

April 11, 1961

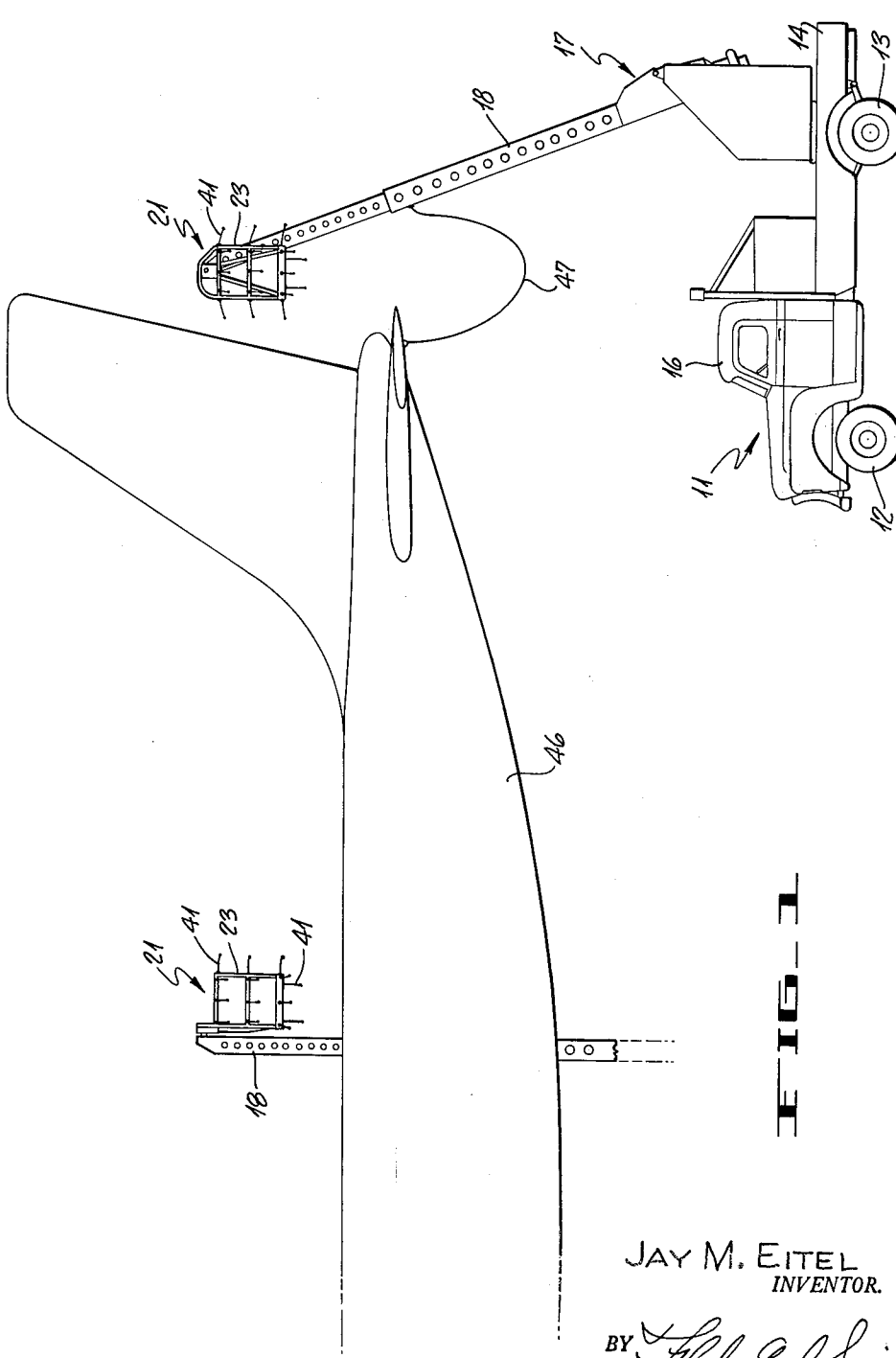
J. M. EITEL

2,979,152

SAFETY APPARATUS FOR MOBILE LIFTING EQUIPMENT

Filed May 8, 1959

2 Sheets-Sheet 1



JAY M. EITEL
INVENTOR.

BY *Flehr & Swain*
ATTORNEYS

April 11, 1961

J. M. EITEL

2,979,152

SAFETY APPARATUS FOR MOBILE LIFTING EQUIPMENT

Filed May 8, 1959

2 Sheets-Sheet 2

FIG. 2

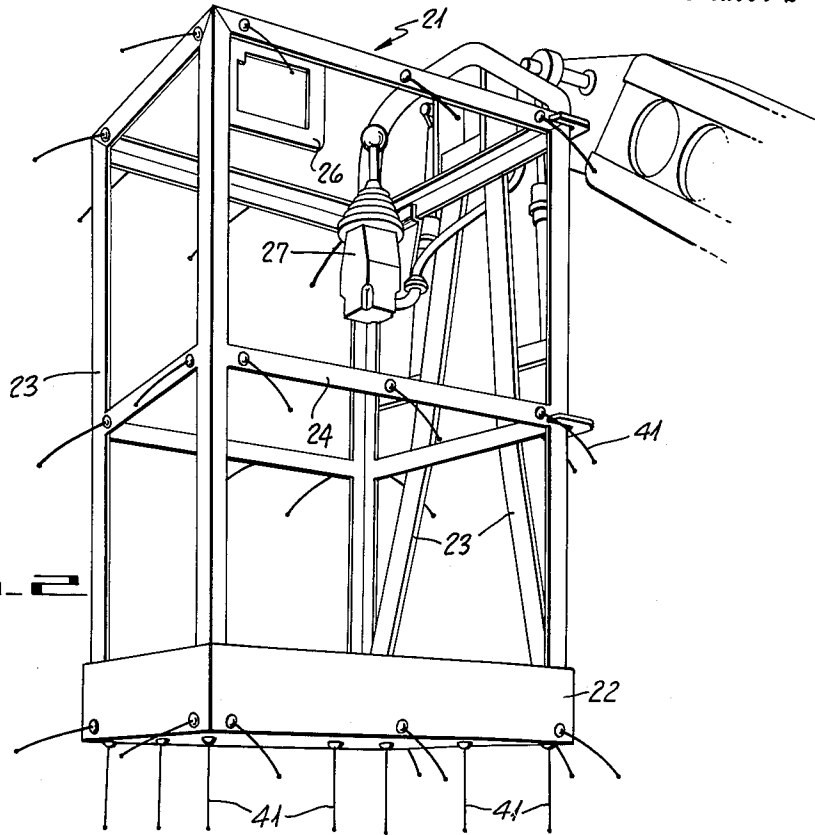
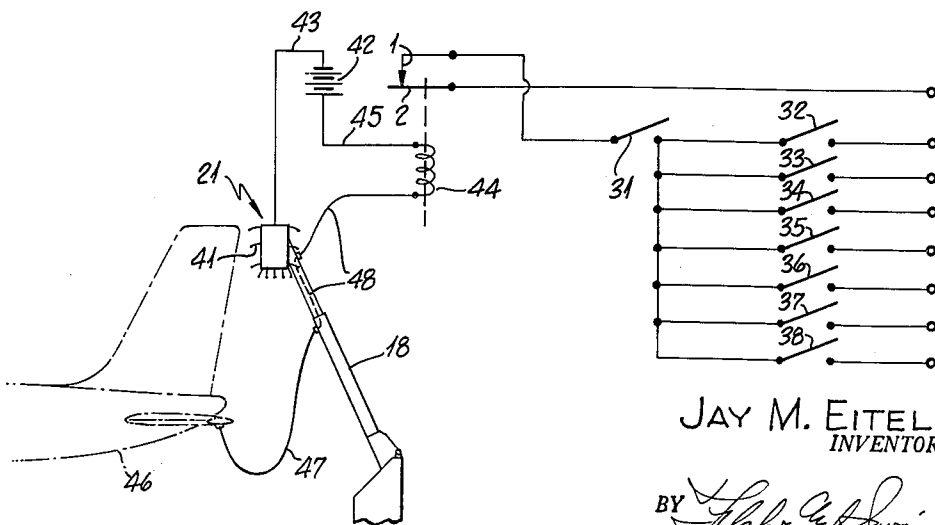


FIG. 3

JAY M. EITEL
INVENTOR.

BY *Lehr & Swain*
ATTORNEYS

1

2,979,152

SAFETY APPARATUS FOR MOBILE LIFTING EQUIPMENT

Jay M. Eitel, 239 Frances Drive, Los Altos, Calif.

Filed May 8, 1959, Ser. No. 811,942

10 Claims. (Cl. 182—2)

This invention relates generally to safety apparatus for mobile lifting equipment usable about a body having conducting surfaces and more particularly to safety apparatus for mobile lifting equipment of the type in which a workman's platform or basket is carried on the outer end of a boom structure.

With lifting equipments of the type described in my copending applications Serial No. 560,621, filed Jan. 23, 1956, entitled "Lifting Equipment"; Serial No. 632,480, filed Jan. 4, 1957, entitled "Vehicle and Lift Construction," and now abandoned; and Serial No. 790,622, filed February 2, 1959, entitled "Mobile Lifting Equipment With Extensible Boom Structure," now Patent No. 2,936,847, issued May 17, 1960, it has been found that it is dangerous to permit inexperienced personnel to operate the lifting equipment where the lifting equipment is to be used around easily damaged surfaces such as around aircraft. There is a need for safety apparatus which will make such lifting equipment usable in such applications by inexperienced operators.

In general, it is an object of the present invention to provide safety apparatus for mobile lifting equipment of the above type which may be operated with safety by an inexperienced operator.

Another object of the invention is to provide safety apparatus of the above character which may be operated by an inexperienced operator around easily damaged surfaces.

Another object of the invention is to provide safety apparatus for mobile lifting equipment of the above character in which the control means for the drive means for the lifting equipment is automatically disabled when the lifting equipment comes within a predetermined range of the body or surface being worked upon.

Another object of the invention is to provide safety apparatus for mobile lifting equipment of the above character which is suitable for use with hydraulically and electrically operated lifting equipments.

Another object of the invention is to provide safety apparatus for mobile lifting equipment of the above character which will not create sparks so that it can be utilized for aircraft maintenance and the like.

Additional objects and features of the invention will appear from the following description in which the preferred embodiment has been set forth in detail in conjunction with the accompanying drawings.

Referring to the drawings:

Figure 1 is a side elevational view of a safety apparatus for mobile lifting equipment incorporating the present invention and showing the lifting equipment being utilized for inspecting the tail surfaces of an airplane.

Figure 2 is a perspective view of the workman's basket or platform carried by the outer end of the boom structure of the lifting equipment and showing the conducting spring-like elements carried by the workman's basket.

Figure 3 is a circuit diagram, partially schematic, of the safety apparatus utilized in the lifting equipment.

In general, the present invention consists of a safety

2

apparatus for lifting equipment which is usable about a body having conducting surfaces. The lifting equipment is of a type which has a boom structure operated by drive means controlled through control means. Conducting spring-like elements adapted to be mounted on the boom structure are provided. Conductor means connecting the lifting equipment to the body is provided to establish good electrical contact between the body and the lifting equipment. Means is operated when an electrical circuit is completed between the body and the lifting equipment to disable the control means for the drive means.

In the drawings, the safety apparatus is mounted on a mobile lifting equipment consisting of a vehicle 11 having front and rear wheels 12 and 13, and a framework 14 mounted upon the front and rear wheels. A conventional cab 16 is mounted on the frame 14 over the front wheels.

A lifting equipment 17 is mounted on the frame 14 generally overlying the rear wheels 13. The lifting equipment 17 can be of any suitable type. For example, as shown in the drawing, the lifting equipment may include a boom structure 18. The boom structure 18 is provided with drive means (not shown) to move the boom structure in the desired manner. For example, as described in my copending applications Serial No. 560,621, filed Jan. 23, 1956, entitled "Lifting Equipment," and Serial No. 632,480, filed Jan. 4, 1957, entitled "Vehicle and Lift Construction," now abandoned, the drive means includes means for extending and retracting the boom structure, for raising and lowering the outer end of the boom structure about a horizontal axis, and means for rotating the boom structure in clockwise and counter-clockwise directions.

If desired, a workman's basket or platform 21 may be mounted on the outer end of the boom structure as shown in the drawing. The basket is constructed as shown particularly in Figure 2 and consists of a base 22 with upright tubular members mounted thereon to provide three side walls 23 and a gate 24 adapted to be opened and closed by a latch 26. A control switch 27 of the type described in Patent No. 2,841,659 is utilized by the operator in the workman's basket for controlling the operation of the drive means to extend and retract the boom structure, rotate the boom structure, or raise and lower the outer end of the boom structure as desired by the operator. Similar control means as described in my copending application Serial Number 790,622, filed Feb. 2, 1959, entitled "Mobile Lifting Equipment With Extensible Boom Structure," now Patent No. 2,936,847, issued May 17, 1960, is provided on the ground for controlling the boom structure in the same manner that it is controlled by the control switch 27. The control switch 27 as described in Patent No. 2,841,659 includes switches 31-38. Switch 31 is connected in series with all of the switches 32-38 and prevents switches 32-38 from being effective to control the drive means before it is operated or closed. The various switches 32-38 are provided to initiate the various functions performed by the drive means as described in copending application Serial No. 632,480, filed January 4, 1957, now abandoned.

The safety apparatus for the lifting equipment consists of a plurality of spring-like conducting elements 41 which are adapted to be secured to the boom structure and more particularly to the workman's basket 21. As shown particularly in Figure 2, the spring-like elements 41 are secured to the various surfaces of the workman's basket and extend generally at right angles from the surface to which they are attached. The spring-like elements 41 are of a predetermined length so that there is an adequate space between the body and the lifting equipment to

accommodate over-run of the drive means as hereinafter described.

A low voltage power supply 42 is mounted in the lifting equipment and preferably in the outer end of the boom structure, and as shown, can consist of a battery which has its negative terminal connected to the basket 21 by conductor 43. As hereinbefore explained, the basket 21 is formed of suitable conducting material such as aluminum and is electrically connected to the spring-like elements 41. The positive terminal of the battery is connected to one side of the winding of a relay 44 by a conductor 45, and the other side of the winding 44 is connected to the body 46 about which the lifting equipment is being utilized by conductors 47 and 48. The conductor 47 is detachably connected to the body 46 and is electrically insulated from the boom 18. The conductor 47 is connected to the winding of the relay 44 by a conductor 48 which is also insulated from the boom structure. Relay 44 includes stationary contact 1 and movable contact 2 which are adapted to be operated by the relay. The contacts 1 and 2 are in series with the switch 31 and for that reason control the effectiveness of switches 31-38.

Operation of my safety apparatus for lifting equipment may now be briefly described as follows. Let it be assumed that the safety apparatus has been mounted on the lifting equipment shown in Figure 1 of the drawing and that it is desired to use the lifting equipment in conjunction with aircraft maintenance and inspection work as also shown in Figure 1 of the drawing. Upon commencing such operation, the operator enters the workman's basket 21 and first connects the conductor 47 to the body 46 about which the lifting equipment is to be used. After the cable or conductor 47 has been connected to the body, the operator may commence the desired operations for the lifting equipment by operating the control switch 27. The control switch serves to position the workman's basket in the desired location through operation of the drive means controlled by the control switch.

If the operator of the lifting equipment should operate the lifting equipment in such a manner that one of the conducting elements or feelers 41 carried by the workman's basket comes in contact with the surface of the plane, a circuit will be completed which will cause energization of the relay 44 and opening of its contacts 1 and 2. Opening of the contacts 1 and 2 of the relay 44 removes all voltage from the control switches 31-38 so that the control switches are no longer effective to control the operation of the drive means for the lifting equipment. The electrical circuit for energization of relay 44 is completed from the negative terminal of the battery through the basket, through one of the conducting elements 41, through the body 46, the cable 47, the conductor 48, the winding of relay 44, conductor 46 to the positive side of the battery 42.

The conducting elements 41 are of sufficient length to permit over-run of the drive means in the event the drive means is moving the boom structure at a considerable rate of speed. Conventionally, however, the amount of over-run is kept at a minimum by the use of brakes which are automatically operated when the associated drive means is de-energized. The conducting elements, as hereinbefore explained, are formed of spring material so that they will in no way damage the surface engaged by the same.

With the utilization of such safety apparatus, the lifting equipment can be operated by an inexperienced operator and can be used around and about very expensive equipment having surfaces which are readily damaged such as aircraft.

After the control switch 27 has been rendered inoperative by operation of the relay 44, the operator may again operate the lifting equipments by breaking the contact between the conducting element engaging the body. As soon as this done, the relay 44 is de-energized and the boom structure may again be operated through the con-

trol switch 27. If desired a master control switch can be placed in the line 46 to de-energize the relay 44 so that the boom structure can be operated by the control switch 27. As soon as the contact between the conducting element and the body has been broken the master control switch can again be operated to place the control switch under the control of relay 44.

It is readily apparent that, if desired, conducting elements may be mounted on other portions of the boom structure in addition to the workman's basket, particularly when those portions of the boom structure may come in contact with a surface and damage the same.

Although I have shown my safety apparatus utilized in conjunction with an electrically operated lifting equipment, it is readily apparent that it may also be utilized in conjunction with hydraulically operated lifting equipment. In a hydraulically operated equipment, the relay 44 can be utilized to operate a solenoid operated master control valve which prevents the other valves in the system from being effective to control the boom structure.

A relatively low voltage source is utilized in my safety apparatus to prevent the formation of a substantial spark which could possibly ignite gaseous fumes found in and about aircraft. A very sensitive relay is utilized so that it can be operated with a very small current. For that reason, a low voltage source is very satisfactory.

Although the conductor 47 has merely been shown to be a length of cable, it is readily apparent that, if desired, a cord reel can be provided on the boom structure so that the cable is normally maintained in an out-of-the-way position.

It is apparent from the foregoing that I have provided a new and improved safety control apparatus for lifting equipment which permits the use of lifting equipment by inexperienced operators even though the lifting equipment is being utilized for inspecting bodies having very delicate surfaces. The safety apparatus may be utilized in conjunction with all bodies where the surfaces are formed of conducting material.

I claim:

1. In a safety apparatus for lifting equipment usable about a body having conducting surfaces, the lifting equipment being of the type having a boom structure, drive means for operating the boom structure, and control means for controlling the drive means, conducting spring-like elements adapted to be mounted on the boom structure, a power supply, means connecting one side of the power supply to the boom structure, means connecting the other side of the power supply to the body, and means operated when one of said elements engages the body to disable the control means.

2. A safety apparatus as in claim 1 wherein said boom structure includes a workman's platform and wherein said spring-like elements are mounted on the workman's platform.

3. A safety apparatus as in claim 1 wherein said spring-like elements are of a predetermined length, the length of said spring-like elements being sufficient to accommodate the over-run of the drive means for the boom structure.

4. A safety apparatus as in claim 1 wherein said last named means includes a relay having contacts in series with said control means.

5. In a safety apparatus for lifting equipment usable about a body having conducting surfaces, the lifting equipment being of the type having a boom structure, drive means for operating the boom structure, a workman's basket or platform mounted on the outer end of the boom structure and control means mounted on the workman's basket for controlling the drive means; the safety apparatus consisting of conducting spring-like elements adapted to be mounted on the workman's basket, a low voltage power supply, means adapted to connect one side of the power supply to the workman's basket, means connecting the other side of the power supply to

5

the body, and means operated when one of said elements engages the body to render said control means ineffective to control the drive means.

6. A safety apparatus as in claim 5 wherein each of said conducting elements extends from said workman's basket at substantially right angles to the portion of the basket to which it is attached.

7. A safety apparatus as in claim 5 wherein said last named means comprises a relay, the relay having contacts in series with the control means.

8. A safety apparatus as in claim 7 wherein the winding of said relay forms a part of one of the means connected to said power supply.

9. In a lifting equipment usable about a body having conducting surfaces, a boom structure, drive means for operating the boom structure, control means for controlling the drive means, conducting spring-like elements mounted on the boom structure, a low voltage power supply, means connecting one side of the power supply

6

to the boom structure, means connecting the other side of the power supply to the body, and means operated when one of said elements engages the body to render said control means inoperative to control the drive means.

10. A lifting equipment as in claim 9 wherein said boom structure includes a workman's basket, the control means being mounted within the workman's basket, said spring-like elements being mounted on said workman's basket.

References Cited in the file of this patent

UNITED STATES PATENTS

15	1,625,505	Stump et al. -----	Apr. 19, 1927
	2,487,922	De Chant et al. -----	Nov. 15, 1949
	2,815,250	Thornton-Trump -----	Dec. 3, 1957
	2,902,105	Wiley -----	Sept. 1, 1959