Oct. 18, 1966 E. L. PERSON 3,279,622

VEHICLE STABILIZING MEANS

Filed Oct. 27, 1964

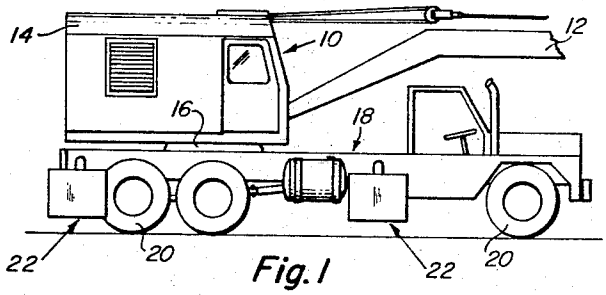


Fig. 1

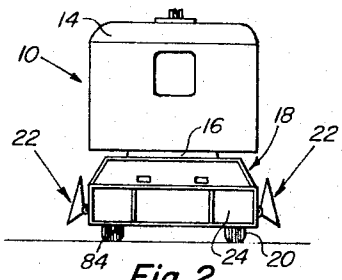


Fig. 2

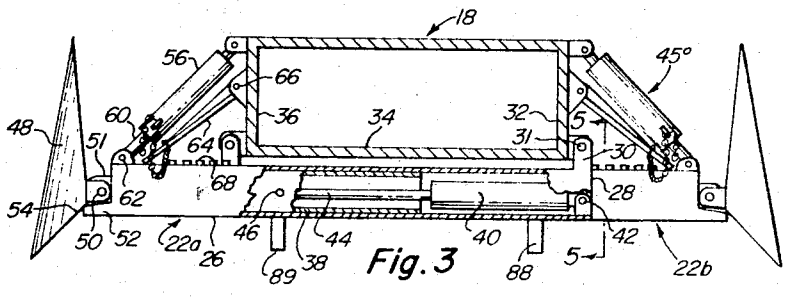


Fig. 3

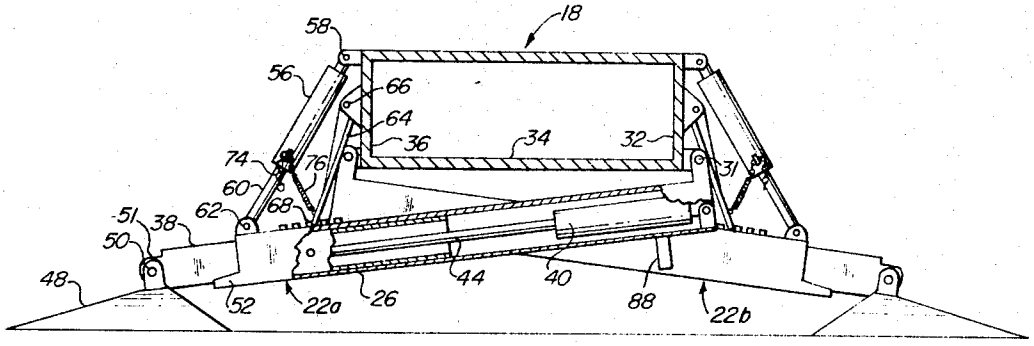


Fig. 4

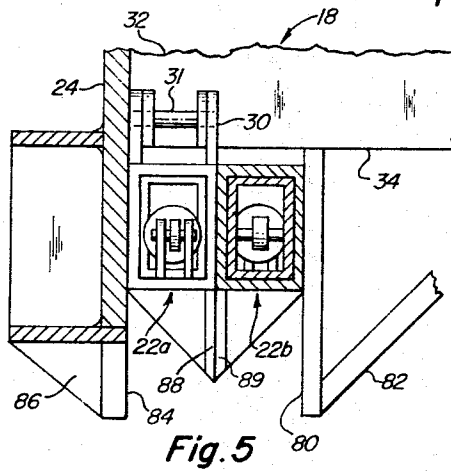


Fig. 5

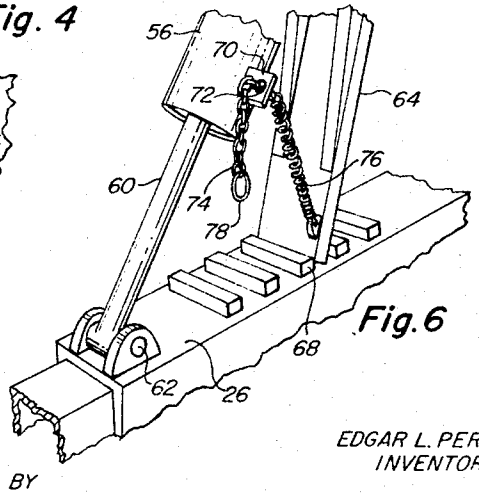


Fig. 6

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VEHICLE STABILIZING MEANS

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The present invention relates to a vehicle stabilizing means, and more particularly to extensible outrigger arms for providing lateral support for heavy-duty mobile cranes, draglines and like equipment.

Although extensible outrigger arms are well known in the art, previous such outriggers have been unduly restrictive in the amount of lateral and downward extension possible and have required certain manual adjustments which are both time-consuming and, in some instances, dangerous.

Accordingly, a primary object of the present invention is to provide a new and improved extensible outrigger arm system for vehicles which overcomes the above disadvantages.

More specifically, an object of the invention is to provide outrigger arms that can be moved from their inoperative to their desired operative positions from a remote source by one person without requiring any manual adjustment.

Another object of the invention is to provide new and improved extensible outrigger arms having a greater downward adjustment than is possible with previously known outriggers.

Still another object of the present invention is to provide extensible outrigger arms having greater lateral stability in all positions of adjustment than previous outrigger arms.

A further object of the invention is to provide an extensible outrigger arm with a ground-engaging pad that is self-positioning and that is automatically collapsible to a vertical position upon retraction of the arm to its inactive position.

Another object is to provide an outrigger arm having an oversize ground-engaging pad for providing a maximum load-bearing surface.

Another object is to provide an outrigger arm that is self-locking in any adjusted position of the arm and self-releasing for maximum safety.

In accordance with an illustrated embodiment, an outrigger arm of the invention comprises two telescoping sections including an outer section hinged at one end to one side of the vehicle frame and extends beneath the vehicle frame and beyond the opposite side thereof where an angularly mounted hydraulic cylinder supports in depending manner the other end of the section for pivotal movement about the hinge axis. A second, inner section of the arm can be extended beyond the movable end of the outer section by a second, hydraulic cylinder mounted within the outer section. A normally horizontal ground-engaging pad pivotally mounted on the outer end of the inner section is engaged by a camming surface of a projecting end portion of the outer arm section when the inner section is fully retracted so as to collapse and maintain the pad in a vertical position when the equipment is moved. Subsequent extension of the inner arm section enables the pad to flop to its horizontal, ground-engaging position. A pivotal locking arm extends downwardly from the same sidewall of the frame as the arm-pivoting cylinder and becomes engaged in one of several notches formed by ratchet-like ribs provided on the upper surface

of the outer arm section when the arm is pivoted downwardly from beneath the vehicle frame so as to prevent subsequent upward movement of the outrigger arm without disengaging the locking arm. An adjustable-tension spring device automatically releases the locking arm when the outrigger arm is lowered slightly, thus enabling subsequent raising of the outrigger. Guide means are provided on the frame for preventing lateral displacement of the outrigger in all positions thereof.

The above and other objects and advantages will become more apparent from the following description and the accompanying drawings wherein:

FIG. 1 is a side elevational view of a vehicle-supported crane structure outfitted with outriggers in accordance with the present invention;

FIG. 2 is a rear-end elevational view of the vehicle of FIG. 1;

FIG. 3 is an enlarged view partly in section of a rear-end portion of the vehicle frame with the rear end plate removed to show the details of mounting of the rearmost pair of outriggers on the frame, the outriggers being shown in a retracted position;

FIG. 4 is a view similar to FIG. 3 but with the outrigger arms extended in a vehicle-supporting position, and with parts of the telescoping arm sections broken away to show the internal construction thereof;

FIG. 5 is a sectional view taken along the line 5—5 of FIG. 3 showing the guide means for preventing lateral displacement of the outrigger arms; and

FIG. 6 is an enlarged perspective view showing the self-releasing lock feature of the outrigger arms.

With reference to the drawings, FIGS. 1 and 2 illustrate schematically a mobile crane **10** including a crane boom **12** and cab **14** mounted on a turntable **16** for swiveling movement on a vehicle frame **18**, the frame being supported when in transit by front and rear wheels **20**.

The frame carries two pairs of outrigger arms **22** including a first pair between the front and rear wheels of the vehicle and a second pair just behind the rearmost wheels of the vehicle for providing the vehicle with lateral stability when the crane is operating. It will be understood that although the outriggers are illustrated on a crane, they may be used with equal advantage on power shovels, log-loading equipment, and other heavy mobile equipment which requires additional lateral stability when the boom is operating.

FIGS. 3 and 4 illustrate the rear pair of outrigger arms **22*a*** and **22*b*** with the rear end plate **24** (see FIG. 2) of the vehicle frame removed to reveal the details of mounting of the arms on the frame **18**. Referring specifically to the rearmost outrigger arm **22*a***, each arm includes a hollow, rectangular outer arm section **26** hingedly mounted at its inner end **28** on an upwardly projecting pair of ears **30** to a lower sidewall portion **32** of the vehicle frame **18** by a hinge pin **31**. The arm section **26** extends laterally beneath the bottom wall **34** of the vehicle frame and beyond the opposite sidewall **36** thereof. A second arm section **38** is telescopingly mounted within the first arm section **26** and is telescoped by a fluid-actuated power cylinder **40**. The cylinder is hingedly anchored at one end by mounting bracket **42** to the inner end of the outer arm section **26** and has a piston rod **44** which extends within the hollow interior of the second arm section where it is pinned at **46**.

A ground-engaging pad **48** is pivoted at **50** to a project-

ing outer end portion **51** of the inner arm section **38** and provides a bearing surface for transmitting to the ground at least a portion of the dynamic load of the vehicle when the vehicle-supported crane is operating. As shown best in FIGS. 3 and 4, a projecting end portion **52** extends outwardly from the lower, outer end of the outer arm section **26** and has an outer camming surface **54** which engages the upper surface of the pad **48** to swing the latter upwardly to a generally vertical position and maintain it in such position when the inner arm section **38** is retracted to its full extent. Thus, retraction of the inner arm section automatically flips the pad to a vertical position so that the pad clears the rearmost wheels **20** and reduces to a minimum the overall width of the vehicle when in transit. Subsequent extension of the inner arm section when setting up for operation allows the pad to flop to a horizontal disposition for engaging the ground surface since the center of gravity of the pad is positioned laterally outside of its pivotal axis **50** while the pad is collapsed. This is one of the features which permits the outriggers to be placed in their operative positions and collapsed to their inoperative positions by a single man while he remains at the controls of the vehicle.

As clearly shown in FIG. 4, each of the ground-engaging pads **48** is of nonsymmetrical construction, with the laterally outwardly directed pad portions having a greater bearing surface than the laterally inwardly directed portions. This construction provides a maximum bearing surface area for each pad greater than that which could be provided if each of the pads were made symmetrical with respect to the pivot pin **50**, since the size of the inwardly directed portion of the pad is limited by the clearance which must be provided between the pad and the ground when the pad is in its collapsed, vertical position.

A second fluid-actuated power cylinder **56** is provided for swinging each outrigger arm about its pivotal connection from a generally horizontal, collapsed position to a downwardly inclined position for supporting the vehicle. The cylinder **56** for the arm **22***a* is pivotally mounted at **58** to the upper side **36** of the vehicle frame **18** opposite the side **32** to which the same arm is pivotally mounted. The cylinder has a piston rod **60** which is pivoted at **62** to the outer end of the first arm section **26** at a position such that the longitudinal axis of the cylinder extends laterally outwardly and downwardly from the side **36** of the frame at an angle of approximately 45° to the sidewall of the frame and to the horizontal when the arms are approximately horizontal. Thus, upon extension of the arm **22***a* to a load-supporting position as shown in FIG. 4, the axis of the cylinder **56** remains in an angular disposition relative to the frame and arm. It has been found that by mounting the arm-pivoting cylinders **56** at a relatively large oblique angle relative to the vertical, or sidewall of the frame, rather than in a generally vertical position as in some prior art outrigger systems, a cylinder having a much longer stroke than usual can be employed for pivoting the outrigger arms, and thus a considerably greater vertical adjustment of the arms can be obtained than was heretofore possible without providing additional adjustment features. This is important in that the angularly mounted cylinders **56** provide the only necessary means of vertical adjustment of the outriggers, whereas in prior art devices utilizing vertical arm-pivoting cylinders it has been necessary to provide vertically adjustable pads in addition to vertical movement of the arms in order to obtain the desired maximum vertical adjustment of the outrigger system.

Each outrigger arm also has a self-locking feature whereby the arms are automatically locked in any adjusted position thereof upon pivoting such arms in a downward direction so that in the event one of the arm-pivoting cylinders **56** should fail, the associated locking device will maintain such arm in approximately the same position it is in when failure occurs. As shown in FIGS. 3 and 4, the locking means includes a locking arm **64** for each outrigger arm, the locking arm for outrigger **22***a* being hinged at **66** to the outer sidewall **36** of frame **18** beneath the associated cylinder **56**. A series of rib members **68** spaced apart along the upper surface of the outer arm section **26** define notches therebetween for receiving the lower end of the locking arm **64**.

When the outrigger arm is horizontal, the lower end of the locking arm rests against the upper surface of the arm section **26** near the cylinder **56** and laterally outwardly of the ribs **68**. However, as the outrigger arm is lowered by the cylinder **56** from its FIG. 3 position to its FIG. 4 position, the locking arm **64** swings downwardly by gravity so that its lower end rides along the upper surface of the arm section **26** over the ribs **68**. When the outrigger arm is in its desired lowered position, it is then raised slightly to cause the lower end of the locking arm to lodge in the closest one of the notches so that the locking arm supports at least some, if not all, of the load that would otherwise be supported wholly by the cylinder **56**. Thus, if the cylinder **56** should fail, the locking arm **64** would continue to support the outrigger arm **22***a* to prevent its collapse.

The locking arm has a self-releasing feature. This feature is shown best in FIG. 6, and includes a small projecting bracket **70** at the outer end of the cylinder **56** which bracket is provided with a keyhole slot **72** within which a length of chain **74** is adjustably secured. A tension spring **76** is attached at one end to one end of the chain and at the other end to the lower end of the locking arm **64**. The tension in the spring is adjusted by adjusting the length of chain between the bracket and the spring. Prior to lowering the outrigger arm, a large amount of slack is provided in the chain portion so that the locking arm will drop into one of the notches when the outrigger is lowered to its desired position. After the locking arm is wedged in one of the notches against one of the ribs, the slack is removed from the chain by sliding the chain to the enlarged portion of the slot and pulling on the finger ring **78** at the free end of the chain. Sufficient tension is placed on the spring when in its adjusted position so that when the outrigger is lowered slightly by extending the piston rod **60**, the locking arm will spring out of the notch in which it is wedged to permit raising the outrigger to its retracted position.

Guide means are provided on the frame **18** to prevent each of the outrigger arms **22***a* and **22***b* from being displaced laterally as they are raised and lowered and while in their adjusted positions. As shown best in FIG. 5, the outrigger arms **22***a* and **22***b* are mounted in side-by-side relationship so that when at least in their collapsed position each one tends to prevent lateral displacement of the other in one direction. However, without the provision of guide means on the frame, lateral displacement of the outrigger arms in the opposite direction would not be prevented. The guide means for this purpose includes an inner guide member **80** which depends vertically from beneath the bottom **34** of the frame **18** and which is reinforced laterally by an angular reinforcing member **82** to prevent lateral displacement of the arm **22***b* in a forward direction. The inner guide member **80** is mounted near the right-hand side of the frame as viewed in FIGS. 3 and 4 where the arm **22***b* undergoes its greatest vertical movement, although such member is not visible in such views.

Another, outer guide member **84** extends vertically beneath the rear end plate **24** near the left-hand side of the frame **18** to prevent rearward lateral displacement of the rearmost outrigger arm **22***a* during the raising and lowering of such arm. A web reinforcing member **86** provides lateral support for the guide member **84**.

In addition to the above guide members, the undersides of outrigger arms **22***a* and **22***b* carry guide members **88** and **89**, respectively. The guide member **88** is attached to the underside of the first arm section **26** of arm **22***a* near its pivoted end to prevent lateral displacement of the arm **22***b* toward arm **22***a* when the former is lowered.

Similarly, the guide member **89** is attached in a corresponding position on the opposite arm **22***b* to prevent lateral displacement of arm **22***a* as the latter is lowered.

Although the foregoing description has been with regard primarily to the rearmost outrigger arm **22***a*, it is to be understood that each of the four outrigger arms **22** is of similar construction and is mounted in a similar manner to the vehicle frame. Moreover, the interrelationship of the forward pair of arms **22** is the same as that described heretofore with respect to the rear pair of arms.

Having illustrated and described a preferred embodiment of the invention, it should be apparent to those skilled in the art that the invention permits of modification in arrangement and detail. I claim as my invention all such modifications as come within the true spirit and scope of the appended claims.

I claim:

1. In a vehicle including a wheel-supported frame, vehicle stabilizing means comprising:

an outrigger arm including a first arm section pivoted to one side of said frame and extending beneath said frame beyond the opposite side thereof,

a second arm section telescopingly mounted within said first arm section,

means within said first arm section for extending and retracting said second arm section,

a ground-engaging pad mounted on the outer end of said second arm section,

means on said frame for raising and lowering said first arm section about its pivotal axis,

locking means including a locking arm on said opposite side of said frame and cooperative notch-defining means on said first arm section for locking said outrigger arm in a lowered position thereof,

and adjustable tensioning means attached to said locking arm for releasing said locking arm from locking engagement with said notch-defining means upon a slight lowering of said outrigger arm relative to said frame.

2. In a load-handling vehicle including a mobile frame having opposite, longitudinally extending sides,

a pair of extensible outrigger arms extending side by side in opposite directions beneath said frame and laterally beyond opposite sides thereof,

each of said arms including a hollow first arm section pivoted at its inner end to said frame at one side of said frame and terminating at an outer end beyond the other side of said frame,

and a second arm section telescopingly mounted within said first arm section,

a first power cylinder means within said first arm section for extending said second arm section beyond the outer end of said first arm section,

a ground-engaging pad pivoted to the outer end of said second arm section,

and a second power cylinder means pivoted to said other side of said frame and to said first arm section for swinging said first arm section about its pivotal connection to said frame,

the improvement comprising,

an arm-stabilizing means for restraining said arms against lateral movement when said arms are lowered into their frame-supporting positions,

said stabilizing means including first rigid means extending downwardly from adjacent the inner end of each first arm section and slidably engaging the facing side of the other first arm section near the outer end thereof when said arms are in their lowered frame-supporting positions so that said first arm sections are mutually restrained against lateral movement toward one another,

said stabilizing means including second rigid means extending downwardly from said frame and slidably engaging the outer side of each first arm section near

the outer end thereof when each said arm is in its frame-supporting position so that said first arm sections are restrained against lateral movement away from one another,

whereby said stabilizing means rather than said second cylinder means restrain said frame against longitudinal movement when said frame is supported on said arms.

3. In a load-handling vehicle including a mobile frame having opposite, longitudinally extending sides,

a pair of extensible outrigger arms extending side by side in opposite directions beneath said frame and laterally beyond opposite sides thereof,

each of said arms including a hollow first arm section pivoted at its inner end to said frame at one side of said frame and terminating at an outer end beyond the other side of said frame,

and a second arm section telescopingly mounted within said first arm section,

a first power cylinder means within said first arm section for extending said second arm section beyond the outer end of said first arm section,

a second power cylinder means pivoted to said other side of said frame and to said first arm section for swinging said first arm section about its pivotal connection to said frame,

the improvement comprising,

a ground-engaging pad pivoted to the outer end of said second arm section,

said pad being disposed, by gravity, in a generally horizontal load-supporting position when said second arm section is extended outwardly beyond said first arm section,

and means projecting outwardly from the outer end of said first arm section for engaging said pad and camming the same to a generally vertical position upon retraction of said second arm section fully within said first arm section.

4. In a load handling vehicle including a mobile frame having opposite longitudinal extending sides,

a pair of extensible outrigger arms extending side-by-side in opposite directions beneath said frame and laterally beyond said opposite sides,

each of said arms including a hollow first arm section pivoted at its inner end to said frame at one side thereof and terminating at an outer end beyond the other side of said frame,

and a second arm section telescopingly mounted within said first arm section,

a first power cylinder means within said first arm section for extending said second arm section beyond the outer end of said first arm section,

a second power cylinder means pivoted to said other side of said frame and to said first arm section for swinging said first arm section about its pivotal connection to said frame,

said second power cylinder means being positioned with respect to said frame and said first arm section so that the longitudinal axis of said second power cylindrical means extends laterally outwardly of and downwardly from said frame at an oblique angle to the horizontal and vertical in all positions of adjustment of the connected said outrigger arm,

arm stabilizing means for restraining said arms against lateral movement when said arms are lowered into their frame supporting positions, including rigid means extending downwardly from said frame and slidably engaging the outwardly facing sides of both said first arm sections near the outer ends thereof when said sections are in their frame supporting positions so that said first arm sections are restrained against lateral movement away from one another,

said stabilizing means further including rigid means on each of said first arm sections engaging the other said first arm section near the outer end thereof

when said outrigger arms are in their lowered frame supporting positions so that said first arm sections are mutually restrained against lateral movement toward one another,

a ground engaging pad pivoted to the outer end of each said second arm section including means disposing said pad generally horizontally when said second arm section is fully extended,

and cooperative locking means on said first arm sections and on said frame for locking outrigger arms in lowered frame supporting positions.

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