

TITLE: ELEVATING WORK PLATFORM

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to an elevating work platform.

5 The platform is particularly suitable for, but not limited to, a work platform mountable on vehicles such as utility vehicles or pickups, vans, light trucks or the like. The term "work platform" shall be used throughout the specification (ie., description and claims) to also include cranes and "cherry-picker" type materials handling equipment.

10 2. Prior Art

Examples of elevating work platforms are manufactured and sold under the US Registered Trade Mark "DUR-A-LIFT" by Dur-a-Lift Inc., of George, Iowa, USA.

15 These platforms suffer some, if not all, of the problems of known elevating work platforms mounted on light vehicles.

With most known platforms, the arrangements for mounting are complicated, expensive and/or space consuming. When the platforms are mounted, they usually do not allow a large working area in the vehicle. Finally, the platforms are not arranged for easy mounting onto standard  
20 vehicles without some interference or requirement for major modification to the vehicles. This means that the platforms are also not readily demountable so that the vehicles can be readily used for other tasks.

SUMMARY OF THE INVENTION

25 It is an object of the present invention to minimise, or ameliorate, at least one of the problems with known platforms.

In one aspect, the present invention resides in an elevating work platform unit, mountable on a vehicle, including:

- a support frame on, or mountable on, the vehicle;
- a base frame having a mast supporting a boom for luffing  
30 and/or slewing movement relative to the base frame or mast;
- coupling means enabling releasable coupling of the base

frame to the support frame; and

bracing means on the base frame and/or mast releasably connectable to the vehicle to provide at least vertical stability to the mast.

5 In one embodiment, the support frame is, or is incorporated in, a towbar at the rear of the vehicle. In an alternative embodiment, the support frame is a load deck or chassis of the vehicle, preferably immediately rearwardly of an operator's cab on the vehicle.

10 In a first embodiment, the base frame is preferably a substantially horizontal beam or frame member arranged to extend substantially transversely to the longitudinal axis of the vehicle. In the alternative embodiment, the base frame is preferably a base plate on the mast.

15 Preferably, the coupling means for the first embodiment includes a socket or tongue on the support frame releasably engageable by a complementary spigot, socket or yoke on the base frame. In the alternative embodiment, the coupling means may be releasable fasteners.

20 The bracing means may include a counter leverage arm releasably interconnecting the mast (or base frame) to the vehicle at a fixing point spaced from the support frame, the counter leverage arm providing vertical stability to the mast when the base frame and/or mast are in tension or compression.

In a van, an internal brace may be provided between the floor and the roof, the counter leverage arm being engageable with the internal brace.

25 Diagonal braces may be provided between the base frame and the mast.

The boom may be a fixed-length, single- or two-stage telescopic, fly- or knuckle-boom and be provided with a work platform or load-engaging hook at its distal end.

30 Preferably, the boom is hingedly mounted on a post rotatably journalled in the mast, where a hydraulic ram is operable to raise

and lower the boom in a luffing movement.

A second hydraulic ram may interconnect the post to the base frame to move the boom with a slewing movement.

In a second aspect, the present invention resides in a vehicle fitted with the platform unit.

#### BRIEF DESCRIPTION OF THE DRAWINGS

To enable the invention to be fully understood, preferred embodiments will now be described with reference to the accompanying drawings, in which:

FIG. 1 is a side view of one embodiment of the platform unit before fitting to a vehicle;

FIGS. 2 and 3 show the platform unit fitted to a light truck and van respectively, with the boom at its lowered position;

FIG. 4 corresponds to FIG. 3 with boom at its raised position;

FIG. 5 is a rear perspective view of the platform unit;

FIG. 6 is a perspective view of the base frame with one example of a coupling member;

FIG. 7 is a perspective view of an alternative coupling member;

FIG. 8 is a perspective view of an interior brace for the van of FIGS. 3 and 4;

FIGS. 9 and 10 are side views of the platform unit with the handrails raised and lowered;

FIGS. 11 to 13 correspond to FIGS. 9 and 10, with the platform unit fitted to a van;

FIG. 14 is a schematic side view of a telescopic boom for the platform unit;

FIG. 15 is a side view of a fly boom;

FIG. 16 is a schematic side view of the fly boom for the platform unit in five alternative luffing positions;

FIG. 17 is a schematic view of a knuckle boom in three alternative luffing positions;

FIG. 18 is a rear perspective view of a second preferred embodiment of the platform unit;

5                FIGS. 19 and 20 are side views of a third embodiment of the platform unit mounted on a light truck;

FIGS. 21 and 22 are similar views of the platform unit mounted on a van; and

10              FIGS. 23 and 24 are schematic side views of a gear lever safety interlock system.

#### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to FIG. 1, the platform unit 10 is shown prior to mounting on the support frame at the rear of a vehicle, which may be a light truck 101 (or utility or pick-up) (see FIG. 2) or a van 102 (FIGS. 3 and 4). As shown in more detail in FIG. 5, the unit 10 has a base frame 11 with a horizontal beam 12 arranged to extend transversely to the longitudinal axis of the vehicle on which it is mounted.

15              A pair of spaced, vertical mounting plates 13, 14 (see FIG. 6) adjustably receive a vertical post 15 of a coupling member 16 having a horizontal spigot 17 adapted to be releasably engaged in a socket on a tow-bar 18 on the vehicle 101, 102. (In an alternative embodiment - see FIG. 7 - the spigot 17 is replaced by a tongue 17a on a coupling 16a, the tongue 17a being bolted to a tongue on the tow bar 18.)

20              The holes 19 in the plates 13, 14 on the base frame 11 and in the posts 15, 15a on the coupling members 16, 16a allow the height of the mounting of the unit 10 on the vehicles 101, 102 to be selectively adjusted.

25              A pair of stabilizers 20 (see FIG. 5) have extension arms 21 hingedly mounted on the beam 12 and have mechanical (or hydraulic) jacks 22 with feet 23. The extension arms 21 can be locked on the lowered position by pins 24 engaged in brackets 25. As shown, the

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stabilizers 20 may be raised for transport. (In an alternative embodiment not shown, the stabilizers 20 can be releasably clipped or otherwise mounted on the beam and be detachable for transport.)

5 A mast assembly 30 has a tubular body 31 extending vertically upwards from the beam 12, and is braced by a pair of inclined braces 32, 33, and a mast post 34 is rotatably journaled in the mast body 31 and support collar 35. A boom 36 is pivotally mounted between a pair of plates 37, 38 at the upper end of the mast post 34 and can be luffed between a lowered position (see FIG. 4) and a raised position (see FIG. 4) by a hydraulic ram 39. A work platform 40 is provided at the distal end of the boom 36, and is held in a fixed inclination relative to the mast 30 by a pair of ties or links 41. By rotation of the mast post 34 relative to the mast body 31, and selective extension or retraction of the ram 39, the boom 36 (and thereby work platform 40) can undergo a range of luffing and/or slewing movements relative to the mast 30 (and thereby the vehicle 101, 102).

As illustrated in dashed lines on FIG. 4, the work platform 40 may be replaced by a crane- or materials-handling hook 40a.

20 To provide vertical stability to the mast 30, a counter leverage arm assembly 42 (see FIG. 5) has a pair of spaced, inverted L-shaped arms 43, 44 fixed to the beam 12 (and/or collar 35). The forward ends of the arms 43, 44 are connected to a cross-bar 45 which has end clamps 46 engageable with the rain gutter (not shown) on the roof of the van 102.

25 In an alternative embodiment, the forward ends of the arms 43, 44 may be bolted to the top bar 44 of a bracing unit 48 (see FIG. 8) bolted to the floor 102a of the van 102 immediately behind the seat(s) 103 in the driver's compartment 104.

30 To minimise drag and to lower the travelling height of the platform unit 10, the railings 49 of the work platform 40 may be hinged downwardly - see FIGS. 9 and 10.

As shown in FIGS. 11 and 12, there may be insufficient clearance between the work platform 40 and the van 102 (or truck) to enable the railings 49 to be simply moved downwardly - this is overcome as shown in FIG. 13 by making the railings 49 foldable.

5 As illustrated in FIGS. 14 to 17, the platform unit 10 may be made even more flexible in its potential applications where the boom 36 is a single-stage telescopic boom 36a (see FIG. 14), or a fly boom 36b (see FIGS. 15 and 16) or a knuckle-boom 36c (see FIG. 17).

10 With the fly boom 36b of FIGS. 15 and 16, primary ram 39 and secondary ram 39a control the luffing of the boom 36b relative to the vehicle, where links 41, 41a maintain the attitude of the platform 40.

The slewing movement of the boom 36 relative to the mast 30 can be controlled manually by a mechanical jack; by an electric motor or a rotary hydraulic motor. However, the latter two options are  
15 expensive.

In the embodiment shown in FIG. 18, a pair of cam plates 51 are fixed to the lower end of the mast post 34 journaled in the mast body 31, which is connected to an upper mast body portion 34a on which the boom 36 is hingedly mounted. A slewing ram 52 is mounted on the beam  
20 12 and its piston rod 53 is releasably connectable to the cam plates 51 via a pin releasably received in holes 54. By advancing or retracting the slewing ram 52, the cam plates 51 and thereby the mast post 31 and the upper mast portion 31a (and thereby boom 36) can be rotated, eg., through 45°, 60° or 90°. For large slewing angles, the piston rod 53 can  
25 be selectively connected to the cam plates 51 to effect the slewing in steps.

When the vehicle is not of sufficient heavy duty for transportation stability, the platform unit 10 may be mounted forwardly of the usual tow-bar point (see FIGS. 19 to 22). In the embodiments of  
30 FIGS. 19 and 20, the truck 101 may have the mast 30 mounted on the load bed and the counter leverage arm assembly 42 extending forwardly

over the driver's compartment 105; or the mast 30 mounted immediately behind the compartment 105 and the counter leverage arm assembly 42 directed to the rear of the truck. For the van 102, the mast 30 may protrude through the roof and the counter leverage arm assembly 42 either extend to a forward or rearward bracing point (see FIGS. 21 and 22).

It will be preferred that the hydraulic system for the unit 10 will be driven via a pump powered by the vehicle's engine - the ram(s) 39, 39a and 52 can be connected by suitable quick-release hydraulic couplings.

To prevent the vehicle from moving while the platform unit 10 is in operation, the manual transmission gear lever 200 is fitted with a linkage arm 201 which engages an interlock switch 202 within the vehicle. The linkage arm 201 can only close the switch 202, to allow operation of the hydraulic pump, when the manual gearbox is in neutral. (For automatic transmissions, the switch 202 will only be closable with the gear selector is in "Park".)

It will be readily apparent to the skilled addressee that the present invention provides a simple, yet efficient elevating work platform unit which can be readily mounted on, or de-mounted from, a transport vehicle which may require little, if any, modification, and which can be easily converted for other tasks.

Various changes and modifications may be made to the embodiments described without departing from the present invention.

CLAIMS

1. A work platform unit, mountable on a vehicle, including:  
a support frame on, or mountable on, the vehicle;  
a base frame having a mast supporting a boom for luffing  
5 and/or slewing movement relative to the base frame or mast;  
coupling means enabling releasable coupling of the base  
frame to the support frame; and  
bracing means on the base frame/and or mast releasably  
connectable to the vehicle to provide at least vertical stability to the mast.
- 10 2. A unit as claimed in Claim 1 wherein:  
the support frame is, or is incorporated in, a tow-bar at the  
rear of the vehicle; or  
is a load deck or chassis of the vehicle.
3. A unit as claimed in Claim 2 wherein:  
15 the support frame is provided immediately rearwardly of an  
operator's cab on the vehicle.
4. A unit as claimed in any one of Claims 1 to 3 wherein:  
the base frame is a substantially horizontal beam or frame  
member arranged to extend substantially transversely to the longitudinal  
20 axis of the vehicle, or  
a base plate on the mast.
5. A unit as claimed in Claim 4 wherein:  
the coupling means includes a socket or tongue on the  
support frame releasably engageable by a complementary spigot, socket  
25 or yoke on the base frame, or are releasable fasteners.
6. A unit as claimed in any one of Claims 1 to 5 wherein:  
the bracing means includes a counter leverage arm  
releasably interconnecting the mast (or base frame) to the vehicle at a  
fixing point spaced from the support frame, the counter leverage arm  
30 providing vertical stability to the mast when the base frame and/or mast  
are in tension or compression.





7. A unit as claimed in Claim 6 wherein:  
when the vehicle is a van, an internal brace is provided between the floor and the roof, the counter leverage arm being engageable with the internal brace.
- 5 8. A unit as claimed in Claim 6 or Claim 7 wherein:  
diagonal braces are provided between the base frame and the mast.
9. A unit as claimed in any one of Claims 1 to 8 wherein:  
the boom is a fixed-length, single- or two-stage telescopic,  
10 fly- or knuckle-boom, and is provided with a work platform or load-engaging hook at its distal end.
10. A unit as claimed in Claim 9 wherein:  
the boom is hingedly mounted on a post rotatably journaled in the mast, and a hydraulic ram is operable to raise and lower the boom  
15 in a luffing movement.
11. A unit as claimed in Claim 10 wherein:  
a second hydraulic ram interconnects the post to the base frame to move the boom with a slewing movement.
12. A vehicle fitted with the platform unit of any one of Claims 1  
20 to 11.

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