Aug. 18, 1970 J. E. FUZZELL 3,524,562

HYDRAULIC CONTROLS FOR BUCKET LOADERS

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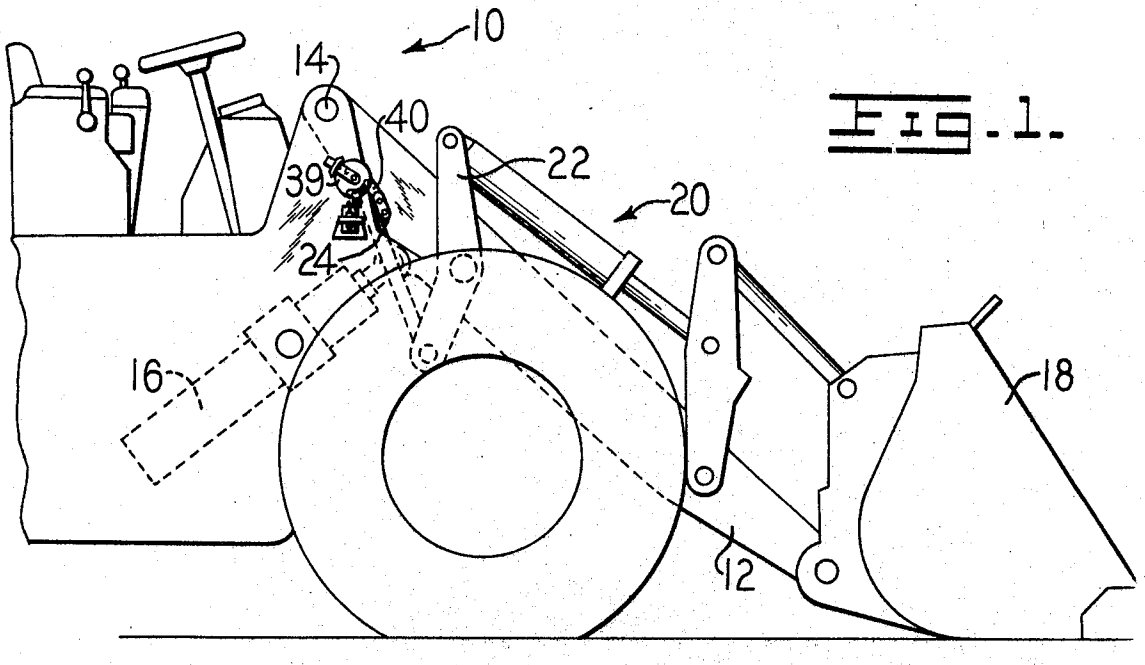


Fig. 1.

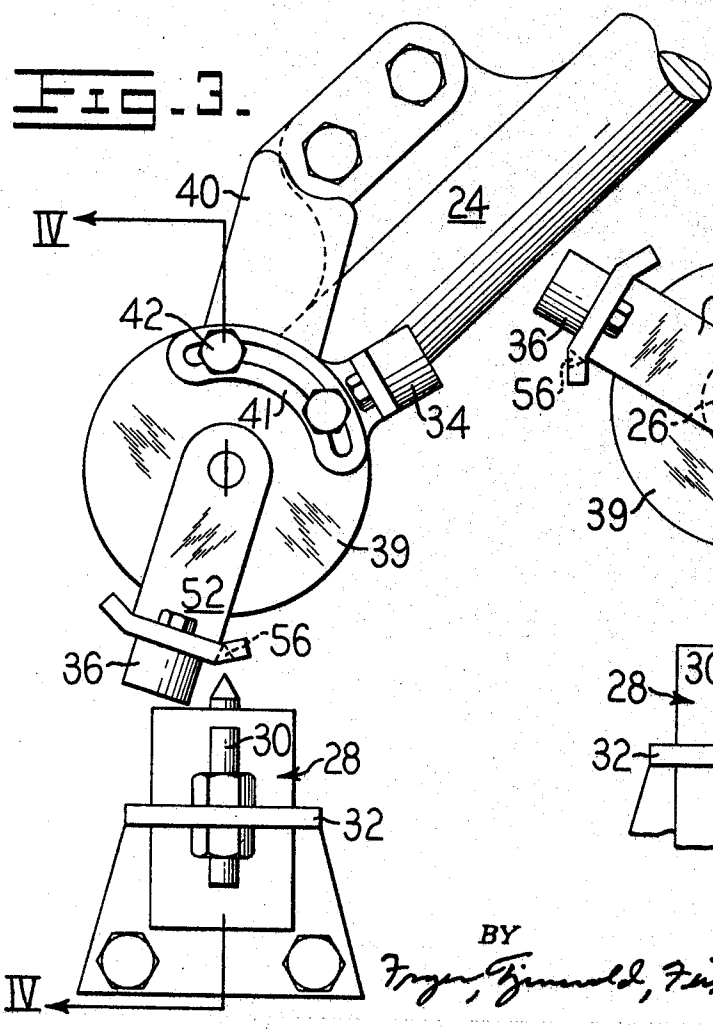


Fig. 3.

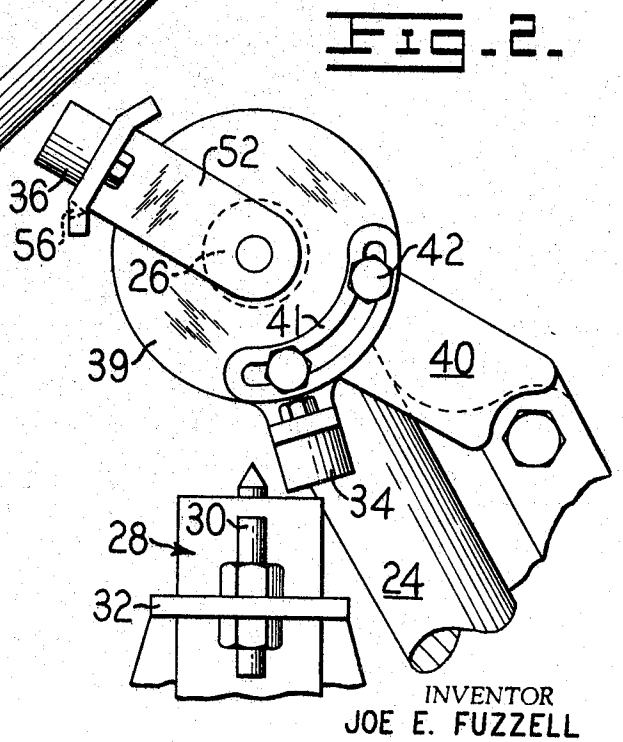


Fig. 2.

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Fig. 4.

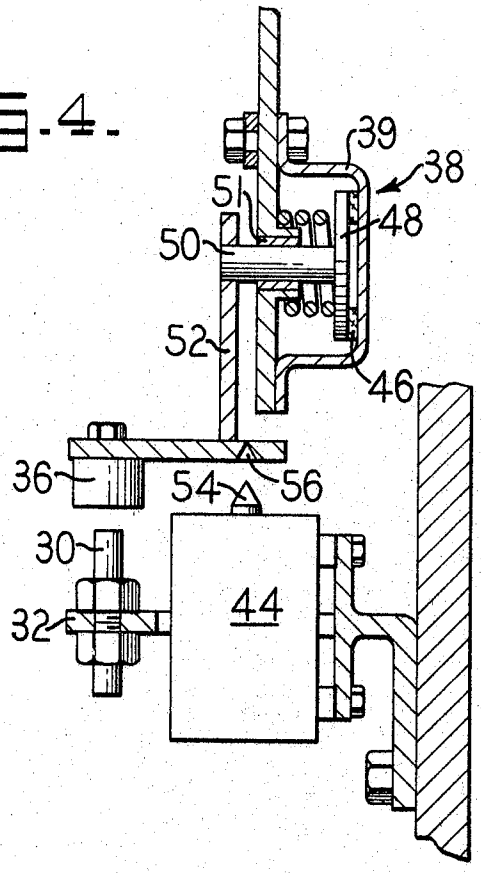
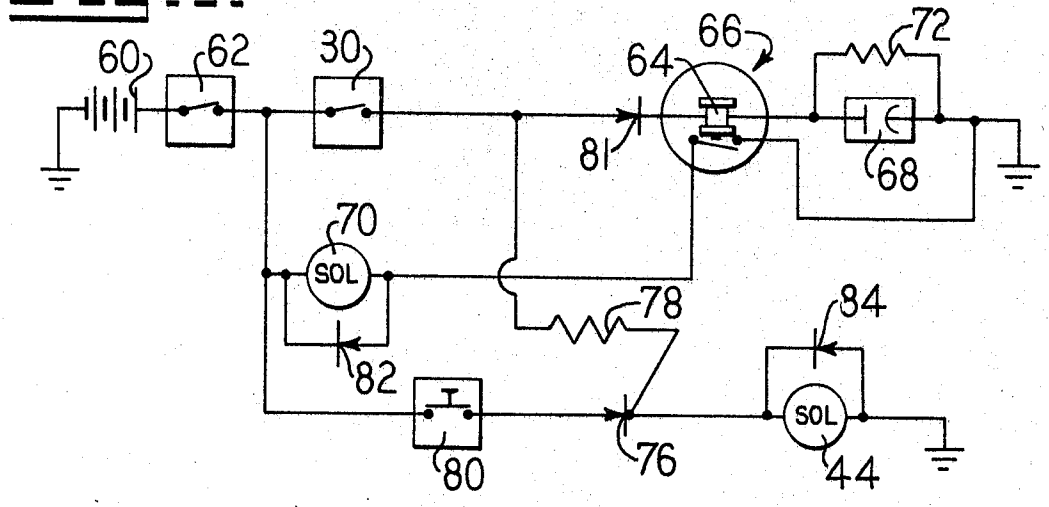


Fig. 5.



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HYDRAULIC CONTROLS FOR BUCKET LOADERS

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ABSTRACT OF THE DISCLOSURE

A control circuit for actuating the bucket of a loader wherein the bucket is automatically stopped at certain positions by means which automatically release a detent which is holding the control valve at a given setting. The disclosure includes means to change the detent release position from the operators station. A time delay is also provided to prevent premature actuation of the release.

Frequently, loaders perform several different tasks during a days operation, and generally each task requires that the bucket be raised to a predetermined dump height. For efficient operation, it is desirable that the bucket height be readjusted so that the bucket automatically stops at different predetermined dump heights. With the current arrangement, the kickout height is manually set by the operator by repositioning the kickout means. That adjustment operation is both time consuming and difficult, since the operator must climb down from his station to reach the kickout mechanism, especially on the larger machines now being developed. As a result, the kickout is generally set at the highest dump height required and the operator manually stops the bucket at the lower heights which causes more work for him to perform.

Also, it has been determined that during normal operation, it is deisrable for the bucket automatically to stop at two operational positions, namely the dump height and ground level dig position. To change the bucket from one position to the other, it is also desirable for the operator to be able to place the lift control lever in a detented position, and immediately remove his hand therefrom so that other operational functions can be performed. However, with the commercially available arrangements, the operator must momentarily hold the lever in the desired position until the trip mechanism moves away from the kickout means. This extra effort increases operator fatigue.

The invention will be more fully understood from the following specification wherein reference is made to the accompanying drawings.

In the drawings:

FIG. 1 is a view in side elevation of the forward part of a tractor and a loader mounted thereon;

FIG. 2 is an enlarged fragmentary view of the detent kickout mechanism of the present invention showing the parts in the dig position of the bucket;

FIG. 3 is a view similar to FIG. 2 illustrating the position of the parts as the upward travel of the bucket is interrupted;

FIG. 4 is a sectional view taken on the line IV—IV of FIG. 3, and;

FIG. 5 is a diagram of the electrical circuit employed in the kickout control mechanism.

Referring now to FIG. 1, a tractor **10** is shown as having laterally spaced lift arms, one of which is shown at **12**, pivotally mounted at **14** with hydraulic jacks **16** adapted to raise and lower the lift arms in a conventional manner. A bucket **18** is pivotally mounted on the forward portions of the lift arms **12** and is adapted to be selectively tilted thereon by conventional tilt linkage **20** which includes a lever **22** pivotally mounted on a lift arm and to a link **24**. As more clearly shown in FIG. 2,

link **24** is pivotally mounted at its other end to the tractor frame by a stub shaft **26**.

The trip mechanism generally shown at **28**, functions to stop the bucket at two predetermined operational heights by causing the control valve (not shown) to return from a raise or float position to its neutral position, thus interrupting the flow to the jacks **16**. The control valve and kickout cylinder are of the type described in my assignees patent to Rodney R. Erickson, number 3,289,546. The control valve has four positions being respectively, raise, wherein fluid is directed to the head end of jack **16** to effect raising of the lift arms, neutral, wherein the flow to and from both ends of the jacks is blocked, lower, wherein fluid is directed to the rod end of the jack **16** to effect lowering of the lift arms, and float, wherein communication is established between both ends of the jack **16** and the tank which permits the lift arms to be lowered by gravity. The control valve is held in the raise and float positions by a detent mechanism and the kickout cylinder functions to release the detent mechanism.

As shown in FIGS. 2 and 4, the trip mechanism **28** comprises a dry reed proximity switch **30**, secured to a bracket **32** on the tractor frame and arranged to be actuated or closed by the influence of a ground level kickout magnet **34** or lift kickout magnet **36**. As will be hereinafter described, closing the proximity switch **30** causes fluid to be directed to the kickout cylinder which releases the detent mechanism. The magnet **36** is attached to a clutch arrangement **38** contained within a clutch housing **39** and magnet **34** is attached to the clutch housing **39** which is supported by a bracket **40** secured to the link **24** so that the center axis of the clutch housing **39** coincides with the axis of pivot shaft **26**. A bracket **41** with an arcuate slot and securing screws **42** enables adjustment of the position of the magnet **34**. In the position shown in FIG. 2, the ground level kickout magnet **34** is in the position wherein the proximity switch is closed. Raising the lift arms causes rotation of the clutch housing **39** to the position shown in FIG. 3, wherein the lift kickout magnet **36** is in position to cause the proximity switch **30** to be closed.

The height at which the lift arms are stopped can be changed by adjusting the position of the lift kickout magnet **36** in relation to the clutch housing **39**. As more clearly shown in FIG. 4, the adjustable means for changing the position of the lift kickout magnet **36**, consists of the clutch arrangement **38** and a plunger type solenoid **44**. The clutch arrangement consists of a cork ring **46** secured to a spring loaded plate **48** to which a shaft **50** is secured. The shaft **50** extends through a bearing **51** and supports a clutch arm **52** to which the lift kickout magnet **36** is secured. Activating the solenoid **44**, which is done from the operator's station, causes a plunger **54** to extend and engage a depression **56** in the clutch arm **52**. With the plunger **54** so engaged, raising or lowering the lift arms causes rotation of the clutch housing **39** while the lift kickout magnet **36** is held fixed in relation to the proximity switch **30**. The solenoid is then deactivated when the desired kickout height is reached.

The control means, as shown schematically in FIG. 5, comprises a power source **60** connected to a pressure switch **62** which is closed when the engine oil pressure exceeds 4 p.s.i. The purpose of switch **62** is to open the electric circuit when the engine is not operating, thereby preventing possible damage to the components and discharge of the battery. Closing the proximity switch **30** completes the electric circuit so that a current will be present in a coil **64** of a reed relay switch **66**. The current in the coil **64** causes a magnetic field which closes the reed relay switch **66** and keeps it closed as long as the cur-

rent is present. However, the duration of the current in the coil **64** is only momentary (approximately 1½ seconds) due to a capacitor **68** in the circuit between the relay switch and the ground connection. When the capacitor becomes fully charged, the flow through the coil is stopped. The 1½ seconds is a function of the resistance of the coil **64**, the resistance of resistor **72**, and capacitance of the capacitor **68**. Closing the relay switch **66** completes a separate circuit to a solenoid control valve **70** which when activated, directs pressurized fluid to the kickout cylinder (not shown) to release the detent mechanism to allow the lift control valve to return to its neutral position. After the 1½ seconds time lapse, the relay switch opens, thus breaking that circuit and deactivating the solenoid control valve **70** so that the flow of fluid to the kickout cylinder is blocked. Thus, after the 1½ seconds time lapse, the control valve can again be put in one of the detented positions. As long as the switch **30** remains closed, the capacitor **68** will remain charged. However, when the switch **30** opens, the capacitor **68** will discharge through a resistor **72** in approximately 1½ seconds and the cycle can then be repeated.

The circuit for actuating the adjusting solenoid **44** is interconnected with the kickout circuit in that the silicon controlled rectifier **76** is triggered by the current from the proximity switch **30**. The rectifier **76** is a rectifying device that normally blocks the current in both directions but can be triggered to allow current in the forward direction while still blocking in the reverse direction. When the proximity switch **30** is closed, current is applied to the gate of the rectifier **76** via the resistor **78**, and if the manual switch **80** is closed, the circuit to the solenoid **44** will be completed, thus activating the solenoid. The function of the resistor **78** is to reduce the current to the gate of the rectifier. The function of a diode **81** is to prevent the capacitor **68** from discharging through the coil **64** as the switch **30** opens. Diodes **82** and **84** are employed as induced voltage suppressors to prevent excessive arcing of the contacts of switch **66** and damage to the rectifier **76**.

A typical operation cycle of the tractor normally starts with the bucket in the ground level dig position shown in FIG. 1. The control valve is placed in the detented raised position and the lift arms start to raise. As the lift kickout magnet **36** approaches the proximity switch **30**, the switch **30** closes, thus completing the circuit to the solenoid control valve **70** as previously described and the control valve returns to the neutral position, thus stopping the lift arms. To lower the bucket, the control valve is put in the detented float position and the lift arms start to lower, thereby causing the lift kickout magnet **36** to rotate away from the proximity switch **30**, allowing the switch to open. Opening the switch **30** allows the capacitor to discharge so that by the time the ground level kickout magnet **34** approaches the switch, the kickout circuit is again ready to cause the control valve to return to the neutral position.

To raise the lift kickout point, the lift arms are raised

to a position below the previous kickout height, and the manual switch **80** is closed. Raising the lift arms is continued and as the lift kickout magnet **36** causes the proximity switch **30** to close, the solenoid **44** will be activated to extend the plunger **54** to engage the depression **56** in the clutch arm **52**, thereby holding the lift kickout magnet **36** against movement relative to the proximity switch **30**. When the desired bucket height is reached, the control valve is returned to neutral and the manual switch **80** is released. The new kickout point is now set.

To lower the kickout height, the lift arms are raised until kickout occurs. The manual switch **80** is then closed, and the lift arms lowered to the desired kickout height and the manual switch **80** is then opened.

What is claimed is:

1. In a tractor mounted loader of the kind having a bucket on power actuated lift arms controlled from the tractor operator's station to initiate raising movement of the arms, and means acting in response to the position of the arms and height of the bucket relative to the ground to stop the raising movement, the improvement which comprises, means operable from the operator's station to vary the position at which the bucket is stopped, said last means including a part fixed to the tractor and a part moveable with the arm, means to effect adjustment of the latter part relative to the arm, said part moveable with the arm being frictionally held to the arm, and means operable from the operator's station to engage and hold said part against movement while the arm is moved.

2. The improvement of claim **1** in which one part includes a proximity switch, and the other part includes an actuator therefore.

3. The improvement of claim **1** in which the means to engage and hold comprises, a depression in one part and an electromagnetically actuated detent on the other part which registers, upon actuation, with said depression.

4. In a tractor mounted loader of the kind having a bucket, power actuated means for raising and lowering the bucket, an operator's station with controls for initiating raising and lowering of the bucket, means operable in response to bucket positions to effect disengagement of said controls, the improvement which comprises an electrical circuit which triggers such disengagement, and time delay means in the circuit to prevent re-engagement of the controls until the bucket reaches a position intermediate its starting and stopping position.

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