gear is expected to operate reliably.

The minimum planting depth for the Mk 52 actuation mine is 25 feet, and the minimum planting depth for the Mk 55 actuation mine is 30 feet. If these mines are to be recovered without divers, they have a fixed maximum water depth of 200 feet, which is the length of the recovery line on the float.

MK 52 AND MK 55 ACTUATION MINE COMPONENTS

The components of the Mk 52 and Mk 55 actuation mines fall into two categories:

1. Components that are the same as or similar to those used in service mines.
2. Components that are unique to ET mines.

The ET components that are the same as those used in service mines include firing mechanisms, flight gear, etc. Information on these components can be found in *Mine Components A through C; Description and Class-B Criteria*, NAVSEA SW550-AA-MMI-010; NAVSEA SW550-AA-MMI-020; and NAVSEA SW550-AA-MMI-030. Information on the components unique to ET mines can be found in *Mines, Underwater: Exercise and Training; Description and Class-B Criteria*, NAVSEA SW550-AE-MMI-010. This section discusses these components and their operation.

MK 5 MOD 1 ET ARMING DEVICE

The Mk 5 Mod 1 ET arming device, shown in figure 2-7, is a hydrostatically operated mechanism. It is identical to the service version except that it contains no explosives. It is 6 3/4 inches high and 6 13/16 inches in diameter, and weighs 9 pounds. It comprises an extender, a hydrostatic switch, and a 10-pin connector mounted on a circular brass plate.

MK 21 MOD 0 CLOCK DELAY

The Mk 21 Mod 0 clock delay, shown in figure 2-8, is used to delay the arming of the mine. It is enclosed in a white aluminum housing 4 1/2 inches high, 6 inches long, and 2 inches wide. It weighs 3 pounds.

MK 27 MOD 0 SEARCH COIL

The Mk 27 Mod 0 search coil, shown in figure 2-9, consists of a 7/8-inch diameter Mumetal core rod extending the full length of the coil; 33,000 turns of No. 21 wire, wound in two equal sections; a jacket, which is a vacuum-impregnated glass cloth

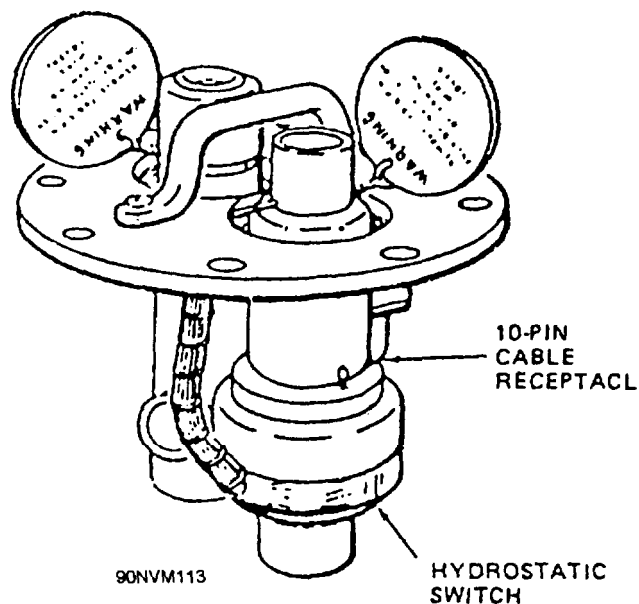


Figure 2-7.—Mk 5 Mod 1 ET arming device.

with polyester resin; and two special rhodium-plated terminals (jack receptacles), which accommodate the rhodium-plated cable connections. The overall length is 57 1/2 inches and the outside diameter is 2 1/2 inches. It weighs 50 pounds. A change of

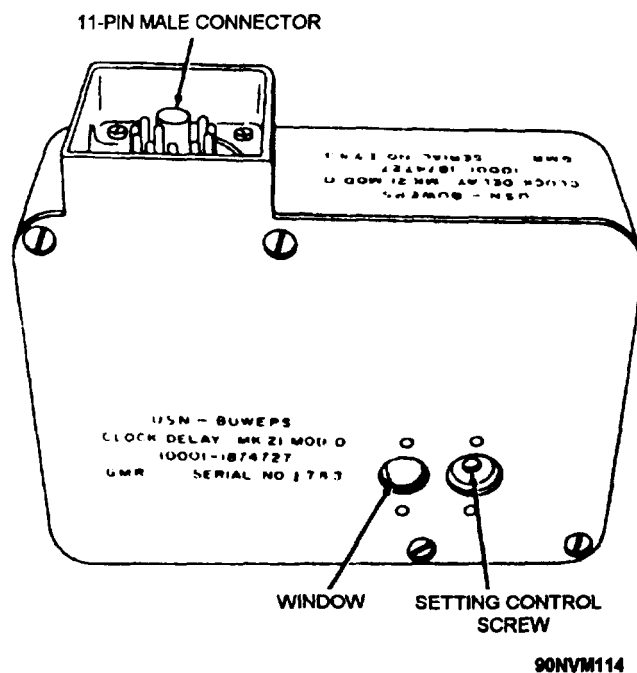


Figure 2-8.—Mk 21 Mod 0 clock delay.

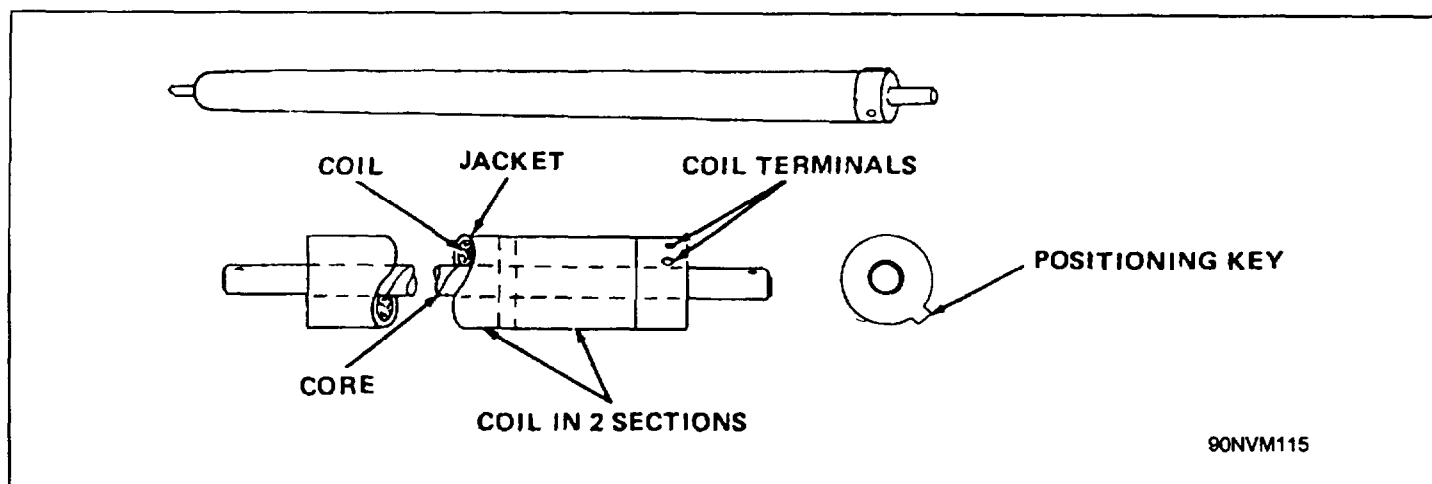


Figure 2-9.—Mk 27 Mod 0 search coil.

magnetic flux along the axis of the search coil caused by a ship's passage produces voltage across the search-coil terminals to produce the input signal to the Mk 20 firing mechanism.

MK 10 MOD 0 ET STERILIZER

The Mk 10 Mod 0 ET sterilizer's sole function is to complete breaks in the mine firing circuit. The unit, shown in figure 2-10, does not contain timing elements since the sterilizing function, which is performed by the elements, is not required in the Mk 52 and Mk 55 actuation mines.

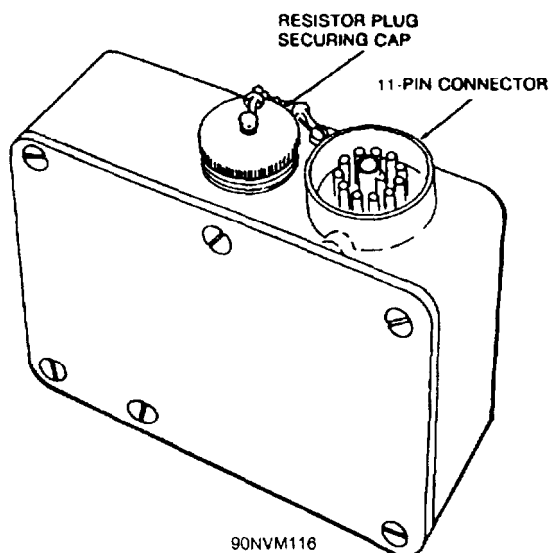


Figure 2-10.—Mk 10 Mod 0 ET sterilizer.

MK 39 MOD 1 CONTROL BOX

The Mk 39 Mod 1 control box is an electro-mechanical timing and switching device housed in an orange aluminum-alloy case measuring 4 1/2 inches high, 6 inches long, and 4 1/2 inches wide. It controls the overall operation of the mine in its armed condition.

The unit consists of 10 motor-driven cams mounted on a common shaft, which rotates through a series of speed-reduction gears at one-half revolution per minute (rpm). Cam-following switches open and close circuits at intervals fixed by the cam's design. One revolution of the shaft, completing a full control-box cycle, requires 2 minutes.

MK 35 MOD 0 JUNCTION BOX

The Mk 35 Mod 0 junction box, shown in figure 2-11, is an olive-drab aluminum box that installs in the instrument rack to join the leads from various points in the mine's circuitry to a single 30-pin socket test receptacle.

The test receptacle, positioned at a cutout in the forward end of the rack, is accessible through the arming-device well for checking the assembled mine's operation.

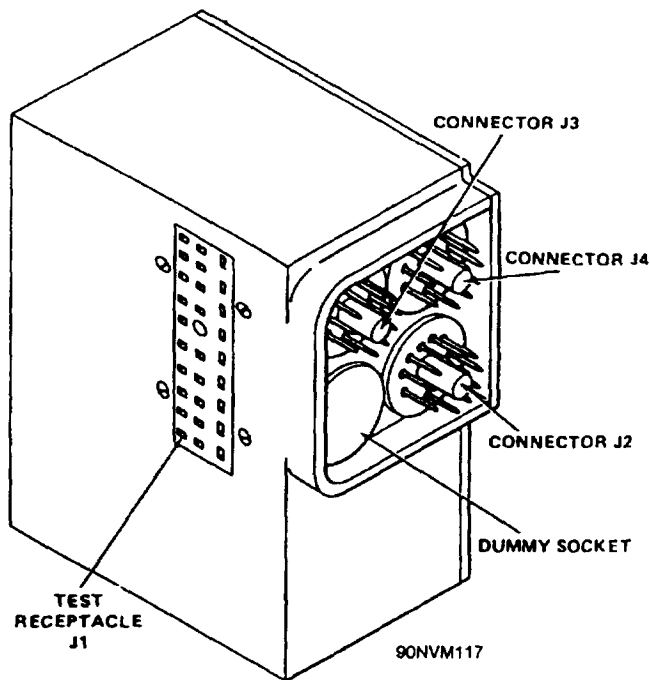


Figure 2-11.—Mk 35 Mod 0 junction box.

MS3314 AND MK 3 SUSPENSION LUGS

MS3314 and Mk 3 suspension lugs used on the Mk 52 and Mk 55 actuation mines, respectively, may be reused for all flight operations if, upon inspection, they exhibit no damage to the threads or to the suspension arch. Moreover, these lugs may be reused on nonflight actuation mines if they exhibit no structural defects and are painted red to distinguish them from serviceable units.

MK 3 INSTRUMENT RACK

The Mk 3 instrument rack provides a housing for most of the components, including batteries, within the mine case. The rack comprises a center section, a battery strap, an instrument strap, a cap, a cover, and the necessary hardware to hold it together. The center section divides the rack into two compartments with batteries in one compartment and components (and a few batteries) in the other. The straps secure the batteries and the components to the center section as a unit.

MK 17 MOD 0 DRILL FLOAT

The Mk 17 Mod 0 drill float, shown in figure 2-12, is used on the Mk 52 and Mk 55 actuation mines to mark their underwater locations (after actuation) and thus facilitate recovery. The float incorporates a signal tube, a tapped hole for an explosive fitting, and a tapped hole for a signal-retaining screw. The float also contains a 200-foot nylon line, which is made fast to the mine until recovery; a 2-foot nylon mooring line, which holds the float submerged until the mine is actuated; and a pipe plug, which can be removed to leak-test the float.

When assembled with a signal, an explosive fitting, and a cap for sealing the signal tube, the Mk 17 float installs into a drill shield, which secures to the tail section of the mine. After the mine has been planted and a target has been detected, the explosive fitting fires and ejects the signal from the float with enough force to shear the rivets that secure the sealing cap in place. A coiled spring, installed in the signal tube, completes the ejection process.

Following the ejection from the signal tube, the signal rises to the surface of the water to emit smoke and flame to indicate that the mine has actuated. After the mine actuation phase and following a predetermined period of time (as set on the Mk 64 switch delay), an explosive fitting in the shield fires and causes the mooring line to be cut, permitting the float to rise to the surface with its recovery line and to mark the location of the submerged mine.

DRILL FLOAT SHIELD ASSEMBLY

The drill float shield assembly, shown in figure 2-13, is a steel cylinder, open at both ends, measuring 13 inches long and 19 inches in diameter. The shield attaches to the tail of the mine and provides the housing for the exercise gear (float, signal, delay switch, etc.). The aft end of the shield has three concave supports welded around its inner circumference and to the bulkhead, upon which the Mk 17 float is positioned. The supports are rubber coated to prevent damage to the float. Mounted in

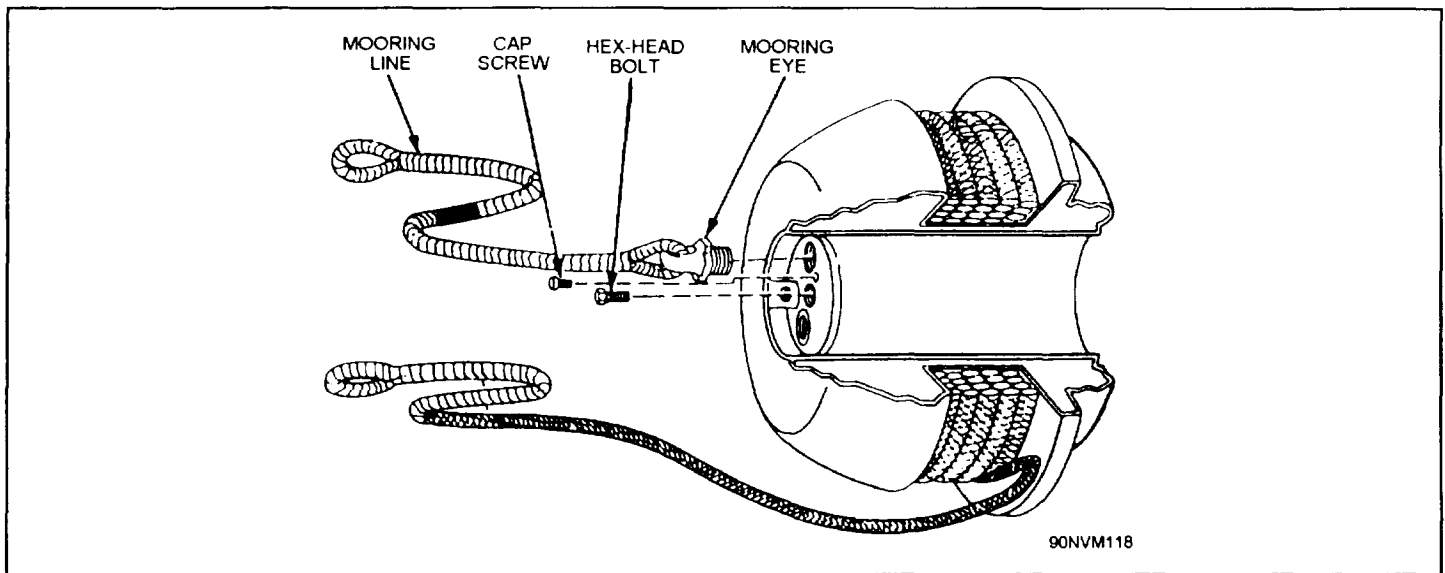


Figure 2-12.—Mk 17 Mod 0 drill float.

the shield are three float-ejection springs, a cable-cutter housing, and a delay-switch housing. The float-ejection springs are placed around the inner circumference of the shield about 6 1/2 inches from the aft end, and are secured to the outer wall of the shield by roll pins and welded brackets. The cutter housing and the delay-switch housing are mounted to the shield bulkhead about 5 inches from the forward end.

MK 115 AND MK 116 MODS 0 AND 1 SMOKE AND ILLUMINATION MARINE SIGNALS

The Mk 115 and Mk 116 signals, shown in figure 2-14, provide a visual indication of mine/simulator actuation. Both signals are identical, except that the Mk 115 produces a yellow smoke and flare display, and the Mk 116 produces a green display. The signals are made of aluminum and measure 9 1/2 inches long and 3 13/16 inches in diameter, and weigh 2 2/3 pounds. They comprise two main assemblies: a shell assembly and a base assembly.

- The shell assembly contains chemicals for producing smoke and flame, an electric squib, and an orifice plug.

- The base assembly contains a seawater-activated battery, a large coil spring, a small coil spring, a sealing disc, and an arming button, which is held safe in a locking cam by the force of the large coil spring.

The Mod 1 signals are essentially the same as the Mod 0, except that the Mod 1 incorporates a redesigned sealing disc, which centers the axis of the large coil spring; a change in design of the detent slot in the signal's base to improve the arming function; a redesigned large coil spring; and a redesigned arming button.

In the storage condition, a protective cap secures to the base assembly. In use, the signals install in the Mk 17 float and are ejected by an explosive fitting. Upon initiation of the ejection mechanism, the signal becomes armed as the arming button is forced out of its locking cam, allowing it to jettison as it exits the float.

As the signal makes its ascent, the sealing disc is held fast by hydrostatic pressure until it reaches a given point near the water surface. At this point, the force of the small spring exceeds hydrostatic pressure and jettisons the sealing disc, allowing seawater to enter and activate the battery. Activation of the battery fires the electric squib which, in turn,

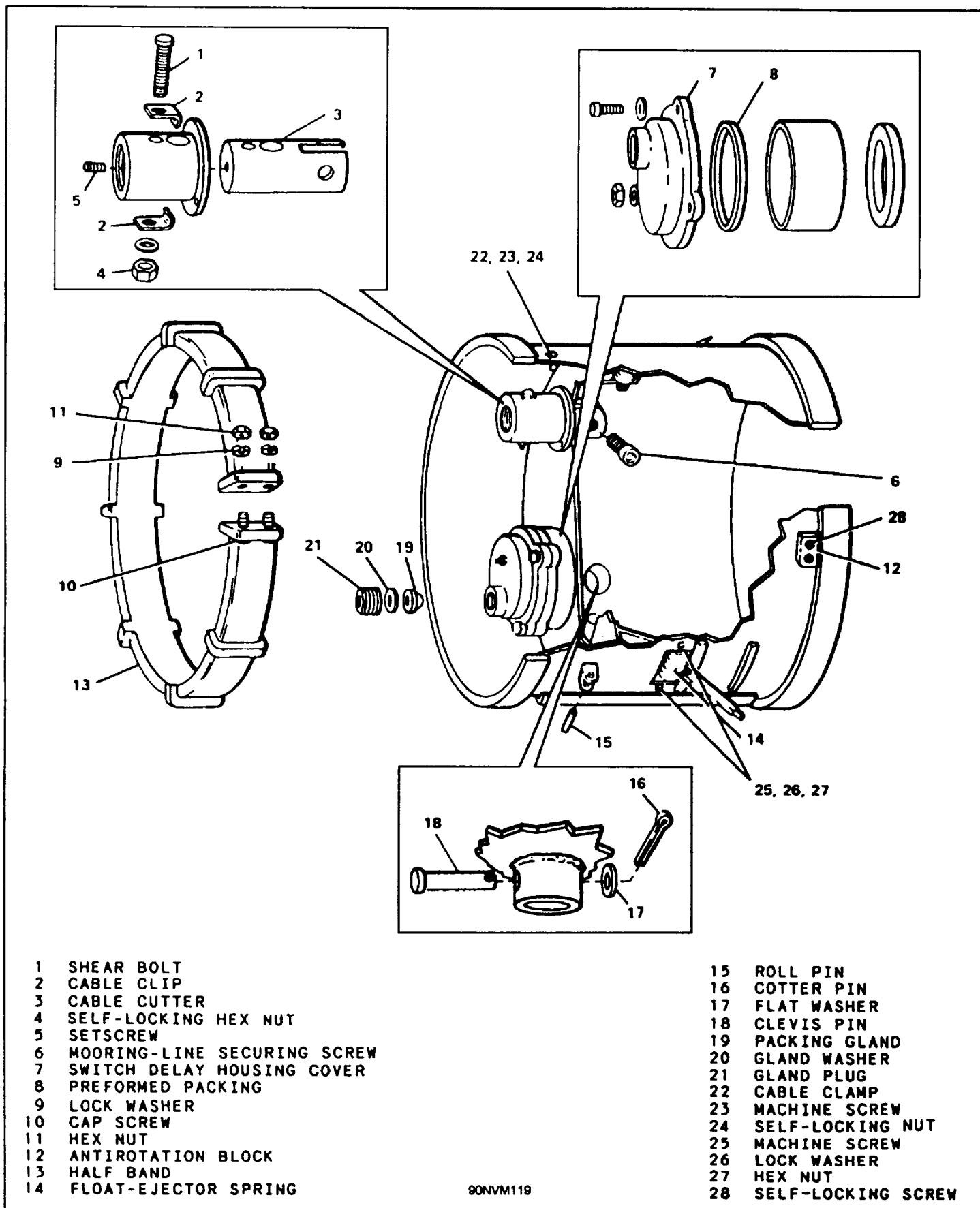


Figure 2-13.—Drill float shield assembly.

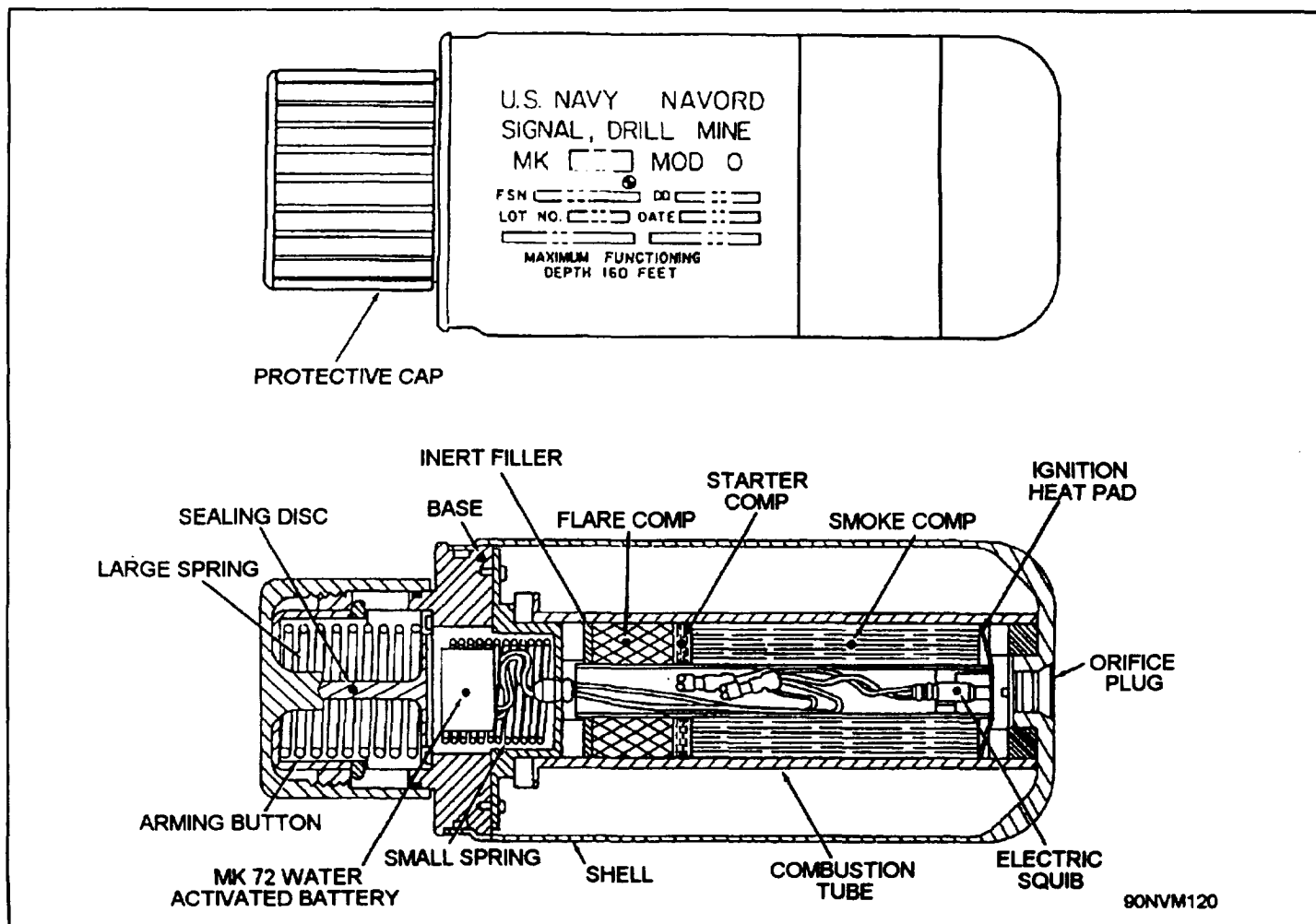


Figure 2-14.—Mk 115 and Mk 116 smoke and illumination marine signals.

ignites the chemicals. The pressure created by the burning chemicals blows the orifice plug, releasing smoke for about 70 seconds, followed by flame for about 25 seconds.

MK 125 MOD 0 SMOKE AND ILLUMINATION SIGNAL

The Mk 125 Mod 0 signal, shown in figure 2-15, provides a visual indication of a mine actuation by a white smoke and flare display on the water's surface. It measures 10 inches long and 3 3/4 inches in diameter, and weighs approximately 2 1/2 pounds. The signal consists of a cylindrical aluminum shell attached to an aluminum base. The shell contains a combustion tube with smoke and flame-producing chemicals, an electric squib, and an orifice plug. The base contains a seawater-activated

battery, a large coil spring, a small coil spring, a sealing disc, and an arming button, which is held safe in a locking cam by the force of the large coil spring.

In the storage condition, a protective cap fastens to the base assembly. In use, the signal installs in the Mk 17 float and is ejected by an explosive fitting. Upon initiation of the ejection mechanism, the signal becomes armed as the arming button is forced out of its locking cam, allowing it to jettison as it exits the float. As the signal makes its ascent, the sealing disc is held fast by hydrostatic pressure until it reaches a given point near the water surface. At this point, the force of the small spring exceeds hydrostatic pressure and jettisons the sealing disc, allowing seawater to enter and activate the battery.

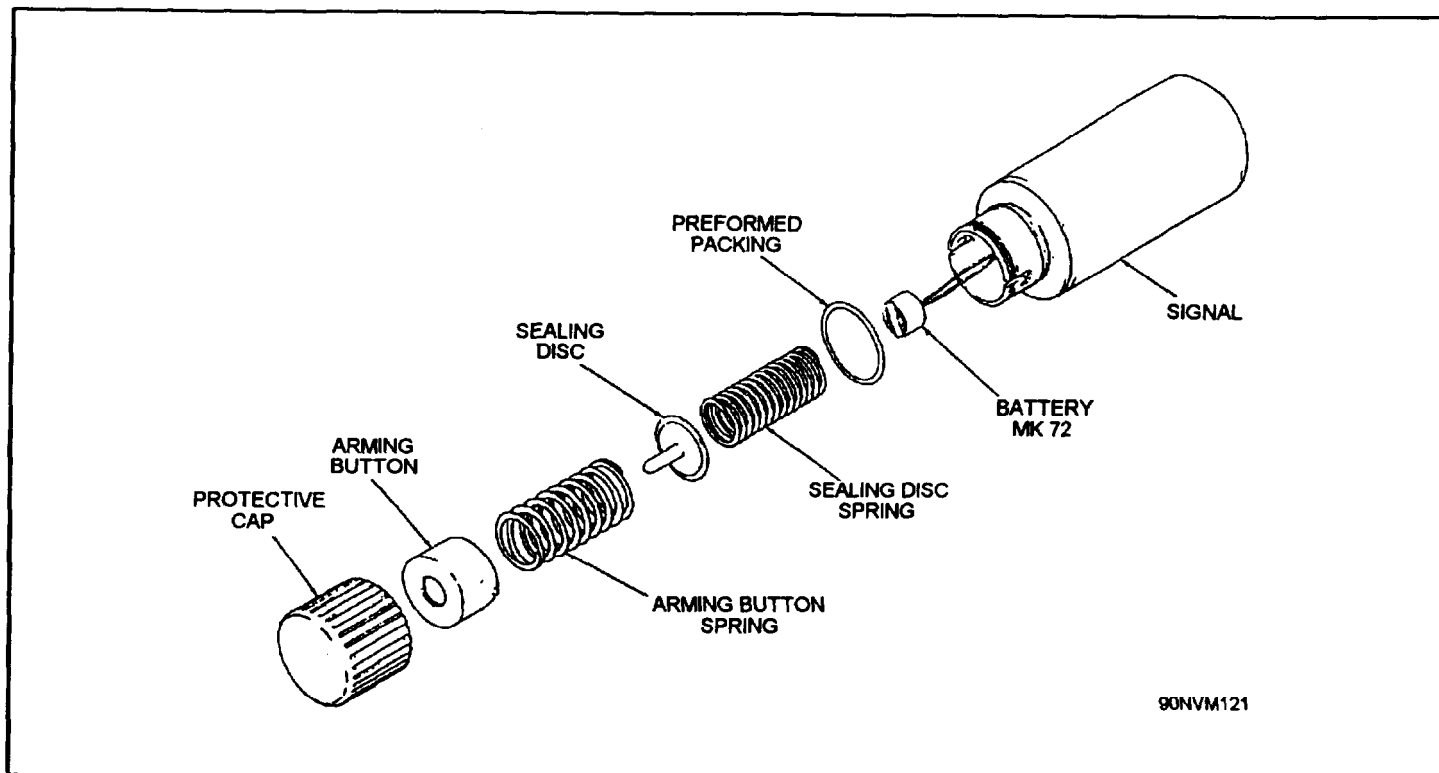


Figure 2-15.—Mk 125 Mod 0 smoke and illumination signal.

Activation of the battery fires the electric squib which, in turn, ignites the chemicals. The pressure created by the burning chemicals blows the orifice plug, releasing white smoke and flame.

MK 64 MOD 3 SWITCH DELAY

The Mk 64 Mod 3 switch delay, shown in figure 2-16, functions at a preset time to fire an explosive fitting that drives a cutter which, in turn, severs a mooring line restraining the submerged float, thus allowing it to rise to the surface with its recovery line. The operating components of the switch delay are contained in a circular, two-piece plastic housing consisting of a main section and a cover secured together with four screws.

When assembled, the housing is 2 inches high and 4 inches in diameter. The housing incorporates a Mk 63 hydrostatic switch and two rotary selector switches wired to 13 resistors for making time delay

settings from 1 to 49 days. The housing also accommodates the Mk 1 timing element and the Mk 135 battery.

In a planted mine, the switch delay functions as follows: The Mk 63 hydrostatic switch operates at a depth of 12 feet and applies current from the Mk 135 battery to the Mk 1 timing element.

Upon expiration of the time-delay period, as set on the selector switches, the timing element operates by releasing a spring-loaded plunger, which closes a circuit to fire an explosive fitting. The firing of the fitting releases a float attached to a nylon line.

Upon surfacing, the float marks the location of the mine, which is then recovered. It should be noted that the Mk 64 switch delay functions as a safety mechanism if the mine is recovered prematurely and if the switch delay has not fired the explosive fitting that releases the float.

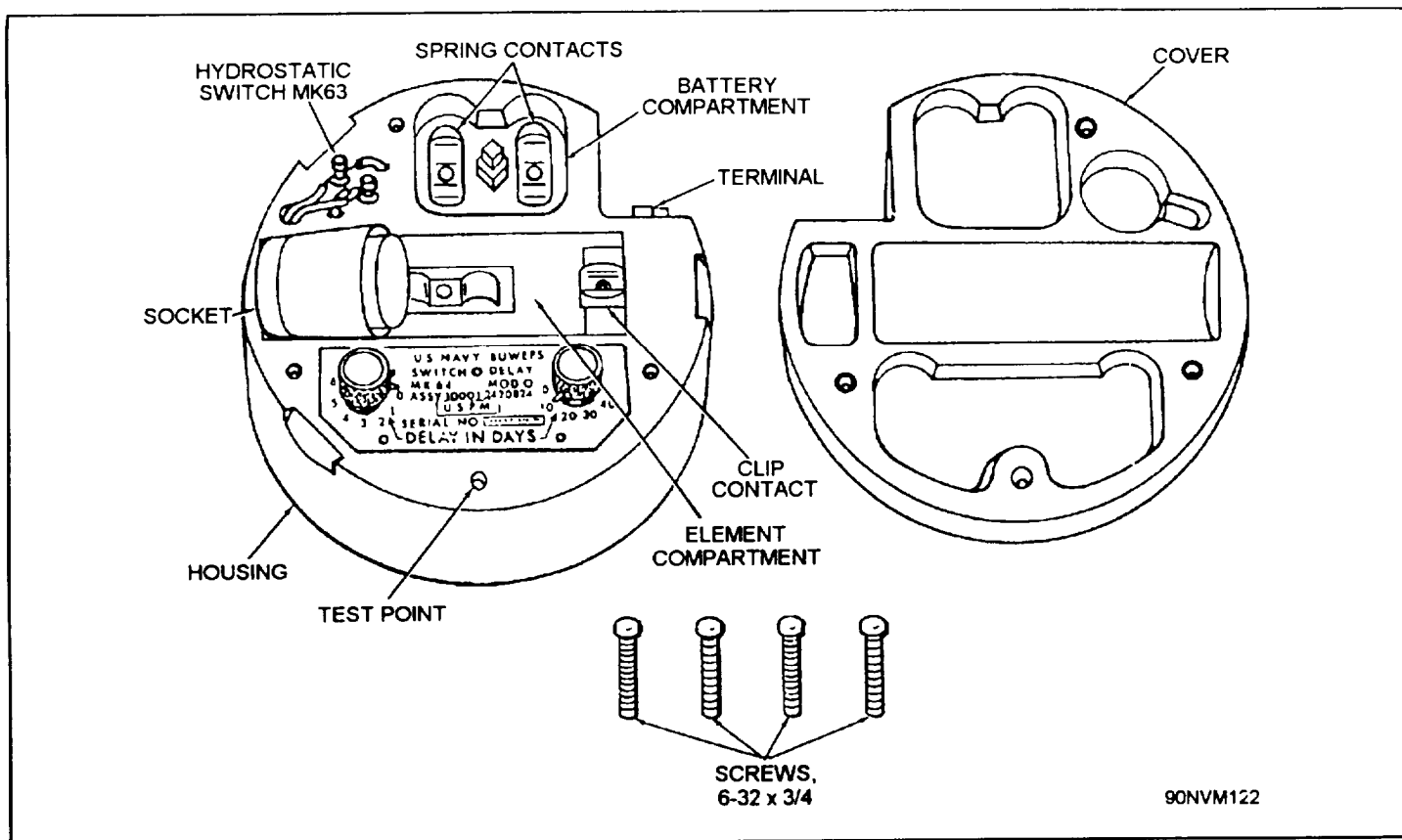


Figure 2-16.—Mk 64 Mod 3 switch delay.

MK 19 MOD 1 EXPLOSIVE FITTING

The Mk 19 Mod 1 explosive fitting, shown in figure 2-17, is an electrically initiated explosive device used to release the recovery float and to cut the electrical cable to the Mk 20 explosive fitting. The fitting consists of a flexible cable and an explosive actuator in a hexagonal steel housing. The threaded end of the housing has a plastic dust cap to protect the threads. A binding-post spring is a safety clip used during handling, shipping, and storage. The threaded end of the explosive fitting is screwed into the cutter housing, and the opposite end is plugged into the Mk 64 switch delay. Upon receipt of an electrical impulse from the switch delay, the explosive actuator is initiated which, in turn, actuates the cutter. The cutter severs the cable of the Mk 20 explosive fitting and releases the mooring cable by shearing a 1/4-inch bolt, allowing the float to rise to the surface.

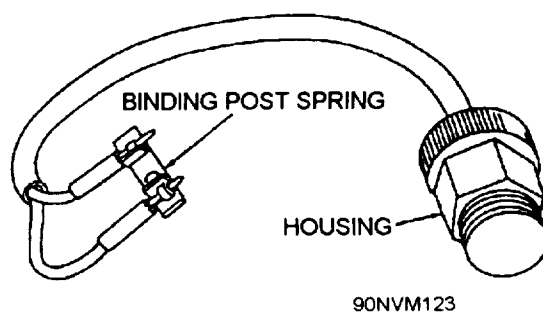


Figure 2-17.—Mk 19 Mod 1 explosive fitting.

MK 20 MOD 0 EXPLOSIVE FITTING

The Mk 20 Mod 0 explosive fitting, shown in figure 2-18, is an electrically actuated explosive device used in the float to release the smoke signal that indicates mine actuation. The fitting consists of a hexagonal actuator and a connecting 59-inch cable, terminating in a 2-pin male connector. The threaded

end of the housing attaches to the float and connects to the smoke signal; the 2-pin male connector plugs into the CA-465 cable assembly in the tail cover of the mine. Upon receipt of an electrical impulse, the explosive actuator in the fitting is initiated and drives the signal into the punch cap, shearing the rivets securing the punch cap and tearing out a section from the base. The signal is then free to rise to the surface.

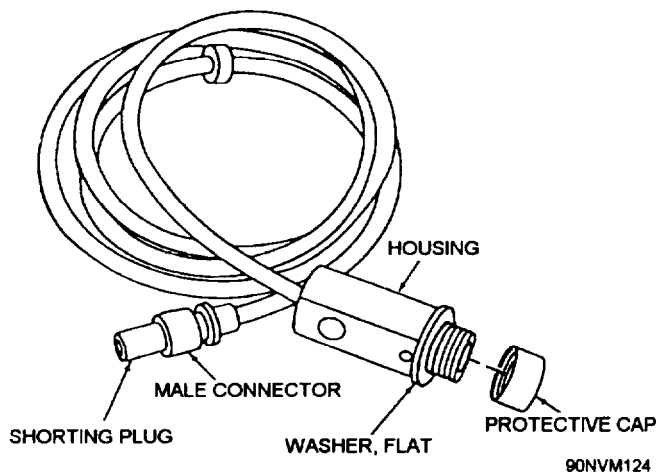


Figure 2-18.—Mk 20 Mod 0 explosive fitting.

MK 25 MOD 0 SIGNAL DATA RECORDER

The Mk 25 Mod 0 signal data recorder, shown in figure 2-19, is a small, rugged, completely self-contained, solid-state device capable of recording the date, the time of day, and the source of repetitive electrical input signals from multiple sources over an extended time frame. Measuring 3 1/2 inches high and 2 1/2 inches in diameter, the recorder is constructed of cylindrically shaped, black molded material. It is watertight and has a single 37-pin electrical connector for testing the system interface.

The recorder has one threaded hole near the center of the end plate for mounting purposes and is self-powered by two internally mounted replaceable

batteries. Totally solid-state in design, the recorder contains a presettable crystal oscillator-based clock as a reference and monitors up to four independent signal inputs for a period in excess of 30 days. A voltage pulse or level increase on any one or more of the input channels initiates a record sequence or an event that results in the date and the time of day being entered into a solid-state, random-access memory (RAM), along with coded information to identify the signal source. The memory has a capability to store up to 143 recorded sequences or events.

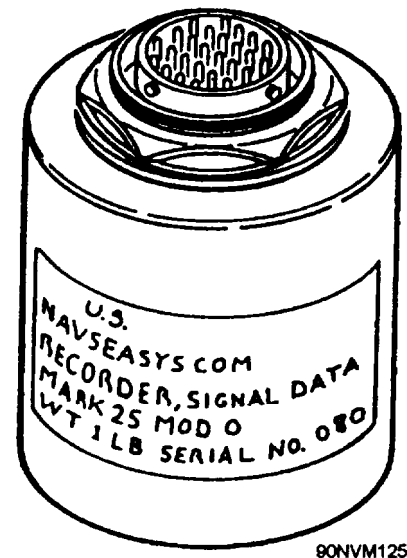


Figure 2-19.—Mk 25 Mod 0 signal data recorder.

MINE-CASE TAIL COVERS

The tail covers used on the Mk 52 and Mk 55 actuation mines, shown in figure 2-20, are secured to the mines by 24 socket-head screws. The covers contain three large holes, about 5 inches in diameter, which accommodate the components for the influence mines. Blanking plates and preformed packings seal these holes when the components are not installed. The covers also contain a hole that accommodates the CA-465 cable assembly, which connects the instrument rack to the explosive fitting in the shield.

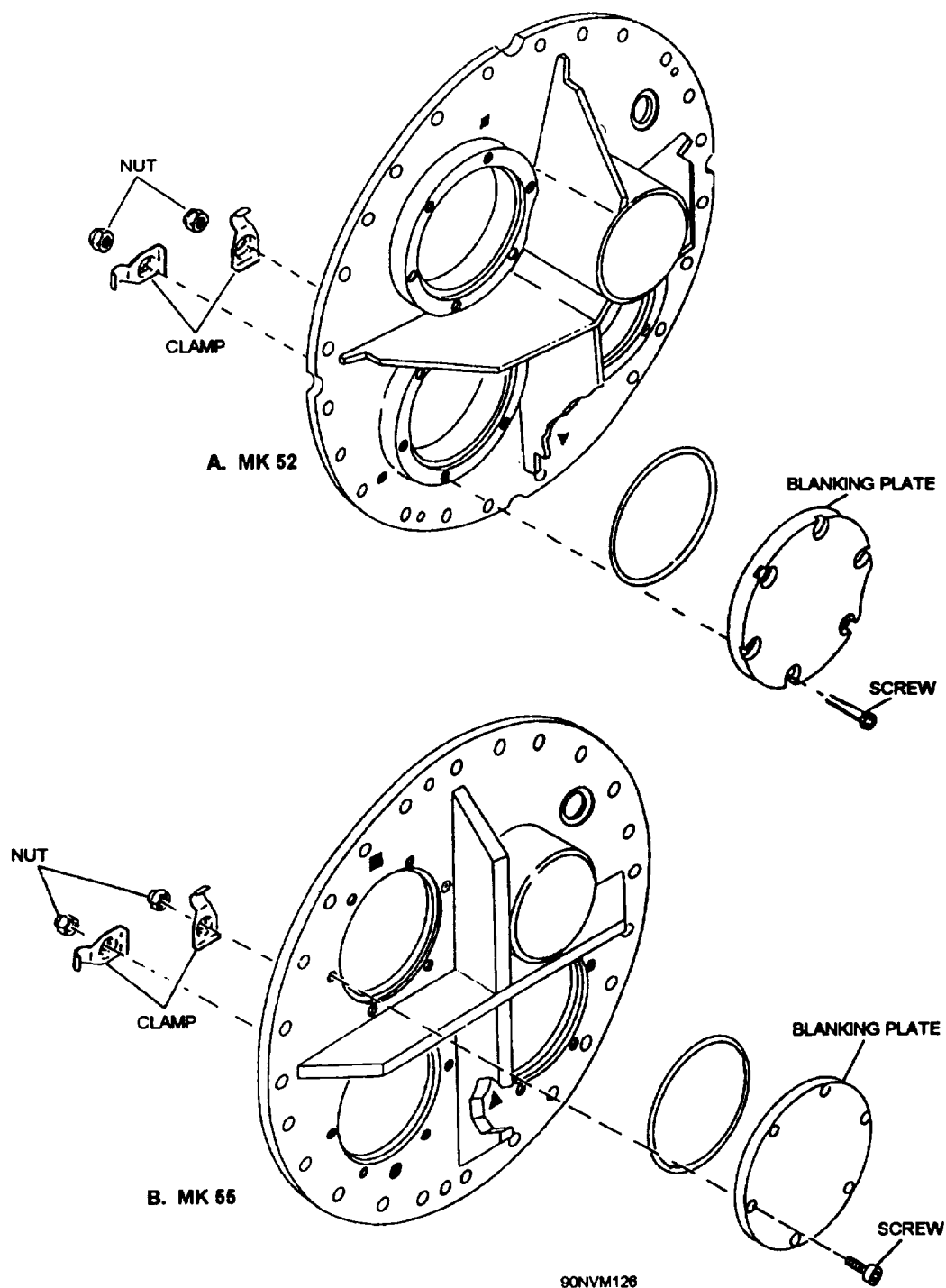


Figure 2-20.—Mine-case tail covers.

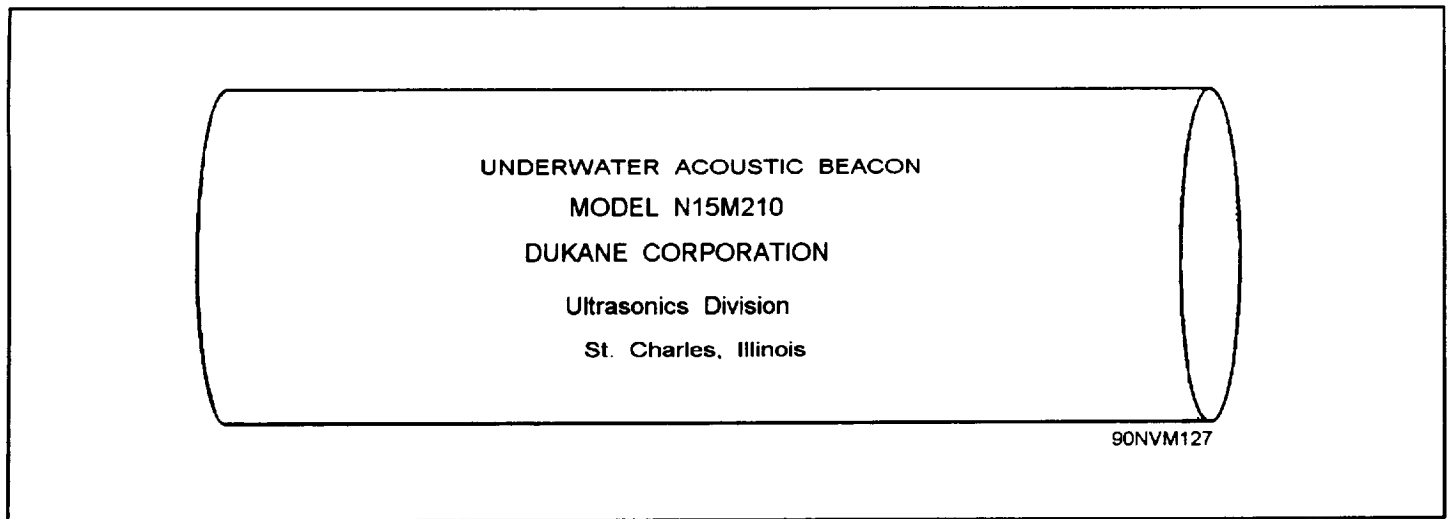


Figure 2-21.—Mk 87 Mod 0 sonar transmitter.

MK 87 MOD 0 SONAR TRANSMITTER

The Mk 87 Mod 0 sonar transmitter, shown in figure 2-21, is used on all actuation mines. It is 3 3/4 inches long and 1 1/4 inches in diameter. Made of stainless steel, the unit is used with a holder that installs externally in the arming device well. It is a rugged, self-contained, battery-powered device that automatically activates when immersed in water. Operating from 35 to 43 kHz, it is capable of transmitting an underwater signal in excess of 2,000 yards for 25 days when the water temperature is above 68 °F.

MK 19 MOD 0 NOSE AND TAIL FAIRING

The Mk 19 Mod 0 nose and tail fairing, shown in figure 2-22, is used on the Mk 52 actuation mine to provide a low-drag profile when the mine is carried externally on high-speed planting aircraft.

The painted aluminum alloy fairing consists of a retractable nose piece, a control wire, a guide assembly, a turnbuckle, a tail fin, and four parachute-release impact-plate retainers.

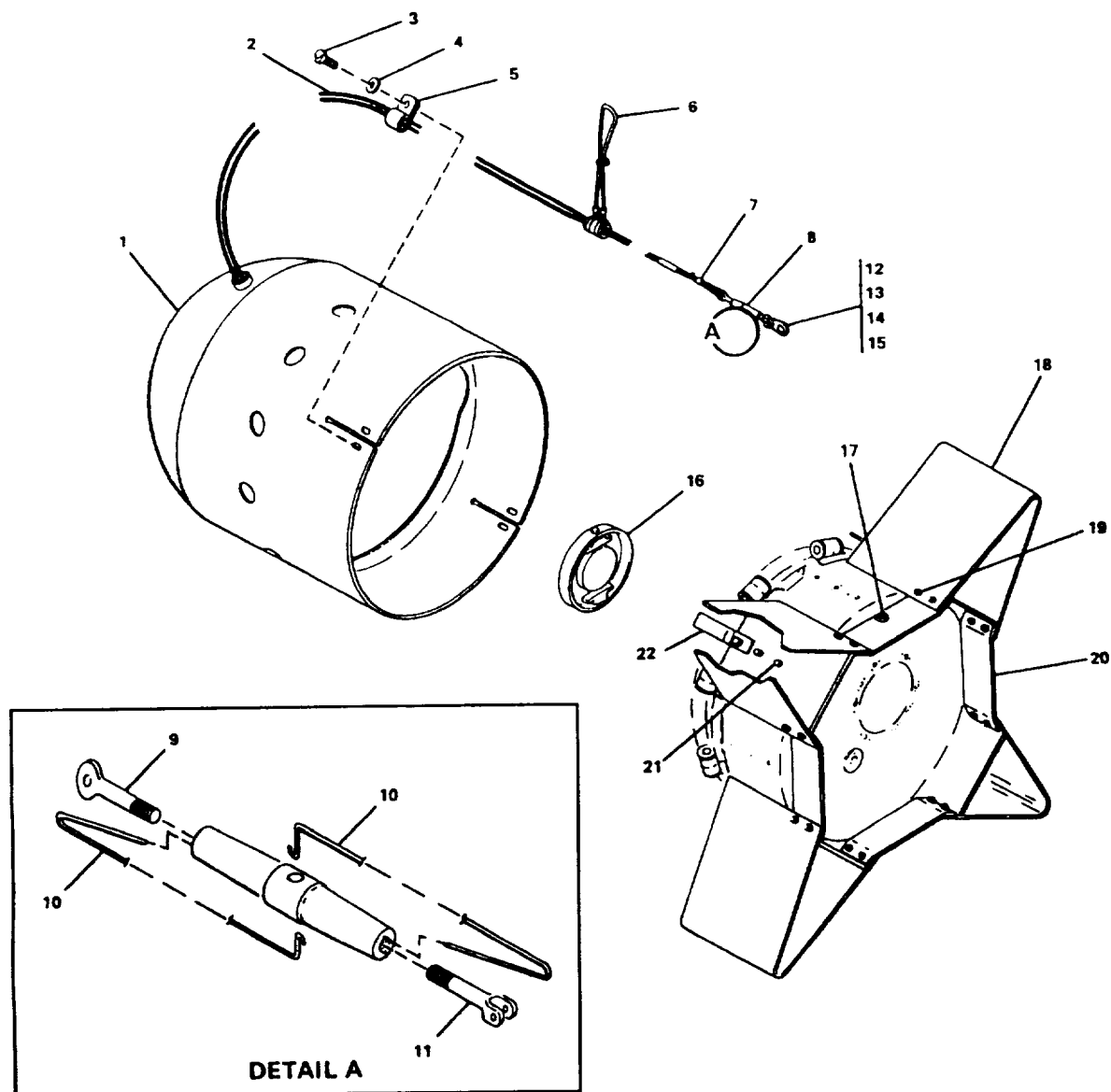
The fairing nose piece consists of an aluminum retractable nose and shroud and a spring-loaded retracting mechanism. It is secured to the forward end of the mine by eight screws and lock washers.

The retractable nose is secured in the extended position by a ball-lock mechanism.

The control wire consists of two lengths of stainless steel wire, which exit the nose through a grommet. The wires then pass through the guide to the turnbuckle, which is secured to a plate installed on the shroud-line lug to draw up any slack. The guide secures to the aircraft bomb rack to pull the control wire from the retracting mechanism, which causes the nose of the fairing to retract as the mine is released from the aircraft. This provides the mine with a high-drag and stable free-fall configuration until the parachute is deployed.

The tail fin consists of four 30-degree, aluminum, quarter sections that are joined at their bases by four shield sections, which are mounted on the parachute pack. The fin stabilizes the mine on the aircraft during flight and during free fall until parachute deployment.

The four impact-plate retainers are steel straps that mount on the forward edge of the base of each fin section. The forward ends of the retainers rest against the four impact plates on the parachute release to prevent withdrawal of the plates during high-speed carriage. When the parachute pack opens, the pack cover, the tail fin, and the retainers are released from the mine, thus freeing the impact plates to operate upon water impact.



1. Fairing nose piece
2. Control wire
3. Machine screw
4. Lock washer
5. Cushioned loop clamp, .265 hole
6. Guide assembly
7. Ferrule
8. Turnbuckle body
9. Turnbuckle eye-end tie rod
10. Turnbuckle locking clip
11. Turnbuckle clevis-end tie rod

12. Cap screw
13. Flat washer
14. Self-locking hex nut
15. Turnbuckle anchor plate
16. Cap assembly
17. Grommet
18. Quarter fin
19. Machine screw
20. Shield
21. Hex-head cap screw
22. Impact plate retainer

90NVM128

Figure 2-22.—Mk 19 Mod 0 nose and tail fairing.

MK 20 MOD 0 NOSE AND TAIL FAIRING

The Mk 20 Mod 0 nose and tail fairing, shown in figure 2-23, is used on the Mk 55 actuation mine to provide a low-drag profile when the mine is carried externally on high-speed aircraft. The painted aluminum alloy fairing consists of a retractable nose piece, a control wire, a guide assembly, a tail fin, four parachute-release impact-plate retainers, a cable clamp, a T-bolt clamp, and an adapter.

The fairing nose piece consists of an aluminum retractable nose and shroud and a spring-loaded retracting mechanism. It is secured to the forward end of the mine by a strap (T-bolt clamp). The retractable nose is secured in the extended (unoperated) position by a ball-lock mechanism.

The control wire consists of two separate 7-foot lengths of stainless steel wire, which exit the nose through a grommet. The wires then pass through the guide and attach to the adapter and are secured and tightened with the cable clamp. The guide secures to the aircraft bomb rack to pull the control wire from the retracting mechanism; thus, the nose of the fairing retracts as the mine is released from the aircraft. This provides the mine with a high-drag and stable free-fall configuration until the parachute is deployed.

The tail fin consists of four aluminum quarter sections that mount on the parachute pack. The fin stabilizes the mine on the aircraft during free fall until parachute deployment.

The four impact-plate retainers are preshaped wires installed between the fin sections. They rest against the impact plates on the parachute release to prevent withdrawal of the plates during high-speed carriage. When the parachute pack opens, the pack cover, the tail fin, and the retainers are released

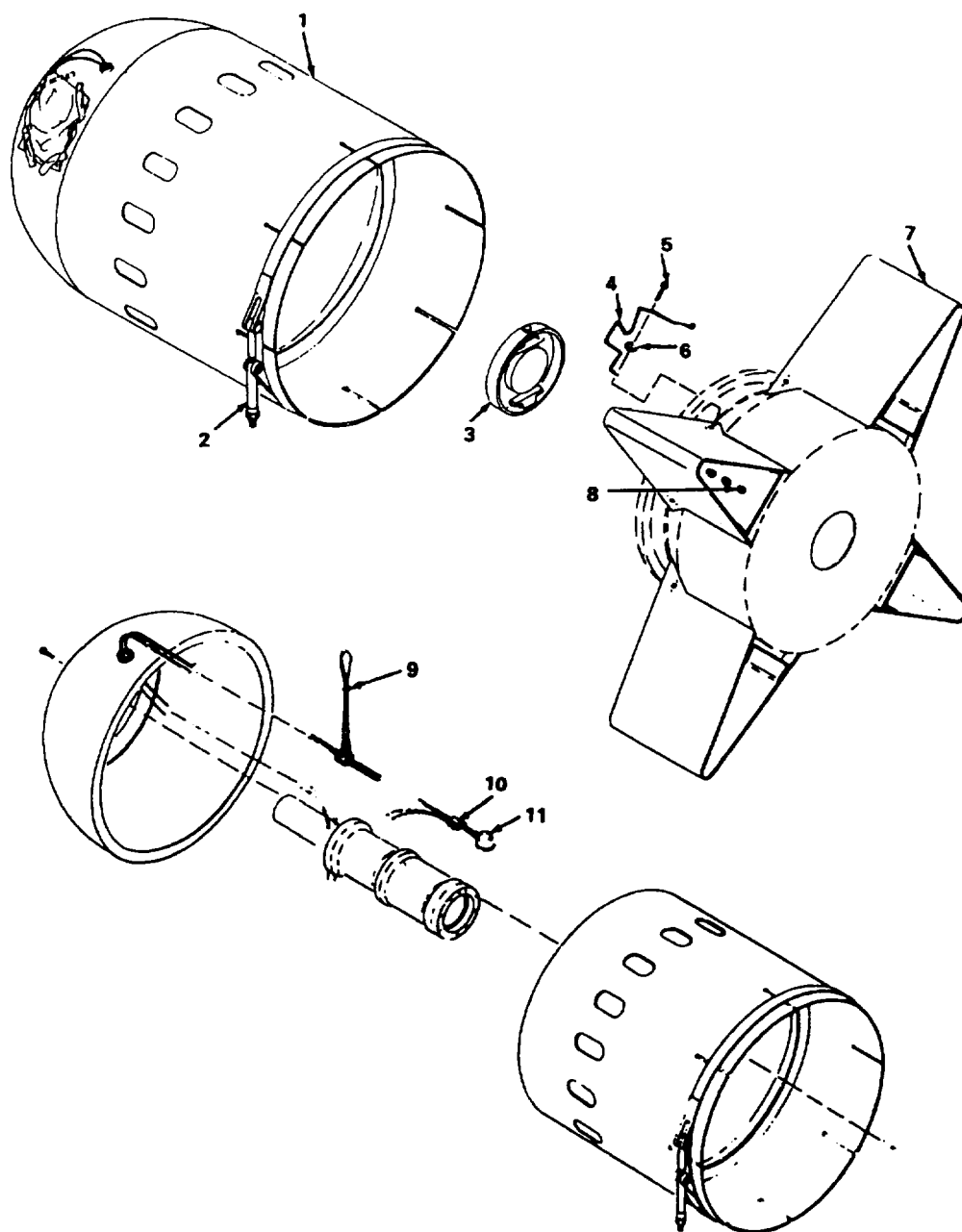
from the mine, thus freeing the impact plates to operate upon water impact.

MK 35 MOD 0 AND MK 36 MOD 0 PARACHUTE PACKS

The Mk 35 Mod 0 parachute pack, shown in figure 2-24, is used on the Mk 52 actuation mine. The pack, containing the Mk 30 nylon parachute, attaches to the mine by the Mk 33 parachute release. The housing incorporates a cylindrical, deep-drawn cover that fits into a concave bottom. Eight sets of threaded holes are equally spaced around the periphery of the housing cover for installation of parachute-release impact-plate retainers, the Mk 20 tail fin, or the tail fin assembly of the Mk 19 fairing.

The Mk 36 Mod 0 parachute pack, shown in figure 2-25, is used on the Mk 55 actuation mine. The pack, containing the Mk 29 Mod 1 nylon ring slot parachute, is attached to the mine by the Mk 20 parachute release. The housing incorporates a cylindrical, deep-drawn cover that fits into a concave bottom. Threaded holes are provided around the periphery of the cover for installation of the parachute-release impact-plate retainers and the four wedge-shaped, cruciform, fin quarter sections of the Mk 18 tail fin or the Mk 20 fairing.

An antirotation stop, riveted to the bottom assembly on its circumference, fits over a bolt head, or between two bolt heads, on the tail plate of the mine. This allows the parachute pack to be assembled on the mine case in a number of positions, at 7.5-degree intervals, within an arc extending 45 degrees on either side of the suspension lug center line. Eight parachute suspension line slots are spaced unequally around the bottom assembly, corresponding to the unequally spaced lugs on the Mk 20 parachute release.



1. Fairing nose piece
2. T-bolt clamp
3. Cap
4. Impact plate retainer
5. Machine screw
6. Flat washer

7. Quarter fin
8. Hex-head cap screw
9. Guide assembly
10. Cable clamp
11. Adapter

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Figure 2-23.—Mk 20 Mod 0 nose and tail fairing.

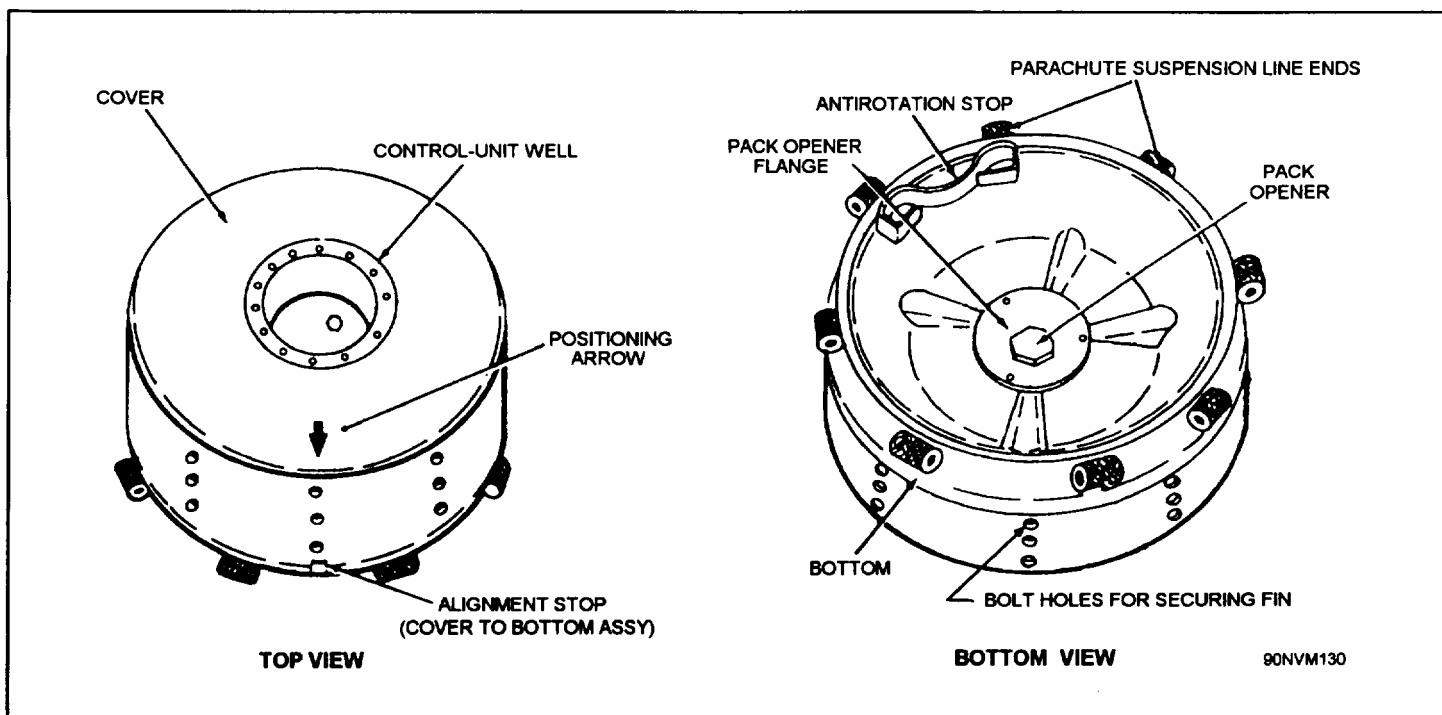


Figure 2-24.—Mk 35 Mod 0 parachute pack assembly.

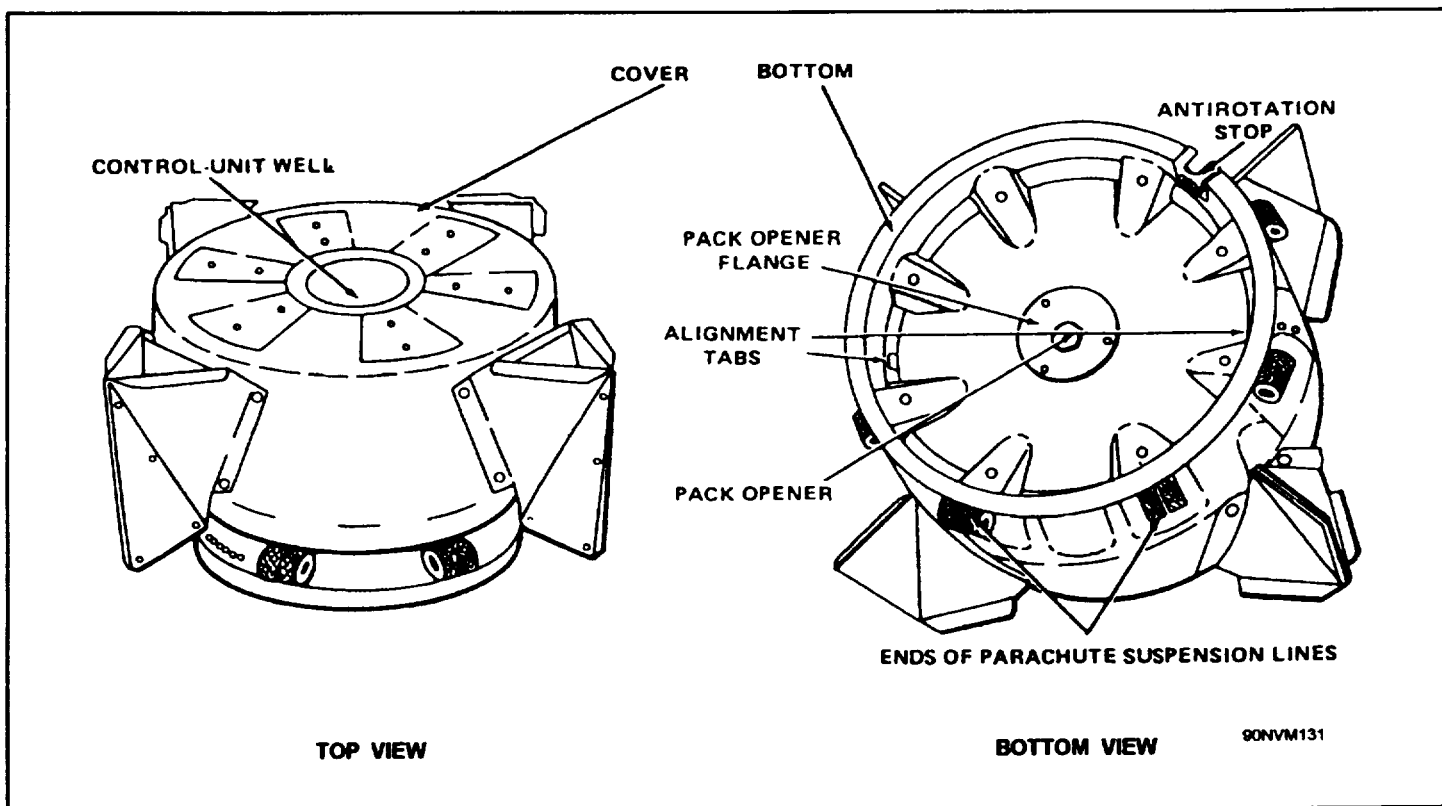


Figure 2-25.—Mk 36 Mod 0 parachute pack assembly.

OPERATIONAL DESCRIPTION

The Mk 52 and Mk 55 actuation mines employ an arming device that contains two hydrostatically operated pistons, the hydrostatic switch piston, and the extender piston, which delay arming until the mine reaches a water depth of approximately 18 feet. The hydrostatic switch piston closes switches in the actuation counter, the clock delay, the sterilizer, and the signal release circuits. The extender piston serves no purpose in the actuation mines. Both of the arming device pistons are held inoperable in the safe position by safety pins.

After the arming device switches operate, the mine is still maintained safe by the clock delay switches that maintain breaks in the actuation

counter circuits. These switches in the clock delay close at preset times, from 1 hour to 90 days after operation of the arming device switches.

The sterilizer contains a resistor plug and closes a break in the timing circuit. It does not limit the armed life of the mine since there are no timing elements installed.

When the mine receives a firing indication, the mine batteries provide a voltage for the electrical explosive fitting, which effects the actuation mine's signal. The mine has a delay switch in the float shield that times the firing of a second electrical fitting, which releases the float from the mine. See figure 2-26.

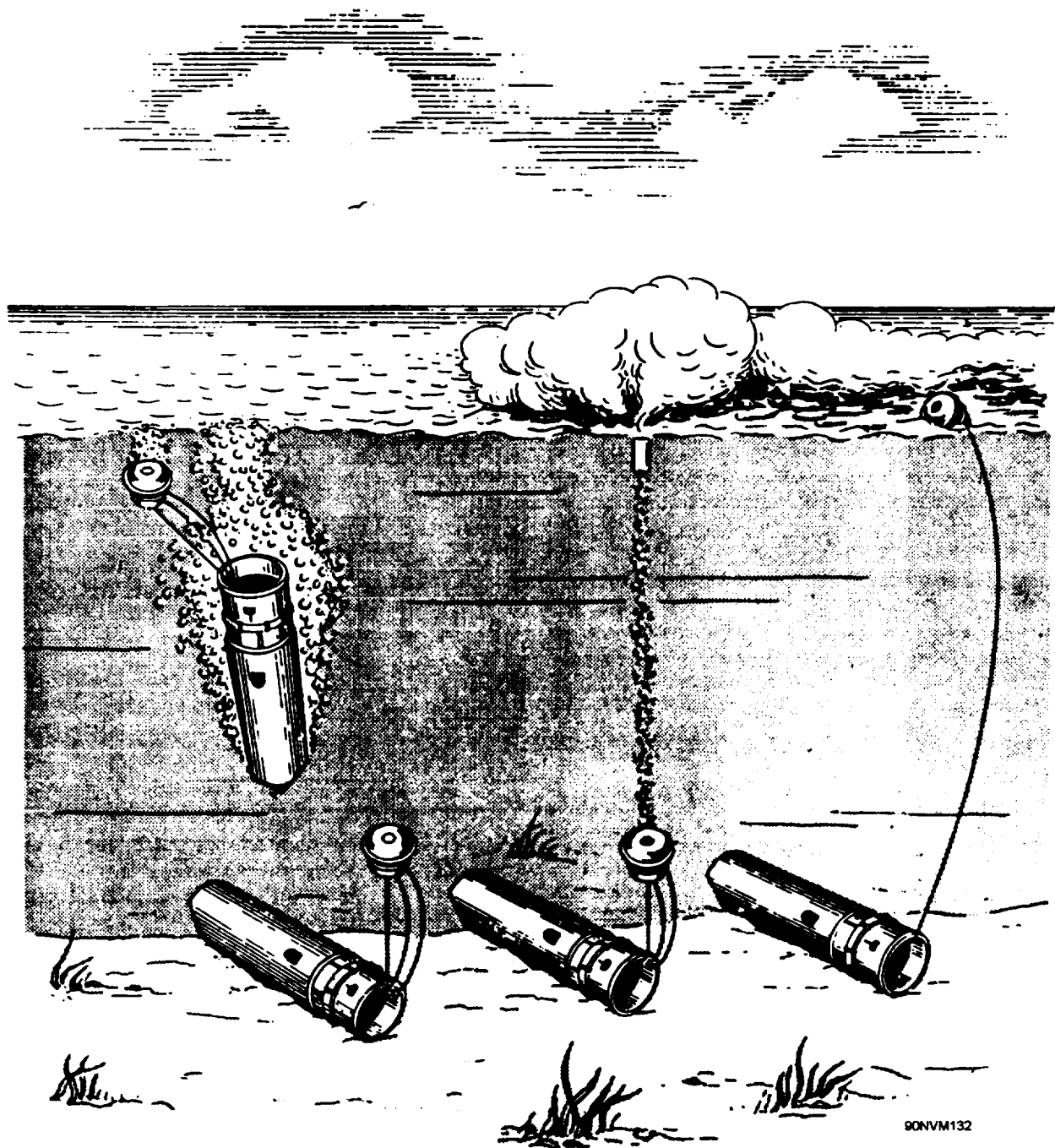


Figure 2-26.—Mk 52 and Mk 55 actuation mines, sequence of operation.

RECOMMENDED READING LIST

NOTE: Although the following references were current when this TRAMAN was published, their continued currency cannot be assured. Therefore, you need to ensure that you are studying the latest revision.

Mine Components A through C; Description and Class-B Criteria, NAVSEA SW550-AA-MMI-010, Naval Sea Systems Command, Washington, D.C., 1988.

Mine Components D through F; Description and Class-B Criteria, NAVSEA SW550-AA-MMI-020, Naval Sea Systems Command, Washington, D.C., 1988.

Mine Components G through W; Description and Class-B Criteria, NAVSEA SW550-AA-MMI-030, Naval Sea Systems Command, Washington, D.C., 1987.

Mirws, Underwater: Actuation, Description, Assembly, and Tests, NAVSEA SW550-AE-MMI-040, Naval Sea Systems Command, Washington, D.C., 1991.

Mines, Underwater: Exercise and Training; Description and Class-B Criteria, NAVSEA SW550-AE-MMI-010, Naval Sea Systems Command, Washington, D.C., 1989.

CHAPTER 3

LAYING, HANDLING, SHOP, HUNTING, AND MECHANICAL SWEEP MINES

LEARNING OBJECTIVES

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

1. Describe the different types of laying mines.
2. Describe the various components used to assemble laying mines.
3. Describe the different types of handling, shop, hunting, and mechanical sweep mines.

The mine exercise and training and evaluation program is designed to provide a constant evaluation of the personnel, weapons systems, and associated equipment. This chapter discusses other exercise and training mines used in this program.

LAYING MINES

Laying mines or laying destructors (DST) are exercise and training (ET) configurations that are used by aircraft and submarine crews to practice mine planting techniques. They evaluate the personnel and the delivery agents in the laying of a mine field. Their cases or explosive sections, as appropriate, are inert loaded to service weight. Except for a weighted instrument rack or a search-coil tube that maintains center of gravity (CG) characteristics, the cases of laying mines contain no internal components. Laying mines are painted orange and white, either white with orange stripes or orange with white stripes.

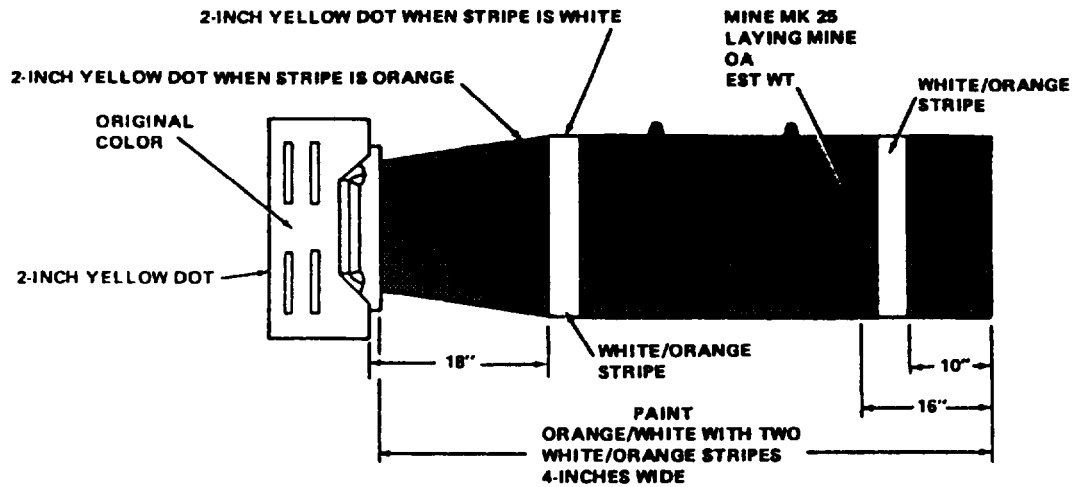
As a Mineman, you will need to know the different types of laying mines and their uses. This section describes the different types of laying mines.

For further information on the description and assembly of laying mines and their components, refer to *Mines, Underwater: Laying; Description, Assembly, and Disassembly*, NAVSEA SW550-AE-MMI-050; and *Mines, Underwater: Exercise and Training; Description and Class-B Criteria*, NAVSEA SW550-AE-MMI-010.

MK 25 LAYING MINE

The Mk 25 laying mine, shown in figure 3-1, is a recoverable, inert-loaded mine case, with a nominal weight of 2,000 pounds. Since a laying mine does not contain target detecting or actuating mechanisms, to maintain the CG and the inertial and ballistics characteristics identical to its service-mine version, the Mk 25 laying mine has concrete in the search coil tube and in the firing mechanism compartment,

If the Mk 25 laying mine is to be recovered, a Mk 87 sonar transmitter is installed in the instrument compartment. For the transmitter to function, a tail cover with four 1/2-inch holes drilled through it is used. The holes allow sea water to enter the instrument compartment to activate the transmitter.



90NVM133

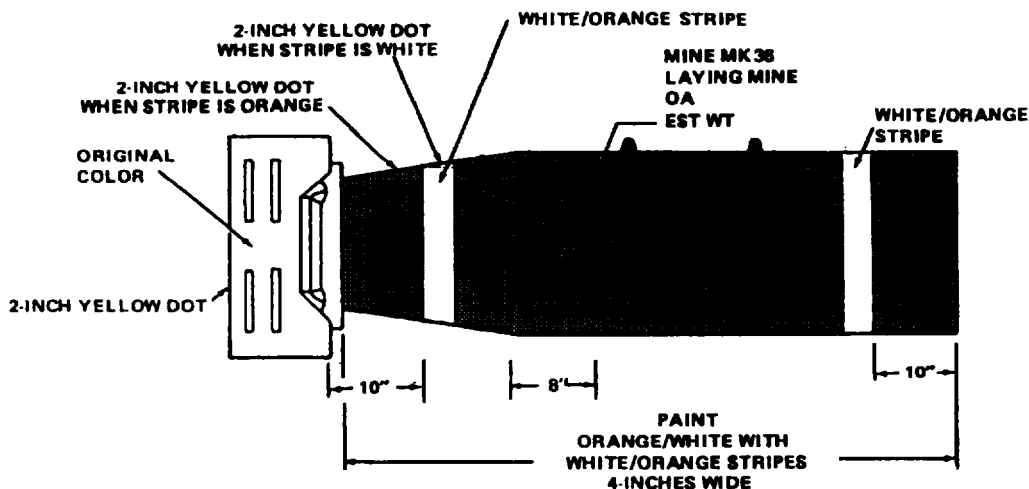
Figure 3-1.—Mk 25 laying mine.

A rubber expanding plug must also be installed in the hydrostatic switch and extender-well conduit to confine the flooding of the mine case to only the instrument compartment.

MK 36 LAYING MINE

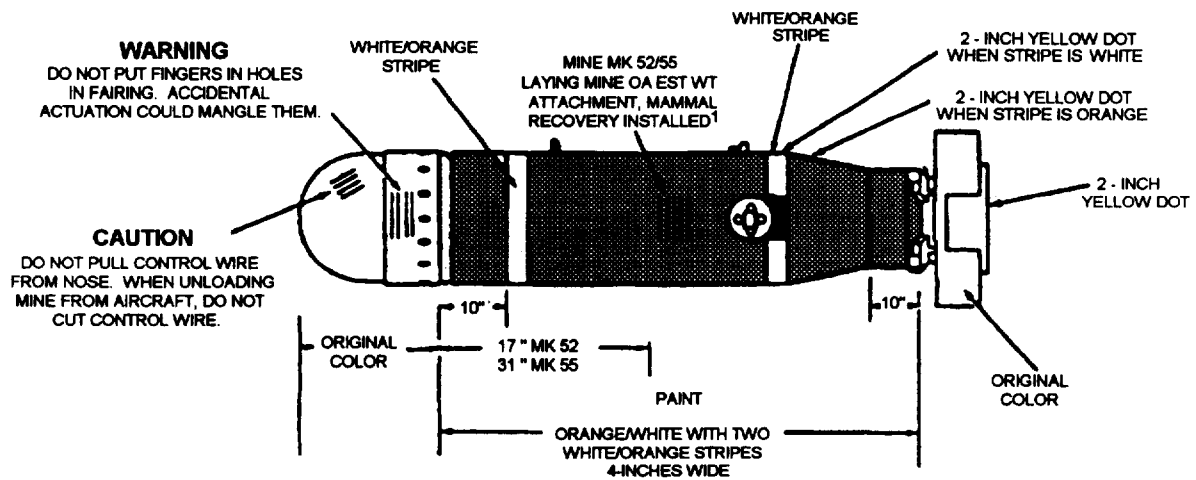
The Mk 36 laying mine, shown in figure 3-2, is a recoverable, inert-loaded mine case, with a nom-

inal weight of 1,000 pounds. The Mk 36 simulates the laying mine characteristics of Mk 52 service mines. Like the Mk 25 laying mine, the search coil tube and the instrument compartment are filled with concrete and the Mk 87 sonar transmitter is located inside the instrument compartment, which is flooded by the four 1/2-inch holes drilled into the tail cover.



90NVM134

Figure 3-2.—Mk 36 laying mine.



¹ THIS STENCIL IS REQUIRED FOR UNITS EMPLOYING THE ATTACHMENT, MAMMAL RECOVERY

90NVM135

Figure 3-3.—Mk 52 and Mk 55 laying mines.

MK 52 AND MK 55 LAYING MINES

The Mk 52 and Mk 55 laying mines, shown in figure 3-3, are inert-loaded shapes identical in size and weight to their service mine counterparts. The Mk 52 has a nominal weight of 1,000 pounds, and the Mk 55 weighs 2,000 pounds. The mines are identical other than size and flight gear.

There are three versions of the Mk 52 and Mk 55 laying mines: one has a locator float tail cover, one has a mammal recovery attachment, and one has the standard three-hole tail cover.

The laying mine with the locator float tail cover has a special tail cover with a locator float well that houses an ejection spring and an orange-colored locator float, all held in the tail cover by the flight gear assembly. Inside the buoyant locator float is a cylinder of coiled float line. One end of the float line is attached to a ring on the tail cover and the other end is secured to the inside bottom of the buoyant float. As the float rises to the surface, the float line is pulled out of the float container.

The laying mine with the mammal recovery attachment contains two components: an extensively modified tail cover and a transmitter holder. An additional sonar transmitter is installed. The modified tail cover has an 8-inch diameter ring welded to the top of the gussets. The sonar transmitter is installed in the transmitter holder at the bottom of the float well. The system allows trained sea lions, equipped with grabber mechanisms, to recover laying mines. The standard version of the Mk 52 and Mk 55 laying mines that use the standard three hole-tail covers does not employ any recovery/locating features.

The Mk 87 sonar transmitter is optional for the Mk 52 and Mk 55 laying mines employing the standard three-hole tail covers and the locator float tail cover. When used, the transmitter is installed on the tail cover of the mine. When using the mammal recovery attachment, the use of the Mk 87 sonar transmitter is mandatory. For this version, the Mk 87 sonar transmitter is mounted in the arming device well. In addition, when using the mammal recovery attachment, a 9-kHz sonar transmitter is installed in the float well of the modified tail cover.

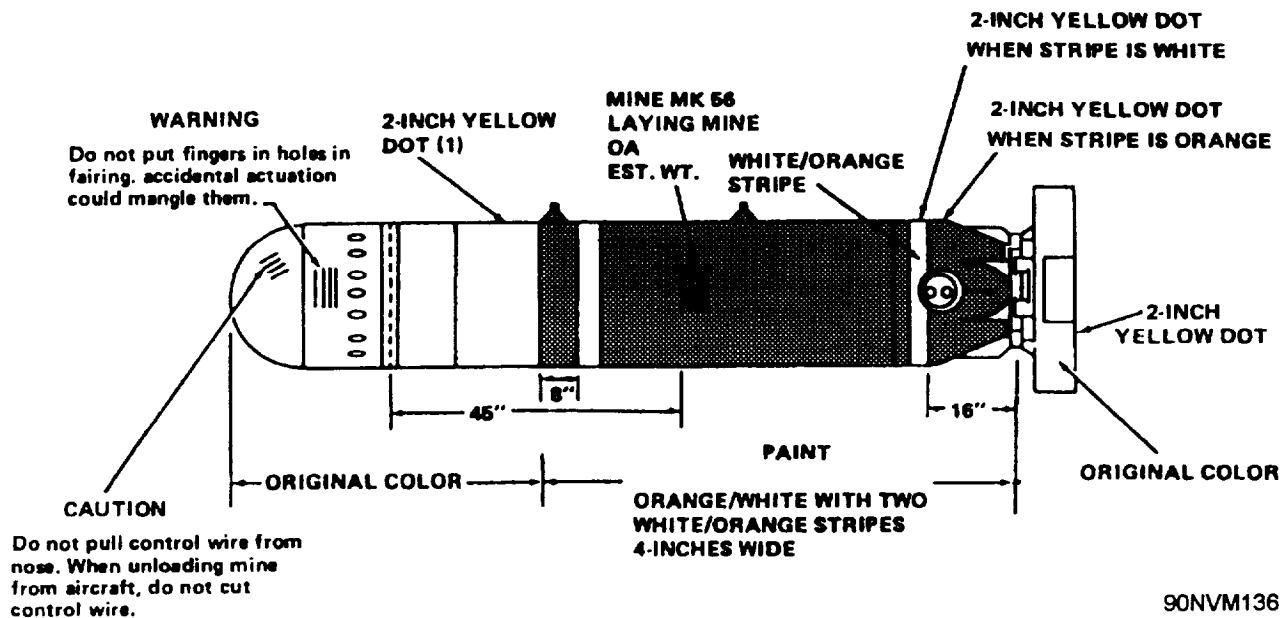


Figure 3-4.—Mk 56 laying mine.

MK 56 LAYING MINE

The Mk 56 laying mine, shown in figure 3-4, is a recoverable, inert-loaded shape identical in weight and size to the service mine counterpart. The Mk 56 laying mine has a nominal weight of 2,000 pounds and consists of a nonfunctional anchor, a mechanism section, an inert-loaded explosive section, an empty arming device, and service-mine flight gear. Since the anchor is nonfunctional, the mine does not separate or moor the buoyant mechanism section.

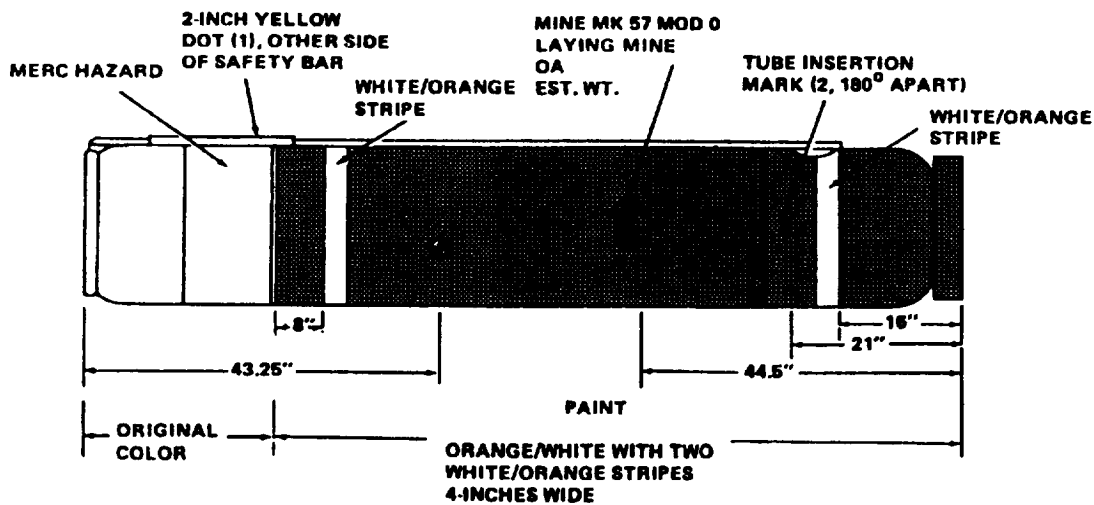
The Mk 56 laying mine does not have a target detecting mechanism, so it is ballasted to maintain weight, CG, and inertial and ballistics characteristics to its service-mine version. This is accomplished by the use of a concrete-filled instrument rack.

To simulate the same weight distribution as to the service mine rack, a steel block is installed in the rack. If the mine is to be recovered, a Mk 87 sonar transmitter is installed on the anchor.

MK 57 LAYING MINE

The Mk 57 laying mine, shown in figure 3-5, is a recoverable, inert-loaded shape identical in size and weight to the service mine. It is designed solely for the training of submarine crews in the techniques of carrying mines and planting mine fields. It has a nominal weight of 2,000 pounds and consists of a modified functioning anchor, a mechanism section, an inert-loaded explosive section, and an empty arming device.

The Mk 57 laying mine does not have a target detecting mechanism; therefore, it is ballasted to maintain weight and CG characteristics identical to its service-mine version. This is accomplished by a concrete-filled instrument rack. Like the Mk 56 laying mine, it has a steel block installed in the rack. The Mk 87 sonar transmitter is installed on the anchor to aid in the recovery of the anchor. The transmitter emits signals to locate the anchor so that a diver can attach a recovery cable.



90NVM137

Figure 3-5.—Mk 57 laying mine.

MK 60 LAYING MINE

The Mk 60 laying mine, shown in figure 3-6, is a recoverable, exercise and training mine identical in size and shape to the service-mine counterpart. The Mk 60 laying mine is designed to train aviation and submarine personnel in the techniques of carrying mines and planting mine fields. It has a nominal weight of 2,000 pounds and consists of an inert-loaded mine case and service flight gear.

The Mk 60 exercise and training mine is issued to the fleet in two operational assemblies (OAs): air launched (OA 01) and submarine launched (OA 02). The Mk 87 sonar transmitter is installed on the rear cover of the mine case.

MK 62 AND MK 63 LAYING MINES

The Mk 62 and Mk 63 laying mines, shown in figures 3-7 and 3-8 respectively, are inert-loaded 500-pound and 1,000-pound general-purpose bombs. They incorporate an inert-loaded Mk 32 arming

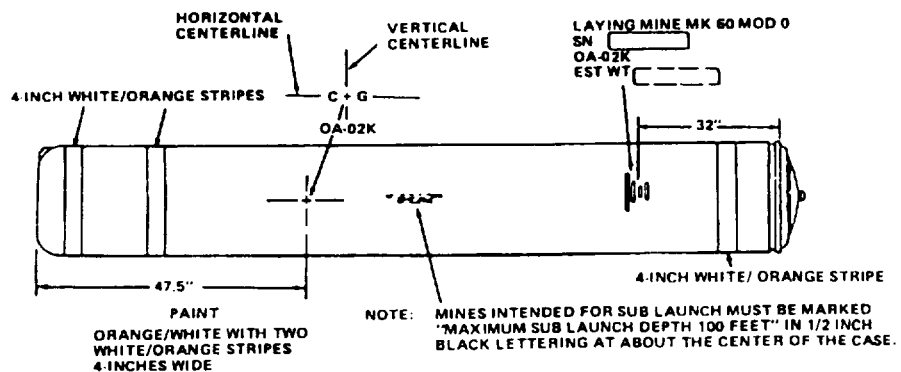
device, a nonoperational Mk 42 firing mechanism, and fully operational fins or tail sections. To facilitate the recovery operation, the mines are equipped with Mk 87 sonar transmitters.

MK 65 LAYING MINE

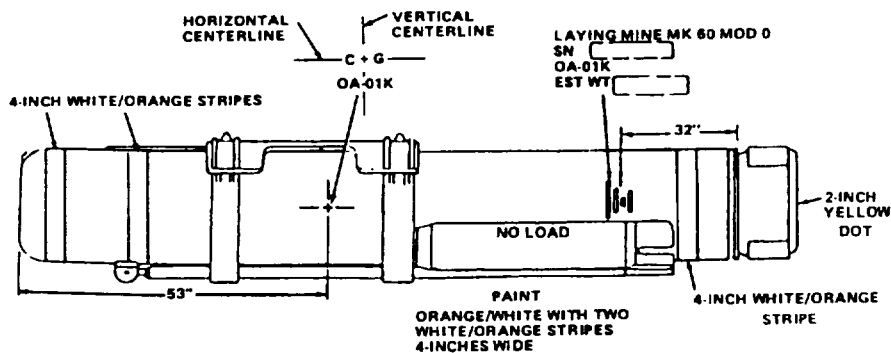
The Mk 65 laying mine, shown in figure 3-9, is a recoverable, inert-loaded shape identical in size and shape to its service-mine counterpart. It has a nominal weight of 2,000 pounds and consists of a mine case, a fairing, a Mk 144 Mod 0 thermal battery, a safety device, and a Mk 7 Mod 1 tail section.

MK 36 AND MK 40 LAYING DESTRUCTORS

The Mk 36 and Mk 40 laying destructors (DSTs), respectively, are 500-pound and 1,000-pound, inert-loaded, general-purpose bombs. They incorporate an inert-loaded Mk 32 arming device, a nonoperational Mk 42 firing mechanism, and fully operational fins or tail sections. To facilitate recovery operations, they are equipped with the Mk 87 sonar transmitter.



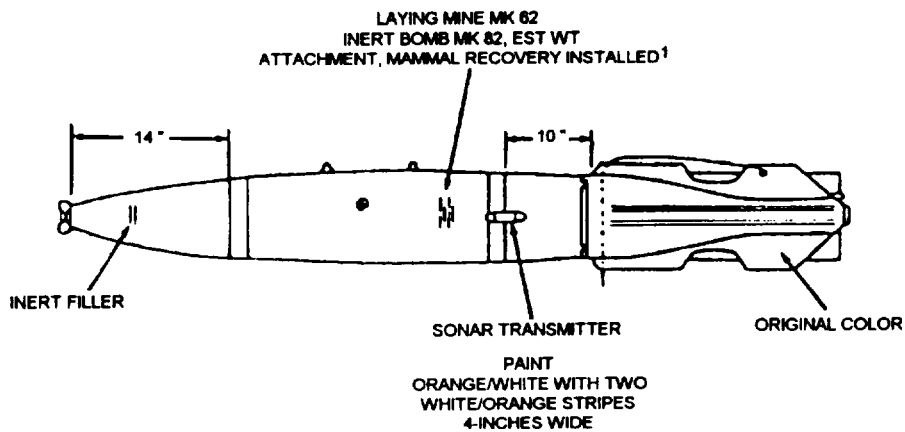
A. SUBMARINE LAUNCH



B. AIRCRAFT LAUNCH

90NVM138

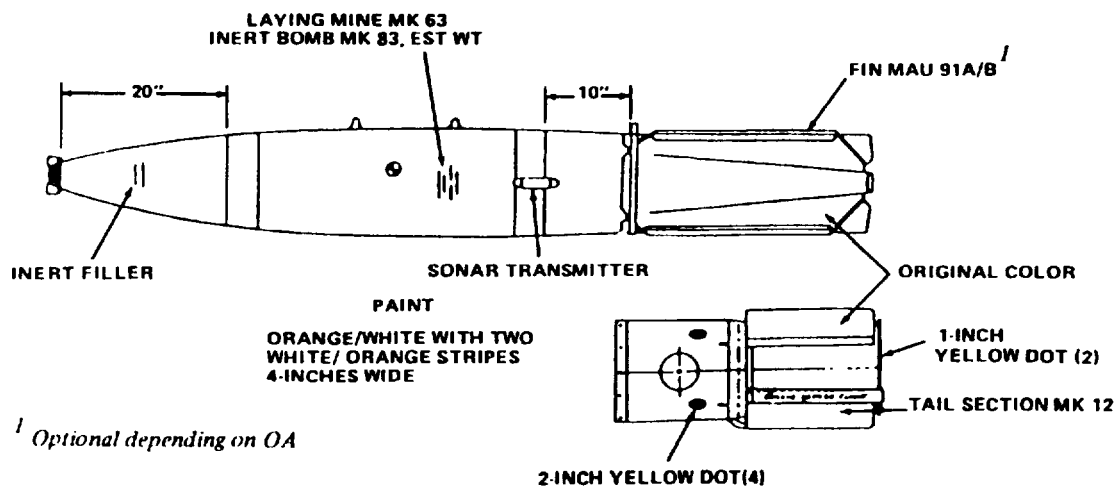
Figure 3-6.—Mk 60 laying mine.



¹ THIS STENCIL IS REQUIRED FOR UNITS EMPLOYING THE ATTACHMENT, MAMMAL RECOVERY

90NVM139

Figure 3-7.—Mk 62 laying mine.



90NVM140

Figure 3-8.—Mk 63 laying mine.

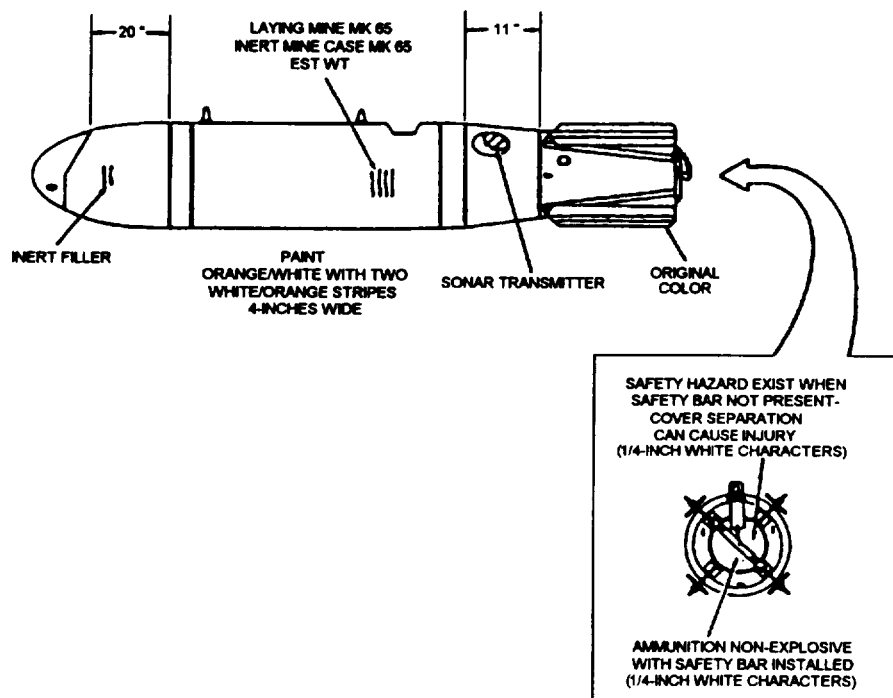


Figure 3-9.—Mk 65 laying mine.

LAYING MINE COMPONENTS

A laying mine contains no internal components, except for a weighted instrument rack or a search-coi I tube that maintains CG characteristics. The Mk 52 and Mk 55 cases may also employ an optional mine-locator float, which installs on the tail cover. A laying mine or a DST incorporates functional flight gear (when applicable) and all components that interface with the planting vehicle. This section describes these components and how they are used in laying mines.

SUSPENSION LUGS

Mk 3, Mk 12, Mk 13, Mk 17, and MS3314 Suspension lugs may be reused for all flight operations if, upon inspection, they exhibit no damage to their threads or to the suspension arch.

SONAR TRANSMITTERS

The Mk 87 sonar transmitter is the most commonly used transmitter. Depending on the laying mine, the Mk 87 transmitter may be installed externally in the arming device well, on the tail cover, or on the side of the bomb case. When the mammal recovery attachment is used on laying mines, an additional sonar transmitter (9-kHz Dukane Model N15A260) is used with the Mk 87.

ARMING DEVICES

The arming devices used on laying mines are identical to those used on their service-mine counterparts. However, they are inert-loaded.

TAIL COVERS

The tail covers for the Mk 25 and Mk 36 laying mines have four 1/2-inch holes drilled through them to allow water entry to activate the Mk 87 sonar transmitter. The Mk 52 and Mk 55 laying mines use tail covers that have a circular steel plate measuring 18 inches in diameter. The plate has a single well welded to the center of the cover,

measuring 11 13/16 inches deep and 8 13/64 inches in diameter, which is used to accommodate a float.

MINE LOCATOR FLOAT

The mine locator float, shown in figure 3-10, is used on the Mk 52 and Mk 55 laying mines. The unit installs in the well of the mine's tail cover and functions as a surface marker for locating and recovering the mine after planting.

The float itself is a polyethylene container 11 inches high and 8 inches in diameter. The container includes a 2-inch-diameter plastic tube with 200 feet of nylon twine. The space surrounding the cavity for the plastic tube is filled with urethane foam. A plastic cover with a feeder hole for the nylon line secures the contents of the container in place.

Connected to the nylon line and external to the container is an 18-inch length of wire rope, called a leader. The free end of the leader includes a shackle, which attaches to the mine's tail cover. The leader functions as a umbilical cord. The plastic tube and the leader are called the line assembly. They are also a part of a replacement parts kit that permits the locator float to be refurbished for reuse.

Additional components of the float include an 8 1/8-inch-diameter polyurethane cushion, an 8 1/8-inch-diameter fiberboard spacer, a coiled spring, three spring clamps, three screws, and three lock washers. The coiled spring and the spacer install beneath the float in the well of the mine's tail cover; clamps, screws, and lock washers hold the spring in place. The cushion installs over the float and is held in place by the mine's flight gear, which also secures the float in the tail cover.

The mine locator float operates as follows: At water impact and upon release of the flight gear, the coiled spring ejects the float from the tail cover. As the mine sinks to the bottom, the nylon line (secured by the leader to the tail cover) pays out, permitting the float to surface and to mark the location of the submerged mine.

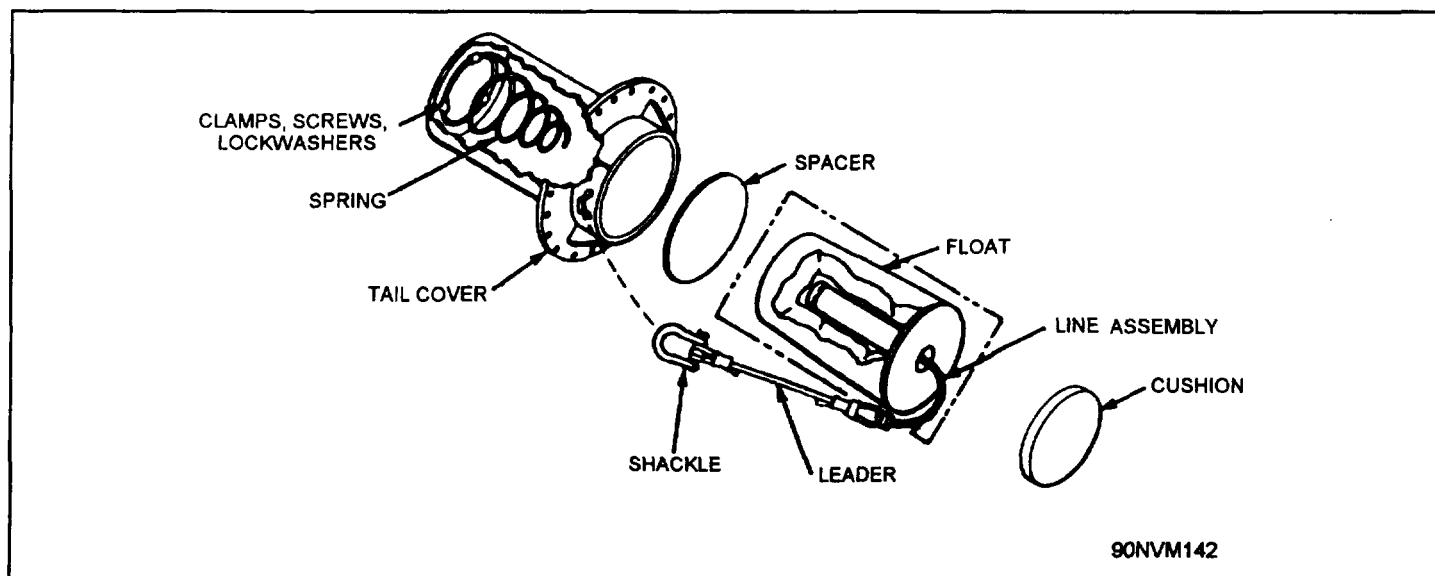


Figure 3-10.—Mine locator float.

FLOAT ASSEMBLY

The float assembly, shown in figure 3-11, is used in the Mk 65 laying mine. It is cylindrical in shape, 6 1/2 inches in diameter and approximately 13 1/2 inches long. The housing is polyethylene foam, which provides buoyancy. The assembly includes a float line attached to the housing and a rapid repair link for attaching the float line to the eyebolt mounted in the float container. This assembly is released when the tail section separates upon water impact. The float assembly is used to locate the laying mine for recovery after deployment exercises.

FLIGHT GEAR

The flight gear used on laying mines is Code A fully functional. The parachute packs use a Mk 112 control unit and a Mk 18 actuator to deploy the parachute after release from the aircraft.

HANDLING, SHOP, HUNTING, AND MECHANICAL SWEEP MINES

To provide proficiency in the loading and planting of mines, we use laying mines. To provide

proficiency in the handling, assembly, hunting, and sweeping of mines, we use mines specifically designed for those reasons. This section describes these mines.

For additional information on the description and assembly of these mines, refer to *Mines, Underwater: Handling, Shop, Mechanical Sweep, and Hunting; Description and Assembly*, NAVSEA SW550-AE-MMI-060.

HANDLING MINE

A handling mine is used to train aircraft and submarine crews in the techniques of mine handling and loading on board. Its case is inert loaded to service weight and contains no internal components, except for a weighted instrument rack used to compensate for weight and CG characteristics.

Externally, the case is fitted with flight gear (when applicable) and all components that interface with the planting vehicle. A handling mine contains no sonar transmitter or explosives and its flight gear is nonfunctional. The handling mine is painted bronze.

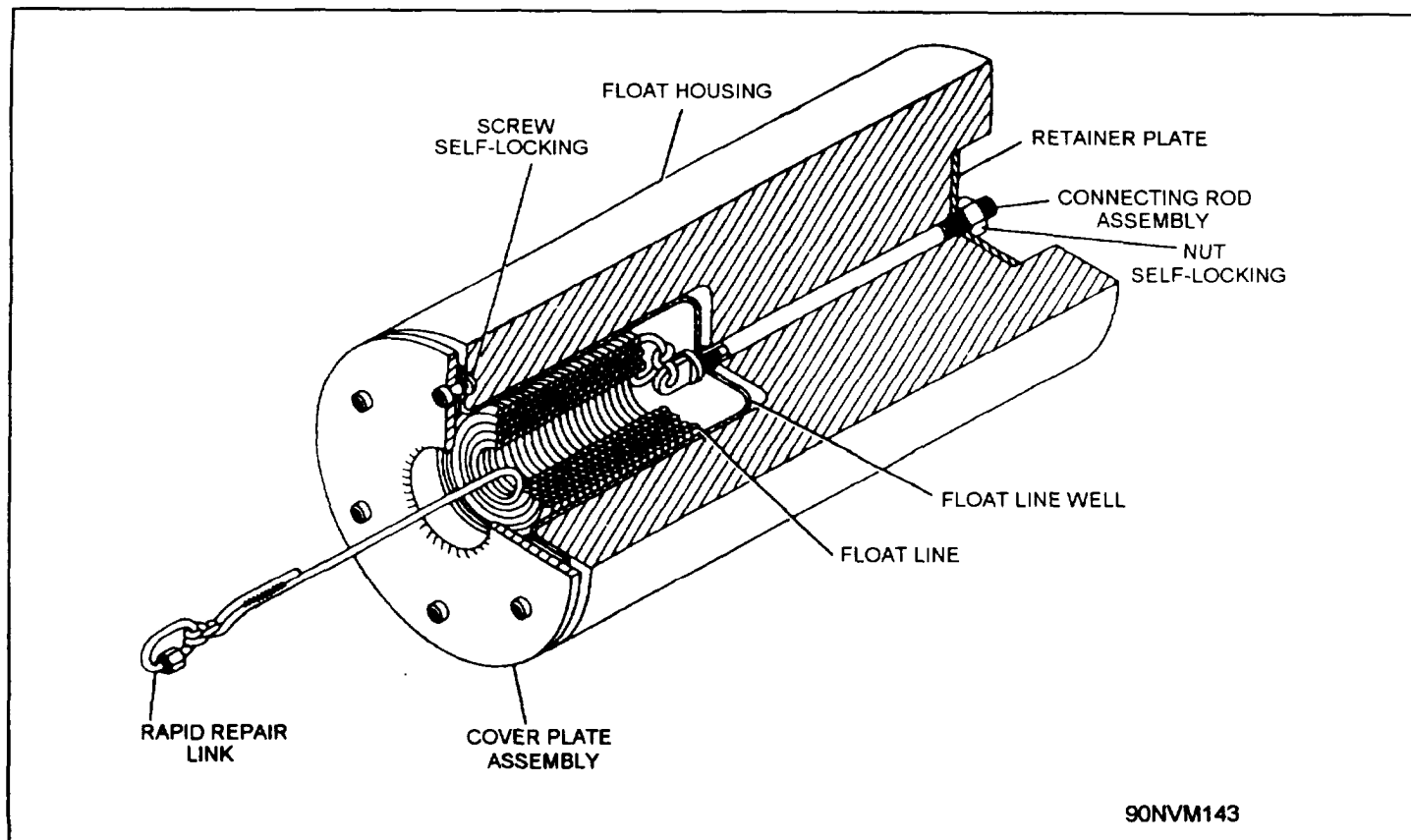


Figure 3-11.—Float assembly.

SHOP MINE

A shop mine is used for instructional purposes and to develop proficiency in mine assembly and testing. Its case is inert-loaded and contains all components necessary to constitute a fully assembled mine. However, dummy or inert loads are substituted for explosive components. The shop mine is painted blue.

HUNTING MINE

A hunting mine is used by mine locating personnel to develop proficiency in the techniques

of mine hunting. Since the purpose of a hunting mine is only to provide a planted shape, any inert laying mine may be used to serve this purpose.

MECHANICAL SWEEP MINE

A mechanical sweep mine, shown in figure 3-12, is an inert-loaded Mk 6 moored mine without actuation mechanisms. It is used for developing proficiency in mechanical minesweeping techniques. The case of the mechanical sweep mine is painted orange with a white stripe. The anchor is painted black.

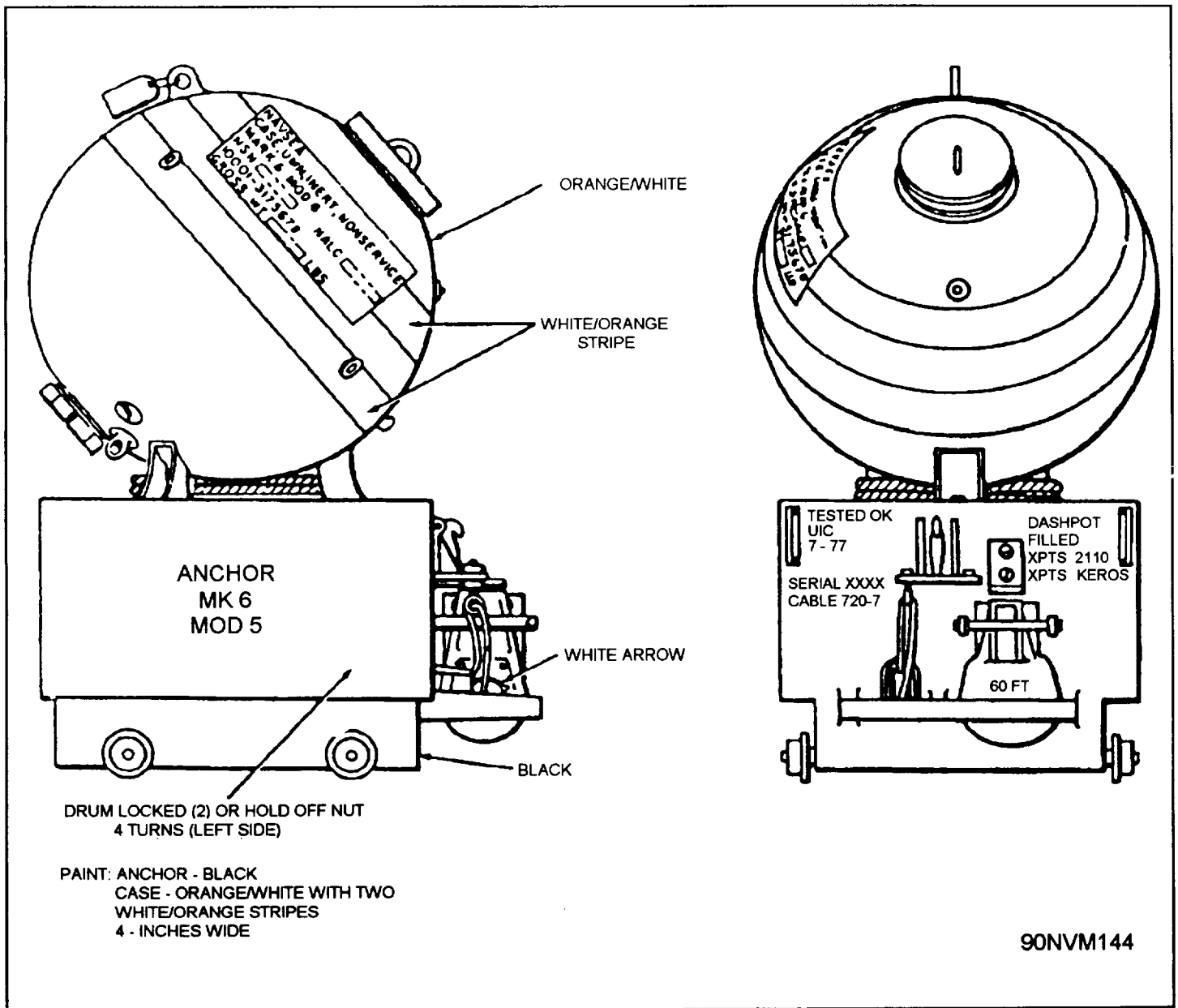


Figure 3-12.—Mk 6 mechanical sweep mine.

RECOMMENDED READING LIST

NOTE: Although the following references were current when this TRAMAN was published, their continued currency cannot be assured. Therefore, you need to ensure that you are studying the latest revision.

Mines, Underwater: Exercise and Training; Class-B Test and Refurbishment, NAVSEA SW550-AE-MMI-020, Naval Sea Systems Command, Washington, D.C., 1989.

Mines, Underwater: Exercise and Training; Description and Class-B Criteria, NAVSEA SW550-AE-MMI-010, Naval Sea Systems Command, Washington, D.C., 1989.

Mines, Underwater: Handling, Shop, Mechanical Sweep, and Hunting; Description and Assembly, NAVSEA SW550-AE-MMI-060, Naval Sea Systems Command, Washington, D.C., 1990.

Mines, Underwater: Laying; Description, Assembly, and Disassembly, NAVSEA SW550-AE-MMI-050, Naval Sea Systems Command, Washington, D.C., 1990.

APPENDIX I

GLOSSARY

The entries listed in this appendix are terms as they are used in this training manual.

ALL-UP ASSEMBLY— A term used to designate a completely assembled ET mine.

ASSEMBLY-LEVEL ITEM— A component, consisting of one or more parts, which is designed to function as an end item in a mine assembly.

MAINTENANCE— The actions required to retain material in a serviceable condition or to restore it to a serviceable condition.

MBOM (Mine Bill of Material)— A computer-produced consolidated list for underwater-mine material.

SPARES— The assembly-level items maintained on site in excess of those installed in mine assemblies.

SUBASSEMBLY— A term used to designate an ET mine storage and shipping configuration.

VISUAL INSPECTION— The class-B testing of mine components by sight, test, or manipulation without the use of test instruments.

APPENDIX II

ABBREVIATIONS AND ACRONYMS

The entries listed in this appendix are abbreviations and acronyms as they are used in this training manual.

CG— Center of gravity

COMINEWARCOM— Commander, Mine Warfare
Command

COMOMAG— Commander, Mobile Mine Assem-
bly Group

CNO— Chief of Naval Operations

DST— destructor mine

ET— exercise and training

NCEA— non-combat expenditure allocation

OA— operational assembly

OCE— officer conducting the exercise

RAM— random-access memory

VEM— versatile exercise mine

APPENDIX III

REFERENCES USED TO DEVELOP THIS TRAMAN

The references listed in this appendix were used to develop this training manual.

Exercise and Training (ET) Mine Material Program, OPNAVINST 8550.9, Chief of Naval Operations, Washington, D.C., 1989.

Guidance for Personnel Assigned in Support of Mine Warfare Exercise and Training (ET) operations, COMOMAG/MOMAGINST 3120.2, Mobile Mine Assembly Group, Chadcston, S.C., 1987.

Information Concerning Mine Warfare Exercise and Training (ET) Material Allowance and Reporting Criteria, COMOMAG/MOMAGINST 8550.9, Mobile Mine Assembly Group, Charleston, S.C., 1994.

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Mine Components D through F; Description and Class-B Criteria, NAVSEA SW550-AA-MMI-020, Naval Sea Systems Command, Washington, D.C., 1988.

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Mine Warfare Exercise and Training (ET) Post Exercise Reporting, COMOMAG/MOMAGINST 8550.1, Mobile Mine Assembly Group, Charleston, S.C., 1988.

Versatile Exercise Mine Mk 74 Mod 0 (VEM); Description and Maintenance, NAVSEA SW550-AE-MMI-070, Naval Sea Systems Command, Washington, D.C., 1993.

Versatile Exercise Mine Mk 74 Mod 0 (VEM); Organizational Level Procedures Rigging, Deployment, and Recovery, NAVSEA SW570-FO-MMO-050, Naval Sea Systems Command, Washington, D.C., 1990.

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