A fixture is provided for supporting load from weapons recoil, being mountable on a flat bed of a road vehicle disposed on ground. The flat bed can receive a weapons mount. The vehicle has longitudinal, lateral and vertical orientations. The fixture includes a box brace, a recoil platform, first and second brackets, first and second beams, first and second posts and a deck. The box brace extends in the lateral direction. The recoil platform is parallel to the brace. The first and second brackets extend from the platform in the longitudinal direction. The beams are disposable parallel to the brace. The beams are translatable in the lateral direction. The first and second posts extend in the vertical direction downward from respective the first and second beams. The deck can receive the weapons mount, and is disposable on the platform and the brackets. The posts are retractable for stowage and extendible for raising the flat bed above the ground.
MOUNTABLE FIXTURE FOR ABSORBING RECOIL

STATEMENT OF GOVERNMENT INTEREST

The invention described was made in the performance of official duties by one or more employees of the Department of the Navy, and thus, the invention herein may be manufactured, used or licensed by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

BACKGROUND

The invention relates generally to vehicular support for a weapons platform. In particular, the invention relates to stands with retractable legs for shock absorption while firing.

SUMMARY

Conventional vehicle supports for weapon systems yield disadvantages addressed by various exemplary embodiments of the present invention. In particular, various exemplary embodiments provide a fixture for supporting load from weapons recoil, being mountable on a flat bed of a road vehicle disposed on ground. The flat bed can receive a weapons mount. The vehicle has longitudinal, lateral and vertical orientations.

In exemplary embodiments, the fixture includes a box brace, a recoil platform, first and second brackets, first and second beams, first and second posts and a deck. The box brace extends in the lateral direction. The recoil platform is parallel to the brace. The first and second brackets extend from the platform in the longitudinal direction.

In exemplary embodiments, the beams are disposable parallel to the brace. The beams are translatable in the lateral direction. The first and second posts extend in the vertical direction downward from respective the first and second beams. The deck can receive the weapons mount, and is disposable on the platform and the brackets. The posts are retractable for stowage and extendible for raising the flat bed above the ground. Other various embodiments alternatively or additionally provide for stabilizing legs mounted to the deck.

BRIEF DESCRIPTION OF THE DRAWINGS

These and various other features and aspects of various exemplary embodiments will be readily understood with reference to the following detailed description taken in conjunction with the accompanying drawings, in which like or similar numbers are used throughout, and in which:

FIGS. 1A and 1B are perspective views of an exemplary platform-carrying truck;

FIG. 2 is a first perspective view of a platform fixture;

FIG. 3 is a second perspective view of the platform fixture;

FIG. 4 is a detail perspective view of the fixture;

FIG. 5 is a perspective view of an optional wheel mount;

FIG. 6 is a perspective view of a fixture leg;

FIG. 7 is a third perspective view of the platform fixture on the truck;

FIG. 8 is an elevation view of the platform fixture on the truck;

FIGS. 9A and 9B are perspective views of the truck with a base;

FIGS. 10A through 10D are side elevation views of the truck and fixture; and

FIGS. 11A and 11B are rear elevation views of the truck and fixture.

DETAILED DESCRIPTION

In the following detailed description of exemplary embodiments of the invention, reference is made to the accompanying drawings that form a part hereof, and in which is shown by way of illustration specific exemplary embodiments in which the invention may be practiced. These embodiments are described in sufficient detail to enable those skilled in the art to practice the invention. Other embodiments may be utilized, and logical, mechanical, and other changes may be made without departing from the spirit or scope of the present invention. The following detailed description is therefore, not to be taken in a limiting sense, and the scope of the present invention is defined only by the appended claims.

The Naval Surface Warfare Center Dahlgren Division (NSWCDD) has been tasked by the Office of the Secretary of Defense (OSD) to determine the feasibility of integrating an Enhanced Mortar Targeting System (EMTAS) onto a wheeled tactical platform or truck vehicle. The vehicle’s suspension supports the recoil of the EMTAS with minor or no modifications done to the vehicle, which has the capability to store 120 mm rounds and extra charges. The vehicle has the means to lift the EMTAS off the vehicle’s flat bed and setting the vehicle on the ground if needed for firing operation.

The Mobile Modular Weapon Platform Fixture System (MMWPFS) constitutes a system in which all these components together work in conjunction in unison to absorb extremely high recoil forces generated by the weapon system and transmit them to the ground surface without causing damage to the vehicle. Conventional platforms for a weapon system are available for a specific military vehicle but cannot be utilized outside the vehicle, leading to operational damage to vehicles and platform structure.

FIGS. 1A and 1B show perspective views 100 of an exemplary vehicle assembly disposed on the ground 110 with a compass rose 120 that indicates longitudinal (x), lateral (y) and vertical (z) directions. The longitudinal directional points forward; the lateral direction points port and the vertical (or azimuth) direction points upward. The military vehicle 130 (e.g., truck) includes a cab 140 (for seating driver and/or passenger), a truck flat bed 150 and wheels 160. In the assembly, the flat bed 150 includes the Mobile Modular Weapon Platform Fixture System (MMWPFS) or fixture 170.

FIG. 2 shows a perspective view 200 of the fixture 170 as deployed for positioning on the ground 110. The stand 170 includes a deck 210 with hand rail 220, and is supported by legs 230 and a stand 240. The deck 210 includes a plurality of holes along the periphery and as a mesh on the surface to facilitate attachments of auxiliary equipment. A ladder 250 can be connected to enable personnel to climb from the ground 110 to the deck 210.

FIG. 3 shows a detail perspective view 300 of the fixture 210. The stand 240 includes port and starboard lateral posts 310 and 320, each of which connects to an extension beam: a fore beam 330 and an aft beam 340. The stand 240 further includes an attachment plate 350 for mounting to the deck 150. The stand 240 optionally includes detachable
recoil wheel mounts 360 that attach to the posts 310 and 320 and enable repositioning the stand 240. FIG. 4 shows a detail perspective view 400 of the fixture 170 with the stand 240. A box beam brace 410 reinforces longitudinal stability against sudden forces from weapons firing. The extension beams 330 and 340 extend parallel and adjacent to the beam brace 410. A horizontal plate 420 connects the beam brace 410 to a recoil box platform 430 with a damper 435 therebetween. The recoil platform 430 supports the deck 210. A pair of longitudinal brackets 440 extend forward (i.e., perpendicular) from the recoil platform 430 to support a bottom plate 445. An extendible slide rail 450 attaches to each bracket 440. For the fixture 170 installed on the vehicle 130, the box brace 410, recoil box and damper 435 are longitudinally oriented parallel to the lateral (y) direction of the compass rose, and similarly the brackets 440 and rails 450 are longitudinally oriented parallel to the longitudinal (x) direction.

Vertical plates 460, 465 and 470 separate the extension beams 330 and 340 from the beam brace 410, with springs and dampers therebetween. For the fixture 170 connected to the vehicle 130, these plates 350, 460, 465 and 470 are perpendicular to the (y) longitudinal direction. A mid-post 480 extends downward from the beam brace 410, as the lateral posts 310 and 320 extend from their respective beams 330 and 340. The posts 310, 320 and 480 engage the ground 110 by recoil shoes 490 and are lengthwise adjustable for vertical retraction and extension. The brace 410, platform 430, and beams 330 and 340 have rectangular cross-sections and are composed of steel. The plates 460, 465 and 470 also comprise steel, as do the posts 310, 320 and 480.

A stem 530 extends from each respective branch parallel to the trunk 510. An axle 540 mounts to each stem 530. A tire wheel 550 that can engage the ground 110 attaches to each axle 540. FIG. 6 shows a perspective view 600 of each leg 230, which is adjustable in length. The leg 230 includes an upper portion 610 and a lower portion 620 that telescopes into or out of the upper portion 610. The lower portion 620 terminates in a pad 630 that engages the ground 110. The fixture 170 typically includes three legs 230 when deployed. While in transit by the vehicle 130, the legs 230 can be stowed.

FIG. 7 shows a perspective view 700 of the fixture 170 mounted to the flat bed 150 of the vehicle 130. A pivotable mortar base 710 can be disposed on the deck 210. The base 710 constitutes the turn table for the EMTAS. FIG. 8 shows a side elevation view 800 of the fixture 170 mounted to the flat bed 150. The compass rose 120 shows the orientation of the vehicle 130 facing to the right (and port away from the viewer). The legs 230 and stand 240 elevate the wheels 160 off the ground 110 and dispose the deck 210 a specified vertical distance (e.g., 73.93 inches) therefrom. The deck 210 slideably connects to the flat bed 150 by the brackets 440 and the recoil platform 430. The legs 230 attach to the deck 210, or alternatively to the bottom plate 445, by hook brackets 810 that can connect and detach as needed.

FIGS. 9A and 9B show perspective views 900 (analogous to FIG. 1B) of the vehicle 130 with the stand 170. FIG. 9A shows the deck 210 including the turn table base 710. FIG. 9D shows such a weapon 910 mounted on a saddle 920 disposed on the base 710 that attaches to the deck 210. The mortar 910 constitutes, for example, a Recoiling Mortar System RMS6-G or else an RMS 6-L. FIGS. 10A, 10B, 10C and 10D show side elevation views 1000 (analogous to FIG. 8) of the vehicle 130 with the stand 170.

FIG. 10A shows the fixture 170 attaching to the vehicle 130 with posts 310, 320 and 480 retracted for road transport. FIG. 10B shows the posts 310, 320 and 480 extended and the wheels 160 elevated above the ground 110. FIG. 10C shows the legs 230 engaged between the stand 210 and the ground 110, and the ladder 250 installed. FIG. 10D shows the vehicle 130 moving away (i.e., forward) from the fixture 170, as deployed. FIGS. 11A and 11B show rear elevation views 1100 of the vehicle 130 and the fixture 170, with the compass rose 120 showing the vehicle 130 facing forward away from the viewer. FIG. 11A shows the fixture 170 as stowed for road transport, with the posts 310, 320 and 480 retracted. FIG. 11B shows the fixture 170 deployed for shock absorption, with the beams 330 and 340 extended outward and the posts 310, 320 and 480 extended downward.

The typical setup time when transporting and using the MMWPFS to fire the weapon (e.g., mortar 910) is reduced approximately by half (ground fire or attached to vehicle 130). Also the fixture 170 can be attached or carried on the rear of a government vehicle for quick transportation and operation for Forward Operating Base (FOB). In view 200, each individual post 310, 320 and 480 can be operated manually using hand cranks and gears, or else hydraulically or with an electric motor. The deck 210 can be pushed in and retracted up by turning the winch on the vehicle 130 such as a jack.

Conventionally, there are no currently fielded platforms capable of deploying a large weapon system that is: 1) easily transported on a variety of vehicles; 2) fire while being transported; and 3) fire from the ground 110 without major alterations. Conventional systems enable large weapon systems to be either ground fired or vehicle fired, but not both. The ground fired systems are also unable to be used while being transported.

Exemplary embodiments enable the weapon system, e.g., mortar 910, to be fired from the vehicle 130 during transport without dismounting. The deck 210 can be adjusted vertically by approximately 5 inches from the ground 110. Whenever weapon system that is integrated adds approximately 4 feet to each of these values (6 feet from the ground 110 or 9 feet from the ground 110 when fired on the flat bed 150 of the vehicle 130. When fired off the rear of the vehicle 130, the fixture 170 is able to receive all the recoil force. Analysis was performed on the EMTAS and MMWPFS using the 5-ton truck (M1083) Family Medium Tactical Vehicle (FMTV) family. The RMS6-G Recoil Mortar (EMTAS) can be fired off the fixture or off the top of a flat bed 150 of the vehicle 130.

A Dynamic Finite Element Analysis (FEA) has been performed on the M1083 truck to determine whether the vehicle’s frame and suspension system could withstand the EMTAS or RMS 6-L. (120 mm Mortar) 40 meter recoil forces when fired off the top of the flat bed 150. The analysis showed that the recoil forces are so strong that the frame structure would be damaged when fired. Some sort of reinforcement would be necessary underneath the weapon system in order to transmit the forces directly to the ground 110 without depending on the vehicle’s structure. Also the reaction of the recoil forces is so rapid that the suspension system cannot react on time and the shocks of the system would bottom out and suffer severe damage. A static Finite Element Analysis (FEA) was performed on the MMWPFS using the Structural Steel (ASTM-A36) series steel, and the results
were acceptable. The fixture 170 can withstand approximately 40 metric tons of recoil forces.

[0034] Human system integration provides the hand rail 220 to reduce personnel hazard from falling off the deck 210 and the ladder 250 to enable an operator to climb onto the deck 210 or the flat bed 150. The deck 210 has several hole mounts in order to accommodate any rail or weapon system that could withstand the recoil forces when fired therefrom (e.g., 81 mm, 120 mm Mortar, 2.75 rocket motor 19/7 tube launcher, Small UAV Drone, or else a base as a lookout tower by using armor instead of the hand rail 220).

[0035] The recoil platform 430 provides spring action to absorb some of the recoil forces transmitted from the weapon (in x, y and z) motion that are then reduced through recoil containment plates 460, 465 and 470, which are designed to reduce the recoil forces of the weapon 910 as these forces are transmitted to the ground 110. Within and between these plates 460, 465 and 470, this recoil containment constitutes an array of part working together in unison (e.g., springs, shock absorbers, rubber mounts, etc.) to absorb that vibrational energy. The pair of extendable beams 330 and 340, splaying in the lateral (y) direction, assist to stabilize the vehicle 130 and the fixture 170 when firing the mortar weapon 910.

[0036] A triplet of vertically adjustable recoil posts (i.e., one center 480 and two adjacent 310 and 320) level the MMWPS system. These posts 310, 320 and 480 are adjustable to different heights to set as a strong column in transmitting all the recoil forces to the ground 110. Three recoil shoes 490 receive the recoil forces from the posts 310, 320 and 480 and distribute these forces to the ground 110. The three sets of retractable stabilizer legs 230 and their pads 630 to engage the ground 110 provide stability for the MMWPS and the vehicle 130 in the longitudinal (x) and lateral (y) directions when the mortar 910 is fired.

[0037] A universal mount 710 on the deck 210 with little or no modification made to attach and transport the MMWPS with a Marine (M1T1R), Army (FMTV), or Air force vehicle (tri-service). The removable recoil legs 230 are used to move the vehicle 130 (short distance), and the MMWPS on a level ground 110 without a vehicle 130 for easy installation when attaching to vehicle 130 or to raw on to the vehicle platform. The Mobile Modular Weapon Platform System is intended to provide a stand for integration with an existing military vehicle that would enable the operation of a weapon system directly or off from the vehicle, as well as withstand the weight, and recoil forces of the weapon without damage to platform, weapon system and vehicle structure.

[0038] The principal feature of the Mobile Modular Weapon Platform System is the ability to utilize the mass of the top carriage to help moderate double recoil forces. Two recoil systems are involved the primary system of the gun, which is directly affected by the dynamic of the round and the secondary system of the top carriage that controls the impetus of the primary system. This fixture 170 has the flexibility of being used while mounted directly to varieties of military vehicle 130 and also independently. The fixture 170 can withstand the weight and recoil forces in order to prevent damage to the deck.

[0039] While certain features of the embodiments of the invention have been illustrated as described herein, many modifications, substitutions, changes and equivalents will now occur to those skilled in the art. It is, therefore, to be understood that the appended claims are intended to cover all such modifications and changes as fall within the true spirit of the embodiments.

What is claimed is:

1. A fixture for providing load support from weapons recoil and mountable on a flat bed of a road vehicle disposed on ground, said flat bed able to receive a weapons mount, said vehicle having longitudinal, lateral and vertical orientations, said fixture comprising:

   a. a box brace extending in the lateral direction;
   b. a recoil platform parallel to said brace;
   c. first and second brackets extending from said platform in the longitudinal direction;
   d. first and second beams disposable parallel to said brace, said beams being translatable in the lateral direction;
   e. first and second posts extending in the vertical direction downward from respective said first and second beams;
   f. a deck for receiving the weapons mount, said deck being disposable on said platform and said brackets;

   wherein said posts are retractable for stowage and extendible for raising the flat bed above the ground.

2. The fixture according to claim 1, further comprising:

   a. a second post extending in the vertical direction downward from said box brace.

3. The fixture according to claim 1, wherein each post further includes a shoe for engaging the ground.

4. The fixture according to claim 2, wherein each post further includes a shoe for engaging the ground.

5. The fixture according to claim 1, further comprising:

   a. a plurality of stabilizing legs attachable to said deck.

6. The fixture according to claim 5, wherein each leg further includes a pad for engaging the ground.

7. The fixture according to claim 1, wherein each post further includes a shoe for engaging the ground.

8. The fixture according to claim 1, said first beam is disposed forward of said box brace, and said second beam is disposed aft of said box brace.

9. The fixture according to claim 1, further comprising:

   a. a damper disposable between said box brace and said recoil platform.

10. The fixture according to claim 1, further comprising:

    a. an attach plate for mounting to said flat bed.

11. The fixture according to claim 1, further comprising:

    a. a wheel mount for each of said first and second posts.

12. The fixture according to claim 1, further comprising:

    a. a plurality of recoil plates perpendicular to the longitudinal direction separating said beams and said recoil box from each other.

13. The fixture according to claim 12, further comprising:

    a. a horizontal plate perpendicular to the vertical direction disposed on said recoil box, said horizontal plate supporting said brackets.

14. The fixture according to claim 12, further including an attachment plate connecting to one of said plates for mounting to the flat bed.

15. The fixture according to claim 1, the weapons mount is a turn table.

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