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TRIP MECHANISM FOR AUTOMATICALLY
POSITIONING VEHICLE LOADERS

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2 Sheets-Sheet 1

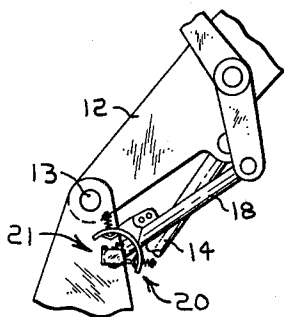


FIG. 2.

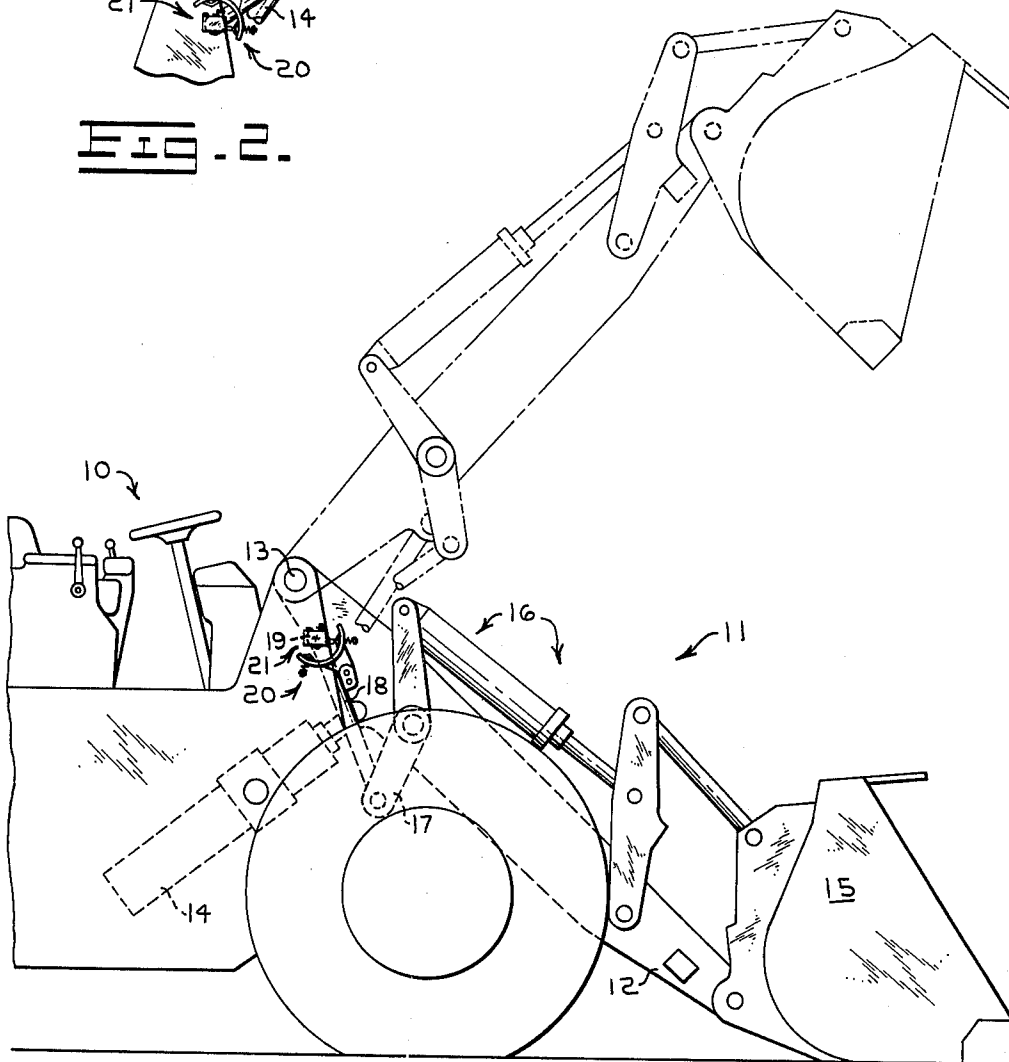


FIG. 1.

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TRIP MECHANISM FOR AUTOMATICALLY
POSITIONING VEHICLE LOADERS

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This invention relates to a trip mechanism for automatically positioning vehicle loaders and more particularly relates to a loader arrangement wherein bucket mounting lift arms thereof may be automatically stopped in one or more predetermined positions of operation.

The increasing complexity of present day material loading apparatus has provided the impetus for providing efficient trip mechanisms for automatically stopping the bucket lift arms of the loader, for example, at predetermined positions above or at ground level. Present day earth handling operations have greatly increased the number of tasks which an operator must perform and thus often distract from his overall efficiency. Also, the operator is not always able to visually observe the bucket to assure that it is in the correct operating position. Attempts have been made to at least partially remedy these problems by providing mechanisms which are capable of automatically stopping the movement of the loader lift arms at predetermined positions. However, such solutions have generally provided relatively complex and inefficient apparatus whereby the desired positioning functions are not always achieved.

The present invention has overcome many of the above described difficulties by providing a trip mechanism which is adapted for automatically positioning a loader bucket in one or more operating positions. Novel aspects of this invention comprise a master-slave system which is arranged to be tripped to inactivate the hydraulic control circuit for the lift arms in response to the engagement with one or more uniquely positioned cams. The cams are arranged to prescribe an arc pursuant to a raising or lowering of the lift arms. Once the control circuit is deactivated, the lift arms and thus the bucket is maintained in a predetermined operating position.

An object of this invention is to provide a trip mechanism for automatically and efficiently stopping pivotal members in a predetermined position.

Another object of this invention is to provide a trip mechanism for vehicle loaders which automatically positions the loader lift arms in one or more selected operational positions in response to selected movements of the lift arms.

A further object of this invention is to provide a trip mechanism which may be adapted to a conventional loader for automatically positioning the lift arms thereof in selected operational positions and which may be expeditiously pre-set without the use of special tools or the like.

Further and more specific objects of this invention will become apparent from the following description taken in connection with the appended drawings wherein:

FIG. 1 is a partial side elevational view of a vehicle mounted loader, illustrating a trip mechanism encompassing novel concepts of this invention with the loader shown in two operational positions;

FIG. 2 is a partial elevational view more particularly illustrating the trip mechanism of FIG. 1 as it would appear with the loader maintained in the raised position; and

FIG. 3 is a schematic view more particularly disclosing a master-slave system which functions to selectively position the lift arms of the loader of FIGS. 1 and 2 in response to actuation of the operatively associated trip mechanism shown therein.

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As illustrated in FIG. 1, a tractor 10 has a loader 11 mounted thereon comprising laterally spaced lift arms 12 (one is shown) pivotally mounted on the tractor at 13. Hydraulic jacks 14 are pivotally mounted on the tractor and to the lift arms to raise and lower them in a conventional manner. A bucket 15 is pivotally mounted on the forward portions of the lift arms and is adapted to be selectively tilted thereon by mechanical tilt linkage 16. A bellcrank 17, forming part of the bucket tilt linkage, is pivotally mounted on a lift arm and to a link 18. As more clearly shown in FIG. 3, link 18 is pivotally mounted at its other end on the tractor frame by stub shaft 19.

Novel concepts of this invention comprise a trip mechanism, generally shown at 20, which functions to stop the lift arms 12 at predetermined positions with respect to ground level by automatically regulating fluid flow to hydraulic jack 14. The trip mechanism essentially comprises a master cylinder or means 21, fixed to the tractor frame, having a reciprocating plunger 22 slidably mounted therein and arranged to be urged in a leftward direction by cams 23a or 23b. The cams may be selectively adjusted to actuate plunger 22 to thereby actuate a slave cylinder or means 24. As will be hereinafter more fully understood, actuation of the slave cylinder will function to move a piston 25 thereof in an upward direction to disengage a detent 26 from a groove 27 formed on a spool 28. The arrangement therein shown then functions to automatically return the spool to a hold position to seal off jack 14 to thus maintain the lift arms in a set position.

Referring now to the more specific constructions and arrangements of the trip mechanism shown in FIG. 3, a semi-circularly shaped bracket 30 is preferably secured to link 18 so that the center axis thereof substantially coincides with the axis of pivot shaft 19. Equally spaced notches 31 are arranged internally on the bracket so as to accommodate the complementary end portions of the cams, under the biasing effects of springs 32a and 32b. Slots 33 and 34 are formed in the bracket and are arranged to receive the shank of the cams to permit selective and expeditious positioning thereof by merely applying a manual force thereon. As shown, the master cylinder 21 is preferably arranged to be substantially surrounded by bracket 30.

A roller 35 is rotatably mounted on the end of plunger 22 which is urged inwardly against the biasing effect of a spring 37 by engagement with a cam by the roller. A slot and pin connection 38 may be cooperatively formed between the cylinder of the master cylinder and the plunger thereof to regulate the limits of plunger travel. The master cylinder may be suitably sealed and provided with a conventional check valve 39 of the poppet type to prevent damage thereto should the pressures occasioned in pressurized fluid chamber 40 thereof exceed a predetermined amount. A conduit 42 operatively communicates the fluid chamber of the master cylinder with the pressurized fluid receiving chamber 43 of the slave unit 24 which slidably mounts piston 25. A fluid reservoir 41 is arranged to supply fluid to chamber 40 in a conventional manner, as shown. Spring 44 functions to bias the piston in a downward direction to engage detent 25 with one of the grooves 27.

The fluid circuit or jack control means of FIG. 3, per se, does not comprise novel aspects of this invention and is substantially described in U.S. patent application Serial No. 78,631, now Patent No. 3,122,247 to Henry E. Beck for an "Automatic Positioning Device for Material Handling Bucket." Briefly stated, when spool 27 is manually actuated in the float position shown, a pump 45 functions to transmit pressurized fluid from reservoir 46 through conduit 47 and into the chambers on both sides of the piston of jack 14, by means of conduits 48 and 49. During this floating position of loader opera-

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tion which may be utilized when the bucket is in scraping engagement with the ground or is lowered, for example, the piston of hydraulic jack 14 literally floats therein to compensate for sudden shocks and provides a dampening function during downward movement of the bucket with the control in float position. Make-up valves 50 and 51 may be utilized to compensate for sudden vacuum or low pressure conditions which might occur in hydraulic jack 14.

When spool 28 is manually or otherwise actuated to either the lower, hold or raise position, the piston of jack 14 is regulated pursuant thereto in a conventional manner. As explained in the above mentioned application, the spool has a washer 53 and a bushing 54 loosely mounted thereon. A compression spring 55 is arranged therebetween to automatically return the spool 28 to a normal or hold position, when detent 26 is out of engagement with grooves 27 or maintained therebetween.

Assuming that the loader is in the raised position as shown by phantom lines in FIG. 1, the spool 28 is then maintained in the hold position. During this operational phase, fluid flow to conduits 48 and 49 from pump 45 is prevented to thus maintain the lift arms in a raised position. Upon manual actuation of spool 28 by the operator to the float position shown, the lift arms gradually descend under the influence of gravity and are damped in their movement due to the floating arrangement maintained by jack 14. Continued lowering of the lift arms will cause cam 23a to actuate plunger 22 which in turn causes actuation of piston 25. Spring 55 then functions to automatically return the spool to the hold position to maintain the bucket at a predetermined position relative to ground level. The lift arms may be more forcibly lowered by manually adjusting the spool 28 to the lower position.

When the bucket is filled, the operator moves spool 28 to the raise position to engage detent 26 with groove 27b. Pressure from pump 45 is then directed through a check valve in line 52 and through conduit 49 to the head end of jack 14 to raise the lift arms. Continued raising of lift arms 12 causes link 18 and bracket 30 to pivot about the axis of pivot shaft 19 to the position shown in FIG. 2. The cam 23b thus actuates the plunger 22 to pressurize chambers 40 and 43 to release detent 26 from groove 27b. Spring 55 thereafter functions to return the spool 28 to the hold position to hold the loader in this raised position of operation, as illustrated by phantom lines in FIG. 1.

I claim:

1. A trip mechanism for automatically positioning a vehicle loader bucket comprising a fluid containing master cylinder having a plunger slidably mounted therein, and an open bracket member pivotally mounted adjacent to said master cylinder and having at least one cam adjustably mounted therein for movement about the pivotal mounting of said bracket member and arranged to engage and depress said plunger when pivoted to a predetermined position relative thereto whereby said plunger may be made operative to pressurize fluid contained in said master cylinder to selectively position said loader.

2. The invention of claim 1 wherein said bracket has internal notch portions formed thereon arranged in juxtaposition to said plunger, complementary portions formed on said cam and arranged to be seated in said notch portions and means adjustably mounting said cam on said bracket for urging said complementary portions into seating relationship with selected notch portions whereby said cam may be positioned to selectively engage said plunger.

3. A trip mechanism in combination with a tractor having at least one lift arm pivotally mounted thereon and jack control means operatively connected between said tractor and said lift arm for selectively actuating said lift arm to a raise, hold, lower or float position of operation and for normally returning said lift arm to a hold

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position of operation, said trip mechanism comprising a semi-circular bracket pivotally mounted substantially about the central axis thereof on said tractor, said bracket having adjustment means adjustably mounting at least one cam on said bracket for selectively positioning said cam on said bracket in substantially opposed relation to said axis and means mounted on said tractor operatively associated with said jack control means and arranged adjacent to said bracket for automatically returning said lift arm to a hold position of operation in response to an actuation thereof by said cam.

4. A trip mechanism comprising a semi-circularly shaped bracket member arranged for pivotal movement substantially about a central axis thereof, cam means adjustably mounted on said bracket member for being selectively positioned therearound and means mounted adjacent said bracket member and arranged to oppose and be actuated by said cam means when said bracket is pivoted to a predetermined position about said axis whereby said means may be arranged to operate as a master cylinder to actuate a slave cylinder in response to a pivoting of said bracket member.

5. The invention of claim 4 wherein said means comprises a cylinder which is arranged to be substantially surrounded by said bracket member having a spring biased plunger slidably mounted therein, the longitudinal axis of said plunger arranged to substantially intersect the center axis of said bracket member, said plunger further arranged to be reciprocated in said cylinder by said cam means when said bracket is pivoted to a predetermined position.

6. A trip mechanism in combination with a tractor having a loader mounted thereon, said loader comprising at least one lift arm pivotally mounted on said tractor, a hydraulic jack pivotally mounted on said tractor and to said lift arm for selectively effecting a raising or lowering thereof, said trip mechanism comprising a bracket arranged about a central axis thereof, said bracket pivotally mounted on said tractor for movement substantially about the central axis thereof and operatively connected to said lift arm to receive pivotal movements in response thereto, a cam adjustably mounted on said bracket to be selectively moved about said central axis and arranged to project at a predetermined distance therefrom, a master means mounted on said tractor and arranged adjacent to said bracket to be opposed and actuated by said cam when said bracket is pivoted to a preselected position, control means operatively associated with said hydraulic jack for selective actuation thereof to maintain said lift arm in a raised, hold, lowered or float position of operation and for normally maintaining said lift arm in a hold position of operation and slave means operatively associated with said master means and said control means for returning said lift arm to a hold position of operation in response to an actuation of said master means by said cam.

7. A trip mechanism in combination with a tractor mounted vehicle loader, said loader comprising at least one lift arm pivotally mounted on said tractor, a hydraulic jack pivotally mounted on said tractor and to said lift arm, a bell crank pivotally mounted on said lift arm, a link pivotally mounted on one end of said bell crank and pivotally mounted on a pivot shaft at the other end thereof to said tractor, said trip mechanism comprising a semi-circularly shaped bracket member secured to said link and arranged to have a central axis thereof substantially coincident with an axis of said pivot shaft, spaced notches formed on internal surface portions of said bracket, at least one arcuate slot formed in said bracket, a cam having portions thereof arranged to be placed in complementary engagement with a selected number of said notches, a shank secured to said cam and arranged in adjustable relationship in said arcuate slot, a spring arranged between said bracket member and said shank for urging the end portions of said cam into

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complementary engagement with said selected number of notches, a master means mounted on said tractor and arranged to be substantially surrounded by said bracket member and having a plunger slidably mounted therein which has an end portion arranged for selected engagement by said cam, control means operatively associated with said hydraulic jack for selective actuation thereof to a raising, holding, lowering or floating condition of operation and for normally returning said hydraulic jack to a holding condition of operation and slave means operatively associated with said master means and said control means for returning said control means to a holding position of operation in response to engagement of said cam with said plunger.

8. A trip mechanism for automatically positioning a vehicle loader bucket comprising a fluid containing master cylinder having a plunger slidably mounted therein and a bracket member pivotally mounted adjacent to said master cylinder and having at least one cam mounted thereon and arranged to engage and depress said plunger when pivoted to predetermined position relative thereto whereby said plunger may be made operative to pressurize fluid contained in said master cylinder to selectively position said loader, said bracket having notch portions

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formed thereon arranged in juxtaposed relation to said plunger, complementary portions formed on said cam and arranged to be seated in said notch portions and means adjustably mounting said cam on said bracket for urging said complementary portions into seating relationship with selected notch portions whereby said cam may be positioned to selectively engage said plunger.

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