Jan. 8, 1952 L. L. EAKIN 2,582,111

HOISTING APPARATUS

Filed Jan. 31, 1949 3 Sheets-Sheet 1

Fig. 4.

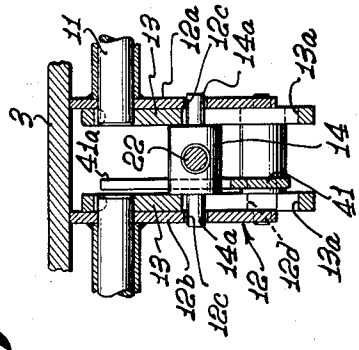

Fig. 1.

Fig. 5.

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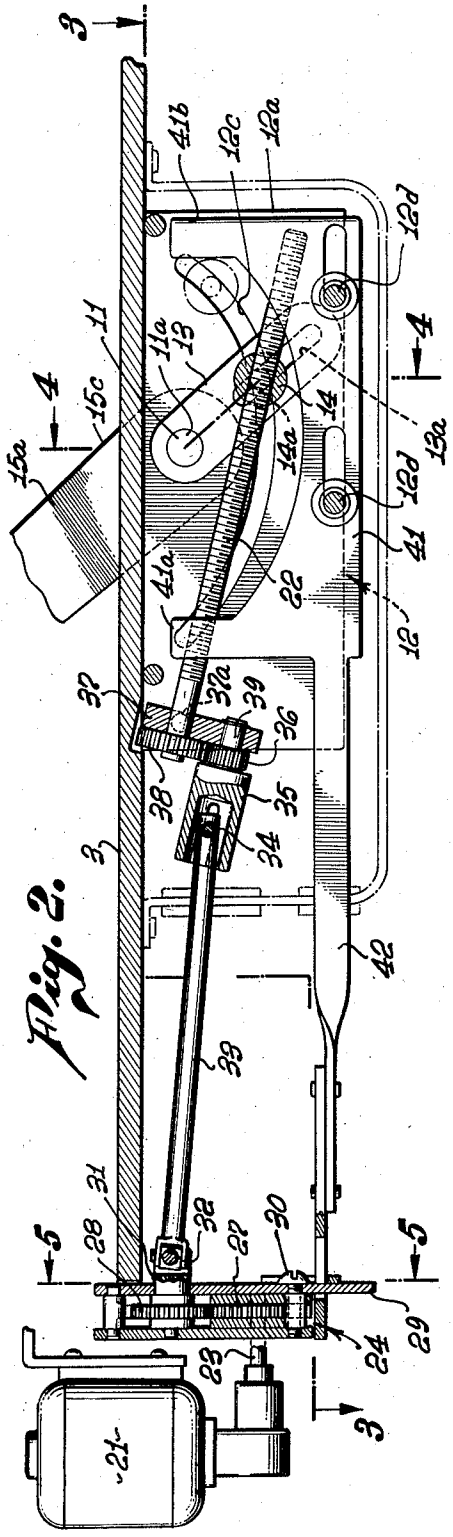

Fig. 2.

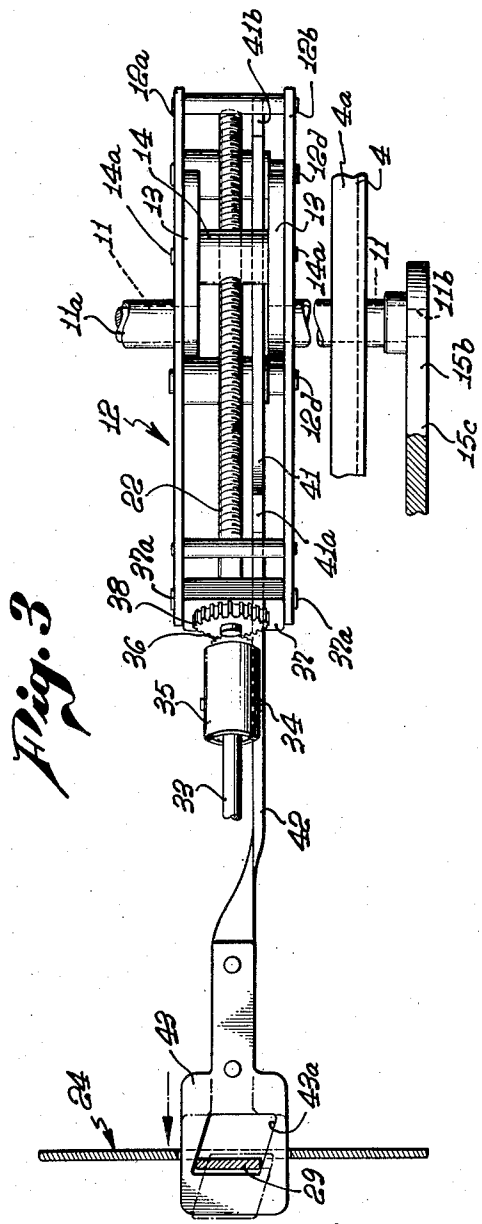

Fig. 3.

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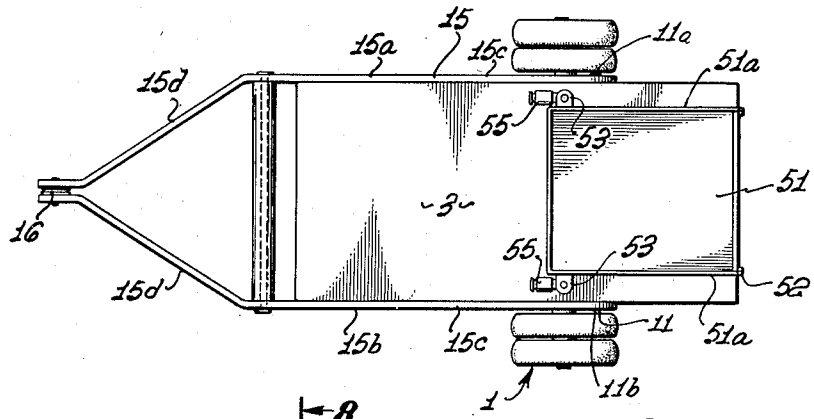

Fig. 6.

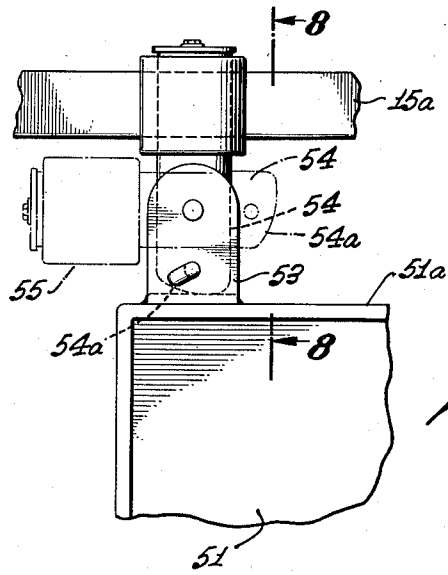

Fig. 7.

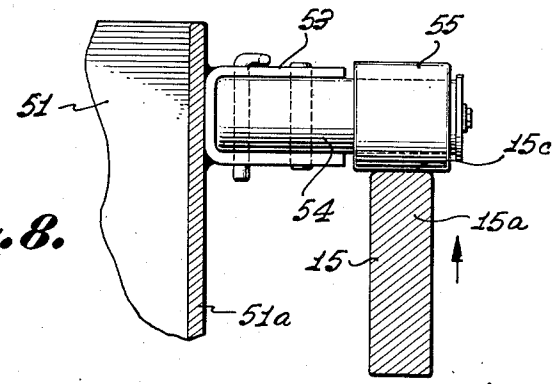

Fig. 8.

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Patented Jan. 8, 1952

2,582,111

UNITED STATES PATENT OFFICE

2,582,111

HOISTING APPARATUS

Lourie L. Eakin, Ventura, Calif.

Application January 31, 1949, Serial No. 73,694

10 Claims. (Cl. 212—8)

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My present invention relates to a hoisting apparatus.

One of the principal objects of this invention is to provide a hoisting apparatus having a boom which may be swung by mechanical means from a relatively low or reclining position to a substantially upright position, or from one substantially horizontal through an upright position to an opposite substantially horizontal position, in such a manner that proportionately greater boom-raising or holding force is applied, when the boom is in a low, reclining, or substantially horizontal position, than when in a substantially upright or intermediate position.

An important object of this invention is to provide a novel mechanism whereby uniform screw-operating means is employed for imparting variable load-raising force, or variable length-lever action to a raising force, and one which is particularly adapted for variously swinging a boom.

An important object also of this invention is to provide a hoisting apparatus of this class which is designed so that it may be readily carried by and effectively used on vehicles, and particularly automobiles or trucks.

Another important object of this invention is to provide simple, positive, and foolproof means for shifting or tilting the boom in opposite directions, and particularly for limiting the shifting or tilting of the boom in either direction, an important feature of this invention being the provision of such control in immediate connection with the swinging boom.

With these and other objects in view, as will appear hereinafter, I have devised a hoisting apparatus having certain novel features of construction, combination, and arrangement of parts and portions, as will be hereinafter described in detail, and particularly set forth in the appended claims, reference being had to the accompanying drawings and to the characters of reference thereon, which form a part of this application, in which:

Fig. 1 is a side elevational view of an automobile truck embodying my invention of the mechanically-operated boom mechanism in one form, and also showing embodied therein a tiltable load-carrying body, and showing by dotted lines said body and boom in a partly raised position;

Fig. 2 is an enlarged fragmentary sectional elevational view showing the boom-operating mechanism illustrated generally in Fig. 1;

Fig. 3 is a fragmentary plan view of the mechanism, shown in Fig. 2;

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Fig. 4 is a transverse sectional elevational view thereof, taken through 4—4 of Fig. 2;

Fig. 5 is a transverse sectional view, taken through 5—5 of Fig. 2, showing particularly the means for automatically shifting the direction of control for the boom;

Fig. 6 is a plan view of the load-carrying body and the boom, shown in Fig. 1;

Fig. 7 is an enlarged top view of the means for attaching the boom to the load-carrying body for raising the latter, a portion of the attachment being shown, in a shifted position, by dotted lines; and

Fig. 8 is a fragmentary elevational view thereof, taken through 8—8 of Fig. 7.

In the drawings, I have shown my invention embodied in a conventional motor vehicle or truck 1, having a driver's cab 2 at the forward end, and at the rear end at platform 3, for supporting various objects during transportation, the platform being carried on the chassis 4 of the vehicle.

Rotatably or pivotally mounted on the side rails 4^a of the chassis 4, and transversely with respect to the longitudinal axis of the vehicle, is a rock shaft 11 made up of axially aligned shaft sections 11^a and 11^b spaced apart at their inner ends. These inner ends are rotatably mounted in plates 12^a and 12^b forming the opposite sides of a rectangular frame 12 carried at the rear portion of the chassis 4 between the side rails 4^a thereof.

To the inner end of the shaft sections 11^a and 11^b are secured the inner ends of arms 13 which are longitudinally slotted, as indicated by 13^a, that is, radially slotted with respect to the axis of the shaft 11. The free ends of the arms are connected by means of a nut or block 14 which has trunnions 14^a at its opposite ends, which trunnions extend slidably through the slots. The trunnions also extend into and are slidable in plate-cam slots 12^c in the plates 12^a and 12^b. These cam slots are substantially arcuate and are arranged below the axis of the shaft, the ends of the slots extending forwardly and backwardly with respect thereto, as will be hereinafter described in greater detail.

The boom, designated 15, comprises arms 15^a and 15^b. One end of the respective arms is positioned at the outer sides of the rails 4^a of the chassis 4 and mounted on the outer ends of the shaft sections 11^a and 11^b. The free portions of the ends of the arms of the boom converge and are secured at their outer ends, as shown best in Fig. 6, a sheave 16 being mounted at the converging ends of the arms of the boom. The arms

are also transversely offset intermediate their ends providing portions 15c and 15d which are positioned horizontally, when the boom is directed forwardly with respect to the vehicle, the portions 15c being substantially flush with the deck or platform 3 and the portions 15d extending over the cab 2 of the vehicle, as shown best in Fig. 1.

The boom 15 is swung about its horizontal axis, to forwardly or rearwardly directed positions, by a suitable motor 21 carried by the chassis of the vehicle, preferably forwardly of the platform 3. This motor operates or rotates a long screw 22 which moves the nut or block 14 forwardly or backwardly within the cam slots 12c, the mechanism connecting the motor to the screw being hereinafter described in detail.

The drive shaft 23 may be the motor shaft or it may be connected thereto through intermediate gearing, not shown. The rear end of the drive shaft is rotatably mounted in a bearing frame 24 which, as shown, consists of spaced apart plates. On the drive shaft 23 is mounted a pinion 25 which meshes with a gear 26 and the latter gear meshing with another gear 27, both of the latter being of the same diameter, all gears being positioned between the plates of the bearing frame. Either of the gears 26 or 27 may mesh with and rotate a driven gear 28 which, as shown, is mounted at the free end of an arm 29 in such a manner that the driven gear 28 may be shifted laterally to mesh with either of the gears 26 or 27, depending upon the desired direction of rotation of the gear 28. The arm 29 is pivotally mounted intermediate its ends on the bearing frame 24, as indicated by 30.

The gear 28 has a forwardly extending stud shaft 31 which is connected through a universal joint 32, shaft 33, and a sliding and swivel connection 34, to a forwardly extending stud shaft 35 carried by a pinion 36. At the forward portion of the frame 12 is pivotally mounted a bearing member 37 which is shown as having trunnions 37a which are pivotally mounted in the two side plates 12a and 12b of the frame 12. The forward end of the screw 22 is rotatably mounted in the bearing member, the axis of the screw extending preferably through the axis of the pivotal mounting of the bearing member. At the forward end of the screw is secured a gear 38 which meshes with and is driven by the pinion 36. This pinion has a stub shaft 39 opposed to but axially aligned with the stub shaft 35, and the stub shaft 39 rotatably supports the pinion 36 on the bearing member, as shown best in Fig. 2. Thus, operation, of the motor turns the screw 22 which moves the nut or block 14 in the cam slots 12c for tilting the boom.

Within the frame 12, and preferably at the inner sides of the arms 13, is positioned a yoke 41 which is slidably mounted, in a forward and backward direction, on guides 12d, which are herein shown as transverse tie members. The yoke has upwardly extending arms 41a and 41b which are adapted to be engaged by the block 14 near its forward and rear positions for shifting the yoke. The yoke is provided with a forwardly extending rod 42, the forward end of which is reciprocally mounted in the lower portion of the bearing frame 24. The forward portion of the rod carries a cam 43 having a diagonal slot 43a into which the lower end of the gear-shifting arm 29 extends. Thus, when the arm 41b of the yoke 41 is engaged by the block 14, the cam 43 is drawn backwardly causing the lower end of the gear-shifting arm 29 to be shifted to the right, by means of the cam 43a, thereby shifting the driven gear 28 to mesh with the gear 26, thus causing the screw 22 to be rotated in the opposite direction. This result is produced when the boom is shifted either to its forwardly or rearwardly directed positions and thereby preventing any sudden or positive limits for the mechanism controlling the boom.

It will be here noted that although the cam slot 12c is substantially arcuate and eccentric it is a relatively wide sweeping cam slot, the forward portion thereof being of less curvature than the rear portion. It will also be noted that the longitudinal axis of the arms 13, instead of being in substantial and opposed alignment with the arms 15a and 15b of the boom, may be at a slight obtuse angle with respect thereto, as shown in Fig. 2, so as to facilitate raising of the boom from the forward position in which the portions 15c are substantially flush with the platform of the vehicle.

It will be here also noted that the frame 12 may be substantially enclosed and serve as an oil or grease box for the mechanism supported by the frame 12.

On the rear portion of the platform 3 of the vehicle is carried a tiltable body 51, which is herein shown as box-like. It is pivotally mounted at its rear end and lower portion, as indicated by 52, on the rear end of the platform of the vehicle, the pivotal axis for the tilting of the box-like body being positioned backwardly from the pivotal axis of the boom.

On the opposite side walls 51a of the body are provided attachments, shown best in Figs. 7 and 8, for raising or tilting the forward end of the body when the boom is raised. Each of the attachments consists of brackets 53, which may be of U-shaped form, upon which are pivotally supported arms 54. On the outer ends of the arms are mounted rollers 55. When the arms are shifted so that they extend directly outwardly from the sides of the body 51, they are in a position to be engaged by the arms of the boom as it is raised from its forward to an upward position, as shown best by dotted lines in Fig. 1. This causes tilting of the body 51 in order to facilitate the discharge of the contents therein. The ends of the arms 54, opposite the rollers 55, are so constructed that they engage the inner portions of the brackets so as to prevent further backward shifting of the rollers, the inner ends of the arms 54 being shaped substantially as indicated by 54a in Fig. 7. When it is desired not to raise or tilt the body, the roller-carrying arms 54 are shifted forwardly, as indicated by dotted lines in Fig. 7.

I wish it to be understood that I do not desire to be limited to the exact details of construction shown and described, for obvious modifications will occur to a person skilled in the art.

I claim:

1. In a hoisting apparatus, a support, a boom pivoted on the support and on an axis transversely thereto and adapted to move to various operative positions with respect thereto, said boom having an arm extending from said pivotal axis, a frame on the support located in a plane perpendicular to said axis and having a plate cam located around the axis with its ends located a greater distance laterally forwardly and backwardly from the axis than the middle portion vertically from the axis, a block slidably mounted on the cam and also on the arm, a bearing member pivotally mounted on a horizontal axis on

and transversely to the frame, a screw rotatably mounted at one end on the bearing member and fixed against longitudinal movement thereon and screwably extending with its other end into the block for moving the same on said cam and on said arm, and means for rotating the screw.

2. In a hoisting apparatus, a support, a boom pivoted on the support and on an axis transversely thereto and adapted to move to various operative positions with respect thereto, said boom having an arm extending from said pivotal axis, a frame on the support located in a plane perpendicular to said axis and having a substantially arcuate cam extending eccentrically around the lower portion of the axis, the ends being located at a greater distance laterally from the axis than the middle portion below the axis, a block slidably mounted on the cam and also on the arm, a bearing member pivotally mounted on a horizontal axis on and transversely to the frame, a screw rotatably mounted at one end on the bearing member and fixed against longitudinal movement thereon and screwably extending with its other end into the block for moving the same on said cam and on said arm, and means for rotating the screw.

3. In a hoisting apparatus, a support, a boom pivoted on the support and on an axis transversely thereto and adapted to move to various operative positions with respect thereto, said boom having an arm extending in a direction from its pivotal axis opposite the main portion of the boom, a frame on the support located in a plane perpendicular to said axis and having a plate cam located around the lower portion of the axis with its ends located a greater distance laterally forwardly and backwardly from the axis than the middle portion vertically below the axis, a block slidably mounted on the cam and also on the arm, a bearing member pivotally mounted on a horizontal axis on and transversely to the frame, a screw rotatably mounted at one end on the bearing member and fixed against longitudinal movement thereon and screwably extending with its other end into the block for moving the same on said cam and on said arm, and means for rotating the screw.

4. In a hoisting apparatus, a support, a boom pivoted on the support and on an axis transversely thereto and adapted to move to various operative positions with respect thereto, said boom having an arm extending in a direction from its pivotal axis opposite the main portion of the boom, said arm being radially slotted, a frame on the support located in a plane perpendicular to said axis and having a plate cam located around the lower portion of the axis with its ends located a greater distance laterally forwardly and backwardly from the axis than the middle portion vertically below the axis, a block slidably mounted on the cam and also slidably mounted in the slot of the arm, a bearing member pivotally mounted on a horizontal axis on and transversely to the frame, a screw rotatably mounted at one end on the bearing member and fixed against longitudinal movement thereon and screwably extending with its other end into the block for moving the same on said cam and on said means, and means for rotating the screw.

5. In a hoisting apparatus, a support, a boom pivoted on the support and on an axis transversely thereto and adapted to move to various operative positions with respect thereto, said boom having an arm extending in a direction from its pivotal axis opposite the main portion of the

boom, a frame on the support located in a plane perpendicular to said axis and having a positive motion slotted plate cam located around the lower portion of the axis with its ends located a greater distance laterally forwardly and backwardly from the axis than the middle portion vertically below the axis, a block slidably mounted in the cam slot and also on the arm, a bearing member pivotally mounted on a horizontal axis on and transversely to the frame, a screw rotatably mounted at one end on the bearing member and fixed against longitudinal movement thereon and screwably extending with its other end into the block for moving the same on said cam and on said arm, and means for rotating the screw.

6. In a hoisting apparatus, a support, a boom pivoted on the support and on an axis transversely thereto and adapted to move to various operative positions with respect thereto, said boom having an arm extending from said pivotal axis, a frame on the support located in a plane perpendicular to said axis and having a cam located around the axis with an end of the cam located a greater distance laterally from the axis than the adjacent portion of the cam, a block slidably mounted on the arm, a bearing member pivotally mounted on a horizontal axis on and transversely to the frame, a screw rotatably mounted at one end on the bearing member and fixed against longitudinal movement thereon and screwably extending with its other end into the block for moving the same on said cam, means for rotating the screw comprising power means, and reduction gear means connecting the power means to the first end of the screw.

7. In a hoisting apparatus, a support, a boom pivoted on the support and on an axis transversely thereto and adapted to move to various operative positions with respect thereto, said boom having an arm extending from said pivotal axis, a frame on the support located in a plane perpendicular to said axis and having a cam located around the axis with an end of the cam located a greater distance laterally from the axis than the adjacent portion of the cam, a block slidably mounted on the arm, a bearing member pivotally mounted on a horizontal axis on and transversely to the frame, a screw rotatably mounted at one end on the bearing member and fixed against longitudinal movement thereon and screwably extending with its other end into the block for moving the same on said cam, means for rotating the screw comprising a spur gear connected to the first end of the screw, a pinion mounted on the bearing member and meshing with the first gear, a power means, and a longitudinally extensible connection between the power means and the pinion.

8. In a hoisting apparatus, a support, a boom pivoted on the support and on an axis transversely thereto and adapted to move to various operative positions with respect thereto, said boom having an arm extending from said pivotal axis, a frame on the support located in a plane perpendicular to said axis and having a cam located around the axis with an end of the cam located a greater distance laterally from the axis than the adjacent portion of the cam, a block slidably mounted on the arm, a bearing member pivotally mounted on a horizontal axis on and transversely to the frame, a screw rotatably mounted at one end on the bearing member and fixed against longitudinal movement thereon and screwably extending with its other end into the block for moving the same on said cam, and means for rotating the screw.

9. In a hoisting apparatus, a support, a boom pivoted on the support and adapted to move to various operative positions with respect thereto, said boom having an arm extending from said pivotal axis, a motor, gear means for the motor, a driven gear variously connectable to the gear means, a shiftable gear support for the gear, a screw connecting said gear to said arm, a shifting member straddling the axis of the boom and having spaced abutments adapted to be engaged by said arm when in extreme opposite positions, and means connecting the shifting member to said gear support for shifting the same with the movement of said shifting member.

10. In a hoisting apparatus, a support, a boom pivoted on the support and adapted to move to various operative positions with respect thereto, said boom having an arm extending from said pivotal axis, a frame on the support located in a plane perpendicular to said axis and having a plate cam located around the axis with its ends located a greater distance laterally forwardly and backwardly from the axis than the middle portion vertically from the axis, a block slidably mounted on the cam and also on the arm, a screw rotatably

supported at one end by the frame and screwably extending with its other end into the block for moving the same on said cam and on said arm, a motor, gear means for the motor, a driven gear adapted to be variously connected with the gear means, a shiftable support for the driven gear, a yoke shiftably mounted on said frame and having arms positioned at opposite sides of the block and adapted to be engaged thereby, when the boom is shifted to near its opposite positions for shifting the yoke, and means connecting the yoke with said gear support for shifting the gear with the movements of the yoke.

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