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ERECTING EQUIPMENT FOR BALLISTIC MISSILES(U) FOREIGN
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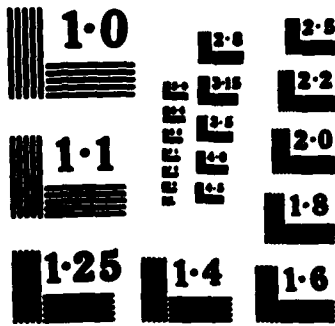
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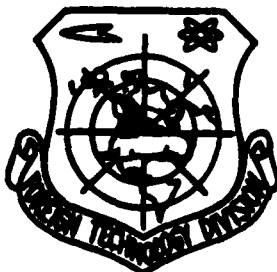
FOREIGN TECHNOLOGY DIVISION



ERECTING EQUIPMENT FOR BALLISTIC MISSILES

by

Wang Linchen



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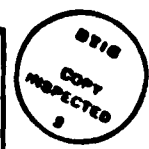
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ERECTING EQUIPMENT FOR BALLISTIC MISSILES

Wang Linchen

There are many types of ballistic missiles and it seems that most of these types of missiles are horizontally placed when transported and are in a vertical state when launched. Because these types of missiles are long cylinders and large in weight, it is also necessary to provide fast speed, accurate and safe missile erecting devices or equipment and the commonly used ones are the gun carriage, lifting and guidance types.

The gun carriage type erecting equipment (as shown in Fig. 1). Some ground mobile missiles and transport vehicles are equipped with gun carriage type erecting equipment but it is actually a launcher. When in ground maneuvers, the missile lies horizontally on the launcher; during war, the transport vehicle stops on a selected position and the gun carriage type erecting equipment is used to erect the missile vertically. This type of equipment is mainly made up of a frame, erector arm, hoisting jack and hydraulic system etc. The transport vehicle can be a wheeled or crawler type trailer or semitrailer and it can also be installed on the chassis of a self-propelled vehicle.

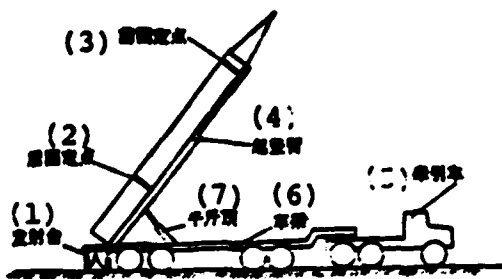


Fig. 1 Schematic of gun carriage type erecting equipment pulled by a tractor.

Key: (1) Launching stand; (2) Rear fixed point; (3) Front fixed point; (4) Erector arm; (5) Tractor; (6) Frame; (7) Hoisting jack.

The frame is the main basic structure for supporting the missile and on most frames there is installed a mechanical or hydraulic extendable support. During the transporting process, the support draws back and is fixed together with the frame. During war, the support is extended out and supported on the ground so that the wheels can be unloaded and loaded and they can regulate the level of the erecting equipment so as to guarantee stability when firing.

The erector arm is an important stress part and when erecting the missile the erector arm pulls the missile up. Its structural form and size are determined by the weight and size of the missile and it is generally made from high strength metal molding material. One side of the erector arm is hinged to the frame and when erecting, the winding hinge axis supports the missile. The front and rear of the missile are fixed with the erector arm and the fixed point must be reliable as well as convenient for removal. The rear fixed point must guarantee that the missile is fixed on firmly and the front fixed point allows a certain displacement along the axial direction. After the missile is erected vertically, it is located on the launching stand.

The hoisting jack is the execute part for erecting the missile and erector arm. At present, the commonly used type is the astronomical telescope type jack. It is composed from 3-4 sleeve parts. This type of structure is relatively compact, extension and drawing back are steady and smooth and use is convenient. It requires very good sealing and it is necessary to have very stringent requirements to guarantee quality during manufacturing.

The applied force of the extension and drawing back of the hoisting jack is supplied by the hydraulic system (Fig. 2). The hemispherical head of the lower end of the hoisting jack is located in the ball socket on the frame and the support ear of

the upper end is connected on the erecting arm. When erecting the missile, connect the electric machine, start the oil pump, open valve 2, close valves 1 and 4 and the fuel in the fuel tank passes valves 2 and 6 by pressurized flow. The action reaches positive pressure cavity A of the jack and thus the sleeve of the jack extends out based on the sequence of III II I → II I → I and the missile is then gradually erected. The erecting speed is controlled by regulating valve 3 and the smaller the opening of valve 3 the faster the speed of the rise and conversely it is slower. If they want to extend the level IV sleeve of the jack, it is necessary to open valve 4. At this time, the fuel of back pressure cavity B can flow back to the fuel tank. If they want to return the missile from a vertical to a horizontal position, they open valves 1 and 4, close valve 2 and start the fuel pump. Thus, the fuel will pass valves 1 and 4, act in cavity B and sleeve IV of the jack will draw back. If the returning speed is too fast, from the automatic safety of valve 6, during the decreasing process, the return flow speed is controlled by valve 5. When the sleeve lowers to position, the closed fuel pump relies on the dead weight lowering of the erector arm and missile and the speed can be realized by regulating valve 3.

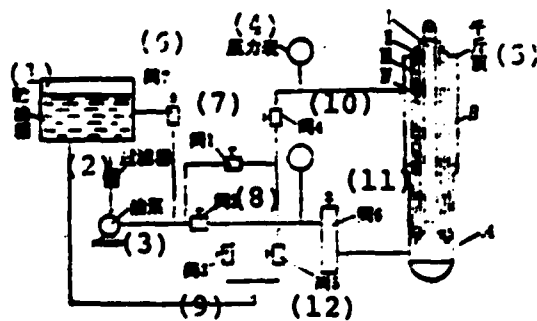


Fig. 2 Schematic of the hoisting jack's hydraulic system.

Key: (1) Fuel reserve tank; (2) Filter; (3) Fuel pump;
 (4) Pressure meter; (5) Hoisting jack; (6)-(12)
 Valve.

The structure of gun carriage type erecting equipment is compact and it is excellent erecting equipment for mobile ballistic missiles.

The lifting type erecting equipment. The weights of some large intercontinental missiles reach to 60 and 70 tons and in the past most were deployed in underground silos. When this type of missile is installed, they first use a crane to lift it up horizontally and afterwards turn it over in space to a vertical position. It is aimed at the center of the launching silo and then lowered so that the missile sits on the launching stand at the bottom of the silo. This type of crane always has interchangeability and when necessary it is lifted up vertically by several cranes or auxiliary equipment. During the erecting process, the operation of the missile is complex, the sustained time is long, the operating area is large and easily reveals the target. As soon as the missile is installed in place, it is placed in a launch position and usually not shifted again.

The guidance type erecting equipment. Guidance type erecting equipment is usually special erecting equipment for a certain type of missile. For example, this type of equipment is used when "Minuteman" missiles of the United States are erected in launching silos. As shown in Fig. 3, it is composed from a guide arm, erector arm hoisting jack, lift etc. The guide arm is firmly erected on the silo wall and aside from using it to erect and remove missiles, it can also be used by operating personnel when servicing and maintaining missiles. A specially made heat preservation tank is installed on the erector arm and the temperature regulating system guarantees the temperature environment of the missile while in transport and storage. The operating fuel pressure when erecting is 210kg/cm^2 and the hoisting jack is composed from a three section sleeve which can sustain a load of 50 tons (the weight of the "Minuteman" missile is 32 tons). The load of the lift structure is 45 tons and after vertical lifting it then lowers to a depth of 22 meters.

Based on reports, this type of equipment can erect a "Minuteman" missile from a transport vehicle into a launching silo in 36 minutes.

At present, following the miniaturization of missiles, transport vehicles usually have both types of equipment which can travel everywhere on road surfaces. In this way, they can avoid the danger of encountering enemy missile attacks at any time as in the case of fixed missiles and it can also raise the survival capabilities of the missiles.

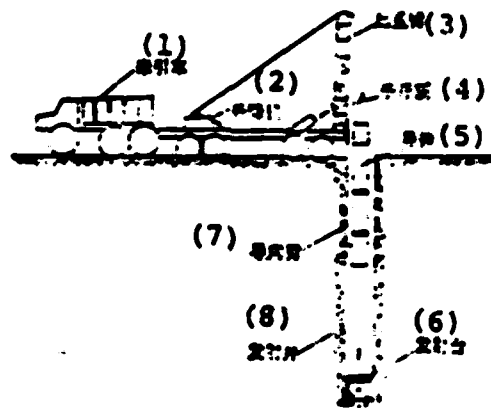


Fig. 3 Schematic of guidance type erecting equipment.

Key: (1) Tractor; (2) Lifter; (3) Erector arm;
(4) Hoisting jack; (5) Missile; (6) Launching stand; (7) Guide arm; (8) Launching silo.

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