Aug. 23, 1960 R. E. NEARMAN 2,950,123

DOLLY, WEAPON COMPONENT TRANSFER, SUSPENDED TYPE

Filed July 31, 1959 5 Sheets-Sheet 1

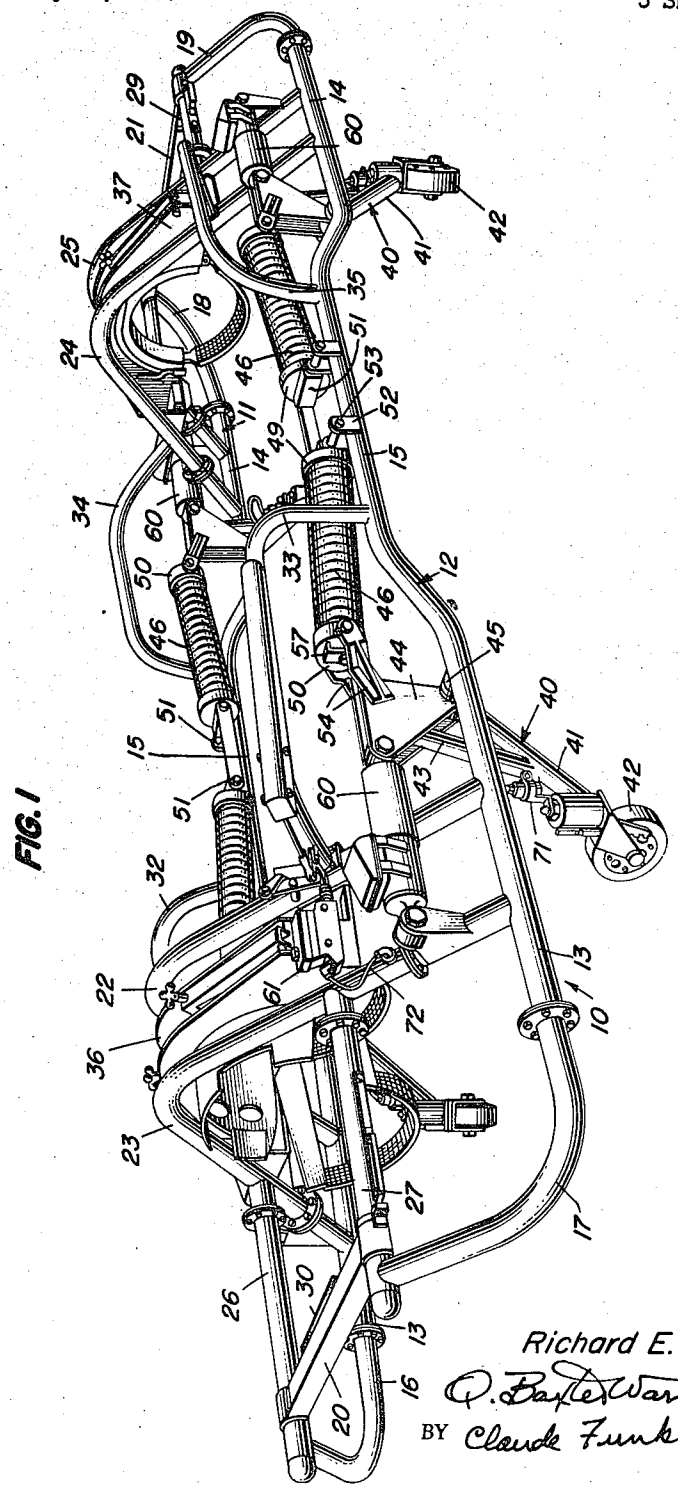


FIG. 1

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DOLLY, WEAPON COMPONENT TRANSFER, SUSPENDED TYPE

Filed July 31, 1959 5 Sheets-Sheet 2

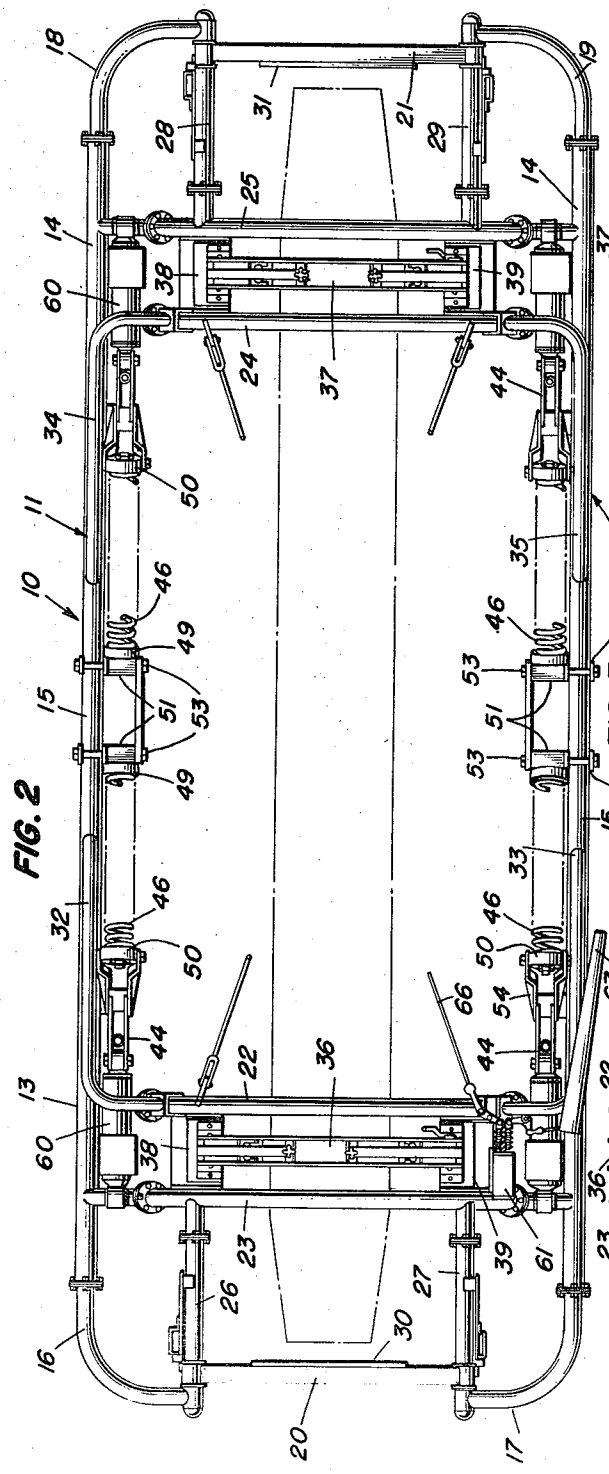


FIG. 2

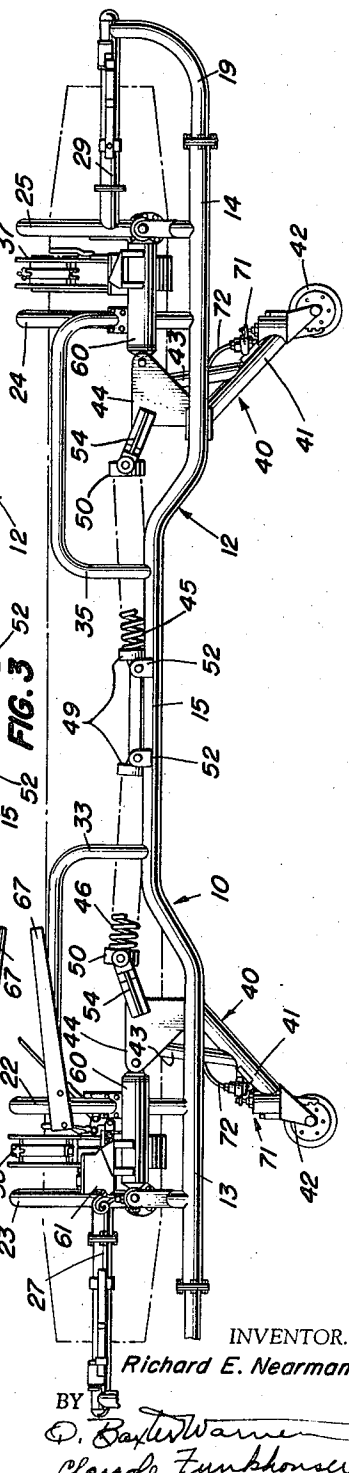


FIG. 3

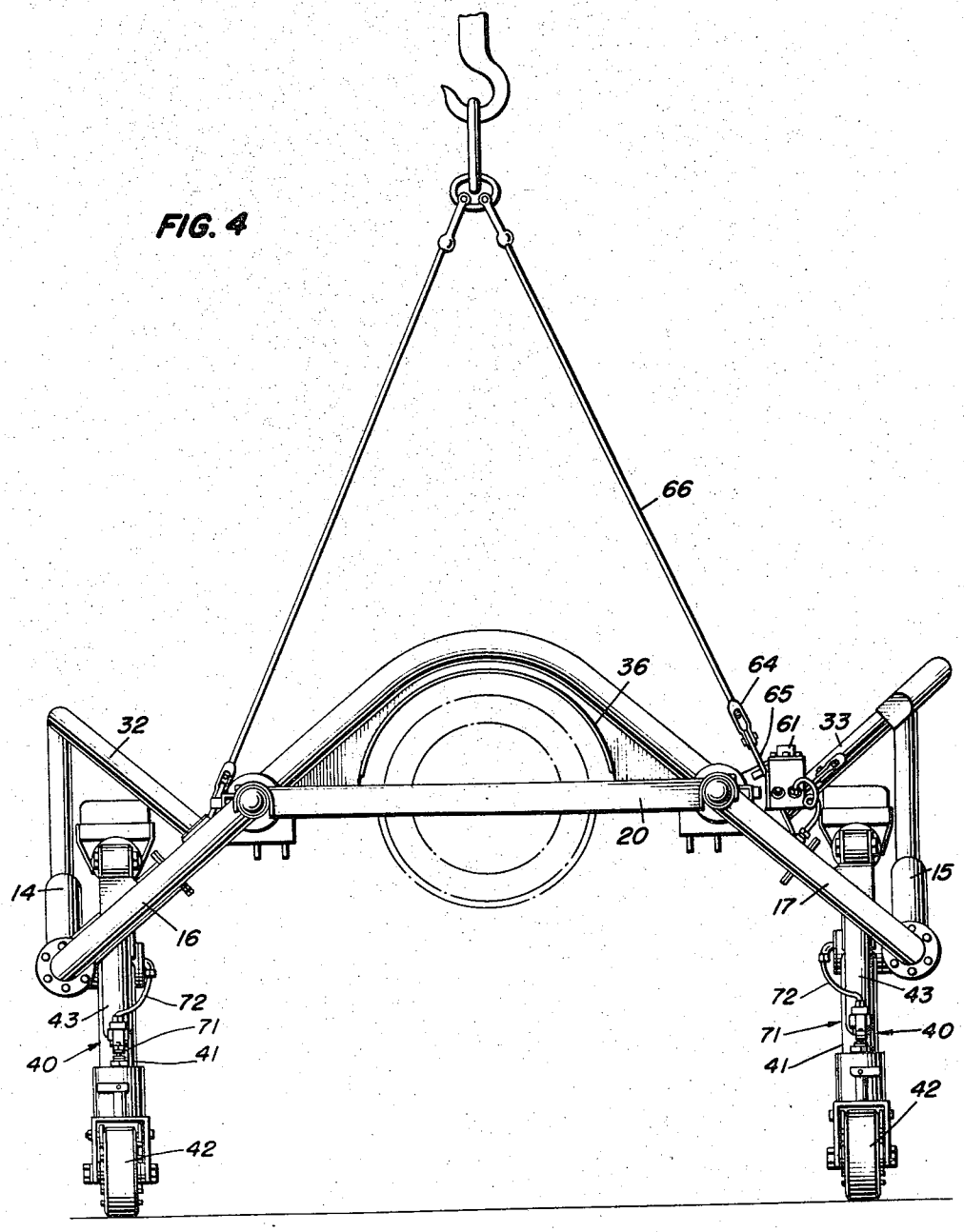
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DOLLY, WEAPON COMPONENT TRANSFER, SUSPENDED TYPE

Filed July 31, 1959 5 Sheets-Sheet 3

FIG. 4



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DOLLY, WEAPON COMPONENT TRANSFER, SUSPENDED TYPE

Filed July 31, 1959 5 Sheets-Sheet 4

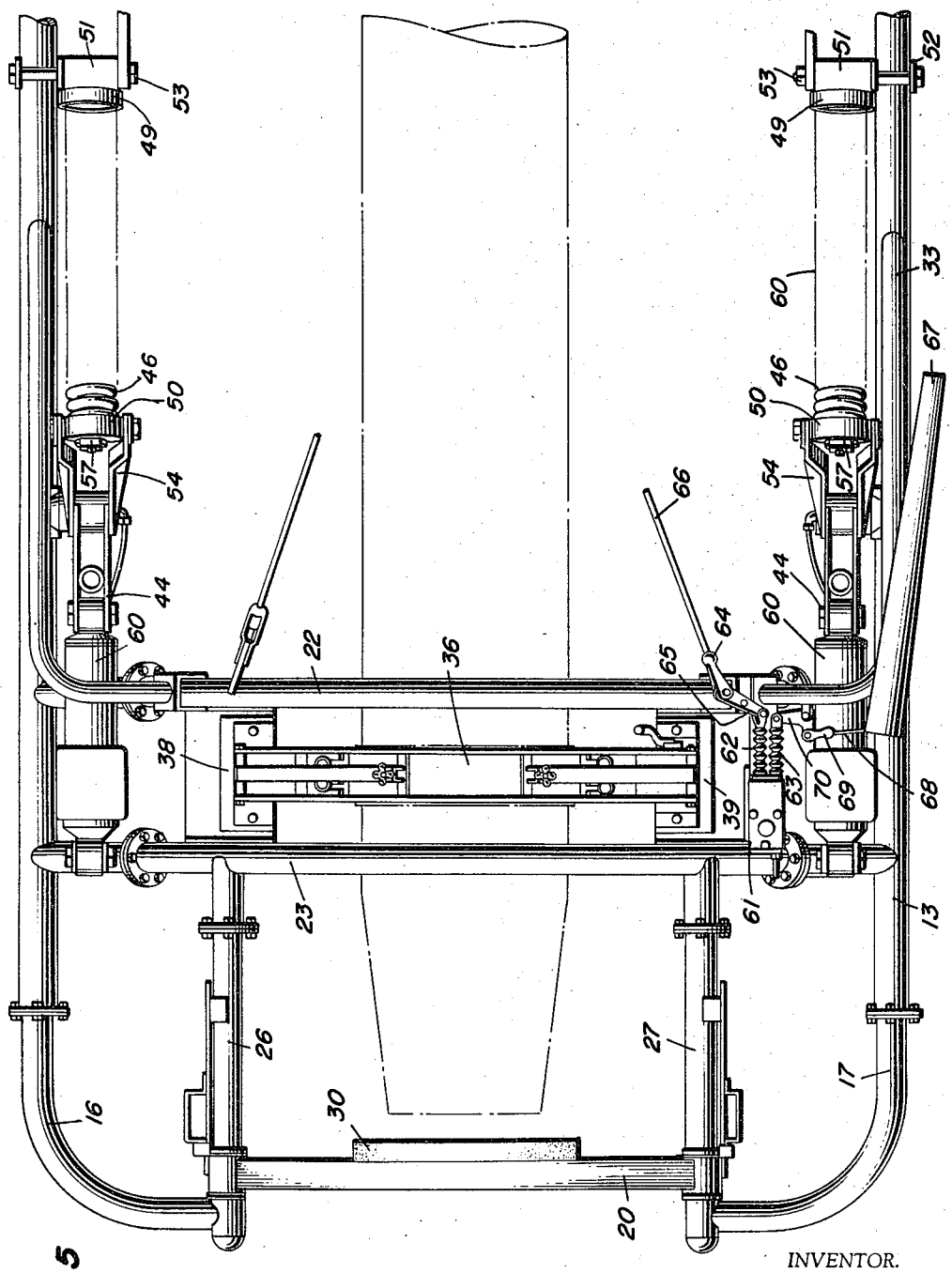


FIG. 5

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DOLLY, WEAPON COMPONENT TRANSFER, SUSPENDED TYPE

Filed July 31, 1959 5 Sheets-Sheet 5

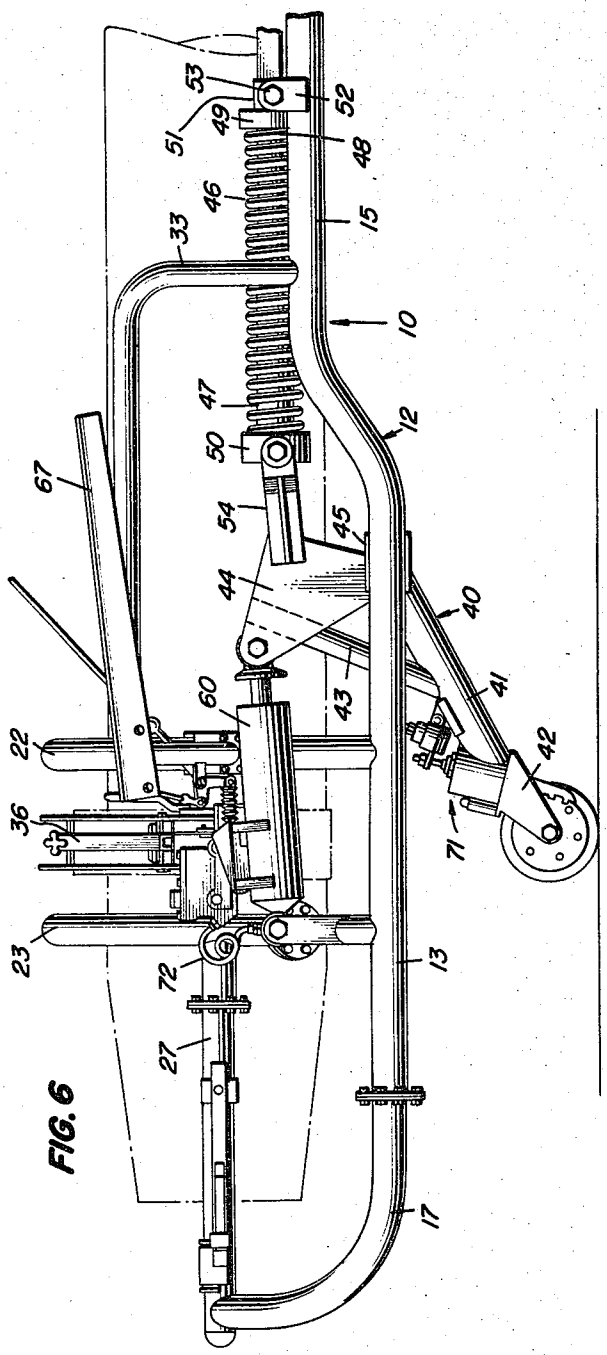


FIG. 6

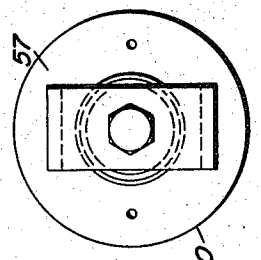


FIG. 9

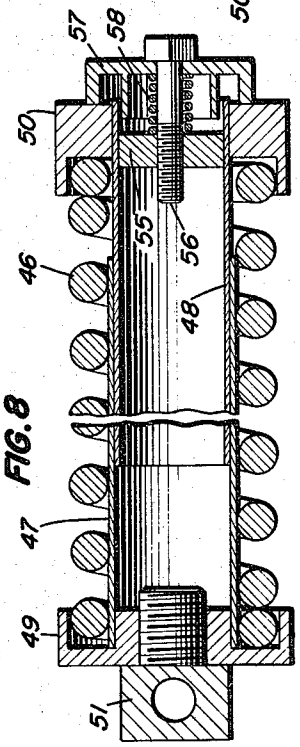


FIG. 8

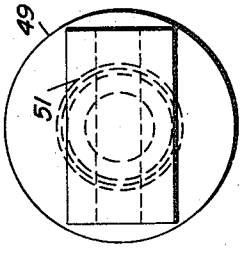


FIG. 7

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United States Patent Office 2,950,123
Patented Aug. 23, 1960

2,950,123

DOLLY, WEAPON COMPONENT TRANSFER, SUSPENDED TYPE

Richard E. Nearman, Rockville, Md., assignor to the United States of America as represented by the Secretary of the Navy

Filed July 31, 1959, Ser. No. 830,969

4 Claims. (Cl. 280—106.5)

The present invention relates generally to material handling equipment; more particularly it relates to a weapon component transfer dolly which incorporates improvements upon the missile transfer dolly shown and described in co-pending application Serial No. 800,901, filed March 20, 1959, Eugene S. Culver, inventor, assigned to the United States Government.

The missile transfer dolly constituting the subject matter of the above-referenced patent application is generally useful in weapons transfer operations but may not be used when it is desired to load a missile or missile component thereon from below because of the presence of the transversely extending torsion bars employed. It is accordingly an object of the present invention to provide a weapon component transfer dolly that may be lowered over a missile or missile component and which, after appropriate connections between said missile or component and said dolly are made, may be used for conveniently transferring said missile or component from ship to ship or between ship and shore.

Another object of the invention resides in the provision of a weapon component transfer dolly which is extremely rugged in construction and which will, therefore, be able to withstand rough usage.

As a further object, the weapon component transfer dolly constituting the present invention employs simple and effective means for protecting the ends of the missile or component from damage, said means, however, being readily removable for permitting manipulation of the missile or component in the dolly.

Additional objects of the invention include the provision of a dolly for the purpose set forth which utilizes a frame that will snugly receive a missile or other weapon component when the dolly is lowered into operative position; and one which employs a simple and highly efficient spring suspension system that will assure maximum protection for a weapon in the event of a free fall from a substantial height.

Other objects and many of the attendant advantages of the present invention will be readily appreciated as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings, wherein:

Fig. 1 is a perspective view of the improved weapon component transfer dolly;

Fig. 2 is a top plan view of the invention;

Fig. 3 is a side elevation thereof;

Fig. 4 is an enlarged end view showing the dolly with a hoisting sling attached, a weapon component being shown in broken lines;

Fig. 5 is an enlarged detail top plan, particularly showing the spring mountings and the weapon component supporting mechanism;

Fig. 6 is a detail side elevation showing the suspension system with one of the wheel assemblies partially deflected;

Fig. 7 is an end view of one of the spring units;

Fig. 8 is an enlarged detail section of the spring unit of Fig. 7; and

Fig. 9 is an elevation showing the opposite end of the spring unit of Fig. 7.

Briefly, the invention comprises a generally rectangular frame having upwardly bowed, substantially V-shape transverse sections and upwardly curved end sections which cooperate to form a pocket or receptacle on the under side of a dolly to receive a missile or other weapon or weapon component. The invention further includes a novel suspension system for the frame, which suspension system comprises individually sprung wheel assemblies and a shock absorber for each said assembly. The springs for the wheel assemblies are of the helical type and extend longitudinally of the frame rather than transversely thereof, so as to be out of the way of a missile or component in the receptacle. Brake mechanisms and weapon component mounting means are also employed for assuring safe handling of the weapon component in the dolly.

Referring now to the drawings in more detail, the frame of the improved dolly is shown generally at **10**. The frame **10** includes side sections **11** and **12** each having straight end portions **13** and **14** and an upwardly offset intermediate portion **15**. Upwardly and inwardly curved end sections **16** and **17** are connected to the straight end portions **13** of the side sections **11** and **12**, and similarly formed end sections **18** and **19** are secured to the portions **14** of said side sections. End bars **20** and **21** effectively connect, respectively, the upper ends of the end sections **16** and **17** and those of the sections **18** and **19**.

Extending across the frame **10** near the opposite ends thereof are longitudinally spaced upwardly bowed, or inverted V-shape, inner and outer transverse sections **22**, **23** and **24**, **25**, the sections **22**, **23** extending between the straight end portions **13** of the side sections **11** and **12**, and the sections **24**, **25** extending between the end portions **14** of said side sections. Spaced brace members **26** and **27** connect the upper ends of the sections **16** and **17** with the outer transverse section **23** medially between its apex or bight and its lower ends. Similarly, as shown in Fig. 2, spaced brace members **28** and **29** connect the upper ends of the end sections **18** and **19** to the outer transverse section **25**. As will be seen, the brace members **26** and **27** mount the bar **20**, and the brace members **28** and **29** mount the bar **21**. Buffers **30** and **31** are mounted on the bars **20** and **21**, respectively, and serve to cushion a weapon or weapon component from shocks due to longitudinal displacement thereof in either direction in the frame.

From a reading of the foregoing and a study of Figs. 1, 3, and 4 of the drawings, it will be understood that the side sections **12** and **13**, the end sections **16**, **17**, **18**, and **19**, the brace members **26**, **27**, **28**, and **29**, and the transverse sections **22**, **23**, **24**, and **25** cooperate to define an inverted receptacle to receive a weapon or weapon component fully within the confines of the frame **10**, such a weapon or weapon component being shown in broken lines, and schematically, in Figs. 2, 3, and 4.

To permit easy handling of the dolly when in use, hand rails **32**, **33**, **34**, and **35** are provided. As best seen in Fig. 1, the hand rails **32** and **34** extend, respectively, from the ends of the offset portion **15** of the side section **11** to midpoints on the sloping side portions of the inner transverse sections **22** and **24**. Similarly, the hand rails **33** and **35** extend, respectively, between the offset portion **15** of the side section **12** to said inner transverse sections **22** and **24**, being connected to said sections at points opposite the points of connection of the rails **32** and **34**.

For the purpose of securing a weapon or weapon component in the frame **10**, material handling apparatus of

the type shown in U.S. Patent No. 2,925,980, filed January 16, 1959 R. E. Nearman, inventor, is employed, said apparatus including strap assemblies **36** and **37** mounted, respectively, between the transverse sections **22** and **23** and between the sections **24** and **25**. The opposite ends of each of the assemblies are mounted in rubber shear blocks **38** and **39**. By the use of the strap assemblies and suitable hoisting gear, the weapon or weapon component may be secured in the frame **10**. As particularly shown in Figs. 4 and 6, the lowermost radial points on the circumference of the weapon are located in the frame in a horizontal plane above that which includes the side sections **11** and **12**. The strap assemblies are so designed and constructed that the weapon or component may be quickly attached to or detached from the dolly, but will be securely held against displacement when in position.

Four leg assemblies normally support the frame **10** above a deck or other surface. These leg assemblies are individually mounted and sprung and are of identical construction, so that a description of one will suffice for all of them. A typical leg assembly is shown at **40** in Fig. 6; it is similar to one of the leg assemblies shown in the co-pending patent application first mentioned hereinabove. The leg assembly **40** includes a leg element **41** which carries a caster **42** at its lower end, a brace element **43**, and a lever element **44**, the lever element being constituted by a pair of triangular parallel spaced plates which straddle the upper end portions of the leg and brace elements. As best seen in Fig. 1, the leg assembly **40** is pivotally connected to the frame **10** by a trunnion **45** which passes through the lowermost apices of the lever element **44** and the upper end of the leg element **41**. When in the "at rest," or unstressed position, the leg assembly would appear as shown in Fig. 3, that is, with the leg element disposed at an angle of substantially 45 degrees to the frame **10**.

In lieu of the transversely extending torsion bars, used in the dolly described in the said first-mentioned co-pending patent application for resiliently supporting the frame above a deck or other surface, the instant invention utilizes longitudinally extending coil springs for this purpose. Referring again to Fig. 6, and also to Fig. 8, one of these coil springs is shown at **46**. When the dolly is in an "at rest" position, the spring **46** is in an extended position; when the dolly is subjected to shock imparted vertically, as would be produced by dropping it to a surface from a substantial distance thereabove, the spring **46** would be compressed, in a manner now to be described.

The spring **46** is trained about a pair of telescoping tubes **47** and **48**, as shown in Fig. 8, and these tubes are mounted, respectively, in end caps **49** and **50**. The end cap **49** carries an eye bolt **51** which is pivotally connected to a pair of upstanding tabs **52** on the offset portion **15** of the side section **12** by a pivot bolt **53**. The cap **50** is pivotally connected to the innermost apices of the lever element **44** of the leg assembly by yoke members **54**. Compression of the spring **46** may be controlled to a limited extent by structure including a web **55** in the tube **48**, a bolt **56**, a U-shape strap **57** having end legs engaging the cap **50**, and a relatively small coil spring **58** surrounding the bolt **56**. Rotation of the bolt **56** will move the cap **50** on the tube **48** for varying the length of the spring and thus its compression.

From the above description it will be understood that outward and upward swinging movement of the leg assembly **40** will be resisted by the spring **46**, to the end that the dolly will be resiliently mounted. The principle of operation of the spring suspension system is the same as that described in the first-mentioned co-pending patent application, except that the linkages have been altered to accommodate the coil springs in lieu of the transverse torsion bars described in said application. Briefly, the spring suspension system utilizes four springs, one for each leg assembly. Two of the springs are mounted longitudinally at each side of the frame in opposed spaced relation, and are pre-compressed (pre-loaded) to, say, four times the weight of the load on the dolly, so that the forces resulting from dropping the loaded dolly must exceed the energy prestored in the springs before the leg assemblies will deflect. The system thus provides uniform deceleration of the dolly and load upon contact thereof with a deck or other surface after a free fall from a substantial height.

Shock absorbers **60** are connected between the outermost apices of the lever elements **44** and the outermost of the transverse sections **23**, **25**, and function to control rebound of the leg assemblies in a conventional manner.

The dolly constituting the subject matter of the present invention includes a brake system similar to that shown and described in the co-pending application first mentioned hereinabove. As best seen in Figs. 1 and 5, the brake system includes a master cylindrical **61** which is mounted longitudinally of the frame between the transverse sections **22** and **23**. The cylinder is provided with pistons **62** and **63**, the piston **62** being connected to a clevis **64** by a link **65** which is pivotally mounted on the section **22**. The clevis is secured to the lower end of a stretch of hoist cable **66** which forms a part of a high line hoist arrangement. Other stretches of the hoist are connected to opposite ends of the transverse section **24** and to the opposite end of the section **22**, as shown in Fig. 2.

The piston **63** is actuated by a lever **67** which has one end pivotally connected to the hand rail **33**, the lever being connected to said piston by a rod **68**, a clevis **69** and a crank **70**, the crank being pivotally mounted on the hand rail **33**. The master cylinder **61** is connected to brake mechanisms **71** (Figs. 1 and 6) by suitable hydraulic lines **72** that are led through the transverse and side sections of the frame.

The brake system is so arranged that the brakes are normally in "on" position, so that when the dolly, with a missile or component thereon, is lowered to a deck or other surface, the casters will be locked and the dolly prevented from moving. Partial raising of the hoist cable, however, will actuate the piston **62** and release the brakes so that the dolly may be moved as desired. Release of the cable will again lock the brakes immediately for instantly stopping the dolly. The brakes may also be released by manually depressing the lever **67**, for actuating the piston **63**.

The dolly hereinabove described is particularly useful in missile handling operations utilizing a high line hoist, because said dolly may be lowered over a missile or component. Thus it is not necessary to raise the said missile or component in order to place it upon the dolly.

Obviously many modifications and variations of the present invention are possible in the light of the above teachings. It is therefore to be understood that within the scope of the appended claims the invention may be practiced otherwise than as specifically described.

What is claimed is:

1. In a weapon component transfer dolly, a frame having side sections provided with straight end portions and upwardly offset intermediate portions, inner and outer transverse sections extending between opposite corresponding ends of the side sections, said transverse sections being upwardly bowed, upwardly and inwardly curved end sections connected to the side sections at their corresponding opposite ends, spaced brace members connected between the upper ends of the end sections and the outer transverse sections, and end bars connecting the end sections and brace members, said upwardly bowed transverse sections and said end sections cooperating with said side sections to define a receptacle for receiving a weapon component within the frame from therebelow.

2. A weapon component transfer dolly as recited in claim 1, including additionally wheel assemblies pivotally connected to the frame at opposite sides thereof, and

springs connected between the wheel assemblies and the frame.

3. A weapon component transfer dolly as recited in claim 1, including additionally wheel assemblies pivotally connected to the frame at opposite sides thereof and having casters thereon, brake mechanisms for the casters, coil springs connected between the wheel assemblies and the frame, shock absorbers connected between said wheel assemblies and said outer transverse sections, and brake control means mounted between adjacent inner and outer transverse sections and connected with the brake mechanisms.

4. A weapon component transfer dolly including a substantially rectangular frame having near each end thereof inner and outer upwardly bowed transverse sections, said frame having side sections including upwardly offset intermediate portions, hand rails extending between the

offset portions and the inner transverse sections, wheel assemblies pivotally connected with the frame for supporting said frame above a surface, casters on the wheel assemblies, a brake system comprising a master brake cylinder on the frame between inner and outer transverse sections, brakes on the casters, means operatively connecting the cylinder with the brakes, and means on one of the hand rails for manually controlling operation of the brake system.

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