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2,363,341

CRANE ATTACHMENT FOR TRACTORS

Filed Nov. 11, 1943

2 Sheets-Sheet 1

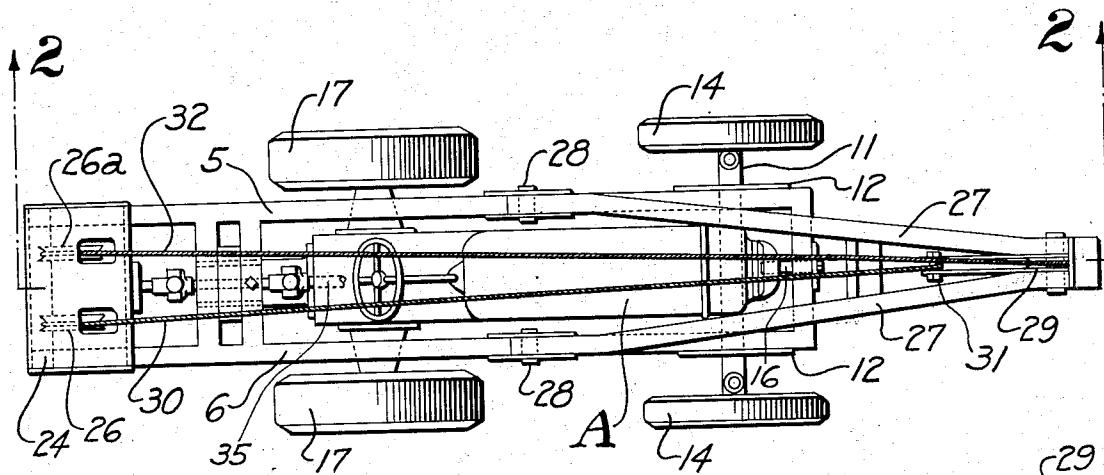


FIG. 1

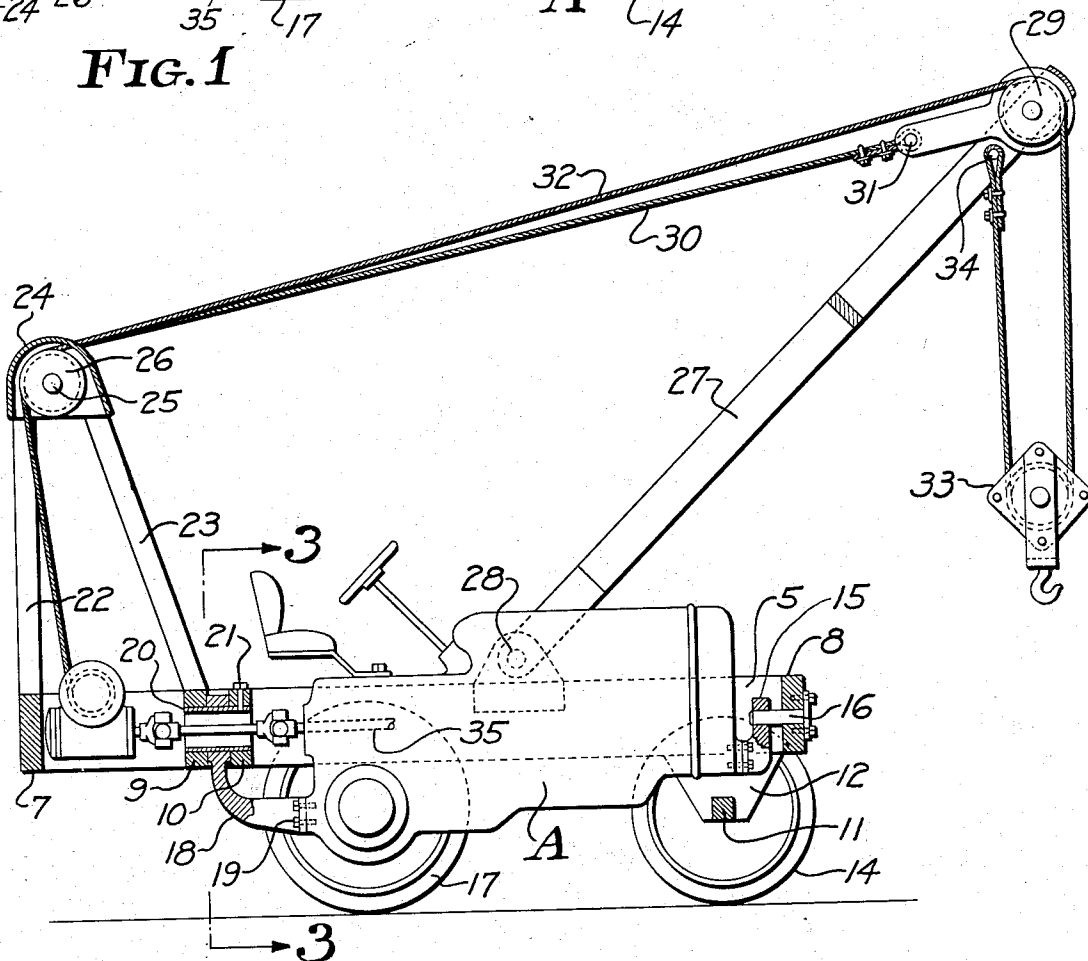


FIG. 2

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2 Sheets-Sheet 2

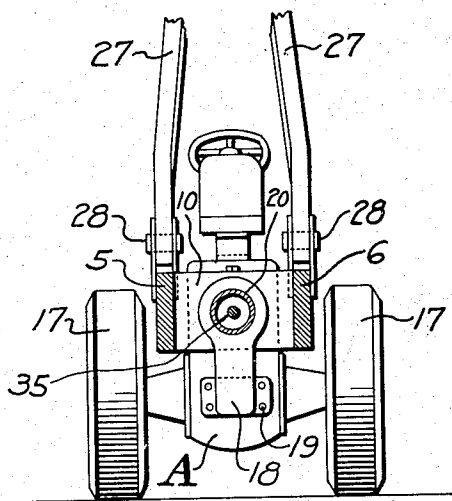


FIG. 3

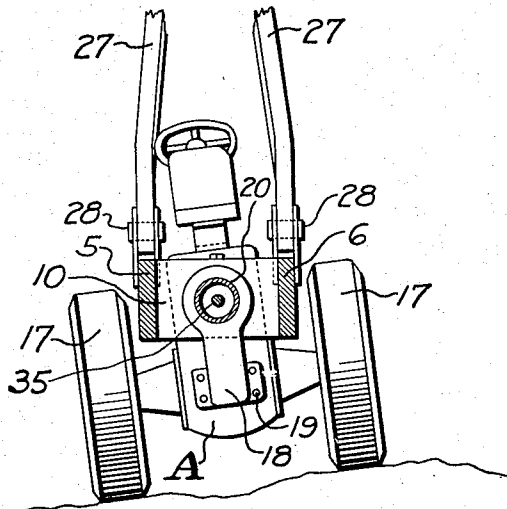


FIG. 4

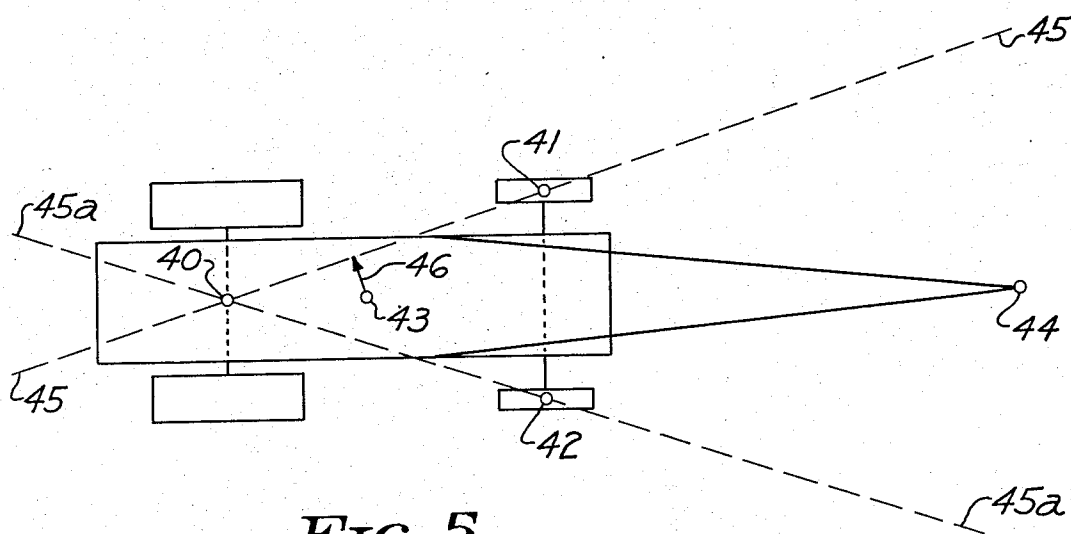


FIG. 5

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CRANE ATTACHMENT FOR TRACTORS

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5 Claims. (Cl. 212—8)

This invention relates to a crane attachment for tractors and especially a crane which is adapted to be mounted on a standard tractor of the conventional wheel type.

The object of the invention is generally to improve and simplify the construction and operation of structures of this character; to provide a crane structure which is adapted to be attached to a standard wheel tractor in such a manner that the crane frame automatically transmits all of its loads to the four supporting ground wheels through three points of support only under all conditions of loading and operation; to provide a wheeled crane structure in which the front or steering wheels are adjacent the boom point and are mounted rigidly relative to the supporting crane frame, while the rear wheels are mounted in such a manner as to permit their free oscillation relative to the crane frame, thus insuring that the crane unit will remain automatically supported upon its four wheels under all conditions of normal loading and operation regardless of unevenness of the ground over which it may be required to travel; to provide a wheeled crane structure which is continuously supported on three points under all conditions of load and no load, and in which two of the three points of support are always located between the center of gravity of the crane unit and the suspended load; to provide a crane unit mounted on the four wheels and in which the center of gravity and the center of load always come on the same side of the sidewise overturning axes; and further, to provide a crane structure giving the operator a maximum vision coupled with a minimum interference from structural members as he enters or leaves the operating seat.

The invention is shown by way of illustration in the accompanying drawings, in which:

Fig. 1 is a plan view of the crane attachment complete, except with the operating seat shown removed for clarity;

Fig. 2 is a sectional elevation on line 2—2 of Fig. 1;

Fig. 3 is a cross section on line 3—3 of Fig. 2, showing the position of the crane elements when all four wheels rest on a level plane;

Fig. 4 is a cross section similar to Fig. 3 except with the tractor, its rear axle and wheels shown tilted relative to the frame—as when the crane unit is supported on uneven ground; and

Fig. 5 is a diagrammatic view of the crane attachment and tractor unit.

Referring to the drawings in detail, and es-

pecially Figs. 1 and 2, A indicates in general a conventional four-wheel tractor in which the motor or engine, the transmission housing, and the final drive housing, together with the rear axle housing, are all mounted to form a rigid unit structure.

Completely surrounding this structure is a rectangular shaped crane supporting frame which consists of two longitudinally extending side beams 5 and 6 which are connected by cross beams 7, 8, 9 and 10, of which the beams 7 and 8 form the rear and front ends respectively of the frame. A front axle 11 is rigidly secured to and supports the front end of the frame by means of gusset plates 12 welded or otherwise secured to opposite sides of the frame, and the axle in turn is supported by front wheels 14 pivoted in forks in the usual manner to permit steering.

A hanger arm 15, pivoted on a pin 16, secured to the cross beam 8, is secured to the front end of the tractor unit and forms a pivotal support therefor. The rear end of the tractor unit is supported by rear driving wheels 17, while the rear end of the crane frame is pivotally supported in an upwardly extending arm 18 which is secured as at 19 to the tractor unit. Thus, the front end of the crane frame is supported directly by the front wheels while the front end of the tractor unit is pivotally supported by the frame. Conversely, the rear end of the tractor unit is supported by the two rear driving wheels, while the rear end of the crane frame is pivotally supported by the tractor unit. This is important, as a three-point support for the crane frame is thus provided with two points of support forward, and one point at the rear. This particular form of support will later be referred to.

The rear pivot point is formed by a sleeve 20 extending through the cross beams 9 and 10, and the arm 18. The sleeve is secured against removal by welding, or by means of a set screw 21, as here shown, while the arm is free to pivot about the sleeve or vice versa—the sleeve and frame are free to pivot about the arm.

Secured to the rear end of the crane frame, and at each side thereof is an A frame. This frame consists of vertical members 22, and angularly disposed beams or structural members 23, and they are connected at their upper ends by a crosswise extending arcuate-shaped member 24. Also extending crosswise of the A frame, and secured therein, is a shaft 25, and journaled thereon are a pair of sheaves 26 and 26a. A

boom is also supported by the crane frame. This boom consists of two arms 27—27 which at their lower ends are pivoted to the crane frame as at 28—28. The upper ends of the boom arms converge and may be connected throughout a portion of their length by a lattice-work or cross members in the usual manner, and a boom point sheave 29 is journaled in the usual way at the point or upper end of the boom.

A two-drum hoist is suitably mounted at the extreme rear end of the crane frame, and in actual practice a cable 30 from one drum leads over sheave 26 and is dead-ended at the peak of the boom as at 31. A second cable 32 carried by the other drum leads over the sheave 26a and 29 to a sheave hook block 33, and is then dead-ended near the point of the boom as at 34.

The two-drum hoist may be driven in any suitable manner, or as here shown through a power take-off shaft 35 on the tractor, and when one drum is driven, a load attached to the hook block sheave may be raised or lowered while operation of the second drum will raise or lower the boom.

The sleeve 20 serves two functions; first, that of a pivotal support for the rear end of the frame, and secondly, that of a housing or passage through which the power take-off shaft may be extended. The sleeve 20 and the pin 16 are in direct alignment with each other so as to permit free oscillation between the tractor unit and the crane frame, or vice versa, and as the power take-off shaft is positioned within the sleeve and centrally thereof there would be no need of the universal couplings shown. Strains may, however, be encountered during certain load conditions which might cause sufficient bending to set up detrimental deflections; hence, the use of universal couplings.

Fig. 5 illustrates diagrammatically the three-point support obtained by the two front wheels and the rear pivot, or the sleeve 20. These three points of support are indicated at 40, 41 and 42. The center of gravity of the crane unit is indicated at 43, and the load to be raised at 44. The axis of sidewise overturning of the tractor and frame is indicated by the lines 45—45, 45a—45a, and the weight lever arm by the arrow 46. It should be noted that the two points of support indicated at 41 and 42, or in other words the front wheels, are located between the center of gravity 43 and the load 44. This is very important as it provides maximum stability against sidewise overturning when the crane is picking up, supporting or transporting a load. Stability is further insured due to the fact that the center of gravity 43 and the load 44 will, during all normal operating conditions, remain in a position inside or centrally of the lines or axis of overturning indicated at 45—45, 45a—45a. In other words, sidewise overturning cannot take place until the center of gravity of the load is shifted to the outside of the axis of overturning.

From the foregoing, it should be apparent that a simple rigid frame and boom structure is provided, and that by attaching it to the tractor in the manner disclosed and described, the major forces produced when lifting or transporting a load will be directed to the forward supports 41 and 42 of the three-point support, and as the front axle and the wheels which represent the forward supports 41 and 42 may be made as heavy as desired, the unit as a whole may be designed for almost any load capacity within the power range of the tractor motor and hoist employed.

It should further be obvious that when a load

is being picked up that the center of gravity or the weight of the crane unit plus the load being picked up shifts forward from the point 43 and assumes a position close to the two front supports 41 and 42 when the load is finally lifted and is being transported; hence, the tractor unit proper is subjected to a minimum of load and strain as no load can be transmitted to the front end of the unit, and only a small portion, if any, to the rear end or pivot point 40. The engine and transmission, or in other words the main mechanism of the tractor, is thus subjected to minimum strain and load incident to operation of the crane attachment, and long life and dependable operation are assured.

Maximum head-on stability is provided inherently by the construction of the unit, and as sidewise stability is insured by the two forward supporting wheels 41 and 42 (Fig. 5), the driver or operator can work in comparative safety. There is of course, some possibility of sidewise overturning of a crane of this type, particularly when operating on a slope or uneven ground surface; hence, it is important that the driver or operator should be able to jump clear of the machine without interference from either side. To this end it will be noted that the diagonal or structural members 23 of the A frames are kept well behind the driver's seat and that the boom pivot points 28 are kept well in front thereof. This arrangement provides a maximum of visibility, and at the same time leaves both sides of the unit open or free of obstructions so that the operator can quickly escape in case of emergency, overturning, etc.

While this and other features of my invention have been more or less specifically described and illustrated, I wish it understood that various changes in form and construction may be resorted to within the scope of the appended claims, and that the materials and finish of the parts employed may be such as the experience and judgment of the manufacturer may dictate, or varying uses may demand.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:

1. A crane structure of the character described comprising a rectangular shaped frame having a front and a rear end, an axle rigidly secured to the front end of the frame, a pair of steering wheels one on each end of the axle and forming a two-point support for the front end of the frame, a tractor disposed within the frame, driving wheels on the tractor supporting the rear end thereof, a pivotal connection between the front end of the frame and the tractor and supporting the front end of the tractor, a pivotal connection between the rear end of the tractor and the frame and supporting the rear end of the frame, said last-named pivotal connection forming a third point of support for the frame, a two-drum hoist supported by the frame, and a boom pivotally supported on the frame and operated by the hoist.

2. A crane structure of the character described comprising a rectangular shaped frame having a front and a rear end, an axle rigidly secured to the front end of the frame, a pair of steering wheels one on each end of the axle and forming a two-point support for the front end of the frame, a tractor disposed within the frame, driving wheels on the tractor supporting the rear end thereof, a pivotal connection between the front end of the frame and the tractor and supporting the front end of the tractor, a pivotal connection

between the rear end of the tractor and the frame and supporting the rear end of the frame, said last-named pivotal connection forming a third point of support for the frame, a two-drum hoist supported by the frame, a boom pivotally supported on the frame and operated by the hoist, and means for transmitting power from the tractor to operate the hoist and boom.

3. A crane structure of the character described comprising a rectangular shaped frame having a front and rear end, an axle and a pair of steering wheels supporting the front end of the frame, a tractor disposed within the frame, driving wheels on the tractor supporting the rear end of the tractor, a pivot on the front end of the frame supporting the front end of the tractor, a pivot on the rear end of the tractor supporting the rear end of the frame, said pivot forming a rear single point support and the front steering wheels a pair of spaced front supports for the frame whereby lines drawn through the rear support and the front supports form the axes of sideways overturning of the tractor and frame with the weight or center of gravity of the tractor and frame located on a center line drawn through the rear support and centrally between the front supports, and a load carrying boom pivoted on the frame and positioned on the same center line.

4. A crane structure of the character described comprising a rectangular shaped frame having a front and rear end, an axle and a pair of steering wheels supporting the front end of the frame, a tractor disposed within the frame, driving wheels on the tractor supporting the rear end of the tractor, a pivot on the front end of the frame supporting the front end of the tractor, a pivot on the rear end of the tractor supporting the rear end of the frame, said pivot forming a rear

single point support and the front steering wheels a pair of spaced front supports for the frame whereby lines drawn through the rear support and the front supports form the axes of sideways overturning of the tractor and frame with the weight or center of gravity of the tractor and frame located on a center line drawn through the rear support and centrally between the front supports, a two-drum hoist supported by the frame, and a boom pivotally supported by the frame and operated by the hoist, said boom being located on the same center line as the center of gravity of the tractor and frame.

5. A crane structure of the character described comprising a rectangular shaped frame having a front and rear end, an axle and a pair of steering wheels supporting the front end of the frame, a tractor disposed within the frame, driving wheels on the tractor supporting the rear end of the tractor, a pivot on the front end of the frame supporting the front end of the tractor, a pivot on the rear end of the tractor supporting the rear end of the frame, said pivot and the front wheels forming a three-point support for the frame, a hoist secured to the rear end of the frame, a seat for the operator of the tractor disposed forward of the hoist, a boom pivoted to the frame at a point forward of the driver's seat, a pair of A-shaped frames secured to the frame, one at each side thereof and to the rear of the driver's seat, guide sheaves carried by the A frames and cables extending from the hoist and over said guide sheaves to operate the boom, said A-shaped frames being spaced a sufficient distance rearwardly of the driver's seat and the pivotal end of the boom being spaced sufficiently forward of the driver's seat to permit unobstructed entrance or exit of the driver from the seat.

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