

[54] **AUTOMATIC VALVE CONTROL
MECHANISM FOR VEHICLE
MOUNTED IMPLEMENTS**

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[58] Field of Search 214/762, 776; 74/582; 91/387

[56] **References Cited**

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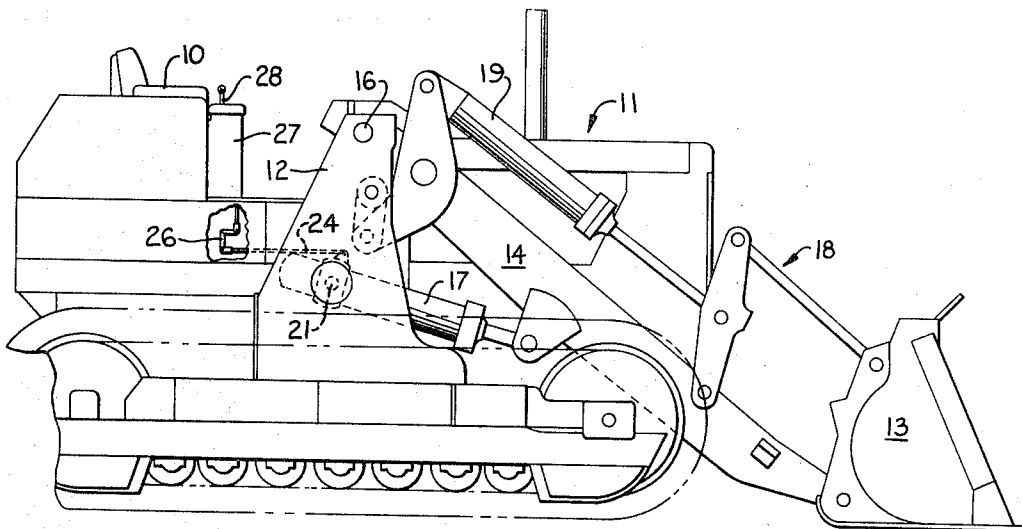
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[57] **ABSTRACT**

An automatic means for controlling the height to which a loader bucket is raised comprising a valve control mechanism supported by pivotal means adapted to be controlled by a hydraulic jack which, in turn, employs a detented control valve by which the jack is operated and means to disengage the detent to allow the valve to return to a neutral position when the implement reaches a predetermined, raised position. The latter means includes a valve-actuating lever connected to the valve by a mechanical linkage, a control link assembly having a spring-loaded, lost-motion link means as an integral part thereof, and lever means actuating the control link assembly by the pivotal movement of the jack. The lost-motion link means is operable upon adjusting the implement to a predetermined position to forcibly move the actuating lever to disengage the detent means allowing the valve to return to its neutral position.

8 Claims, 5 Drawing Figures



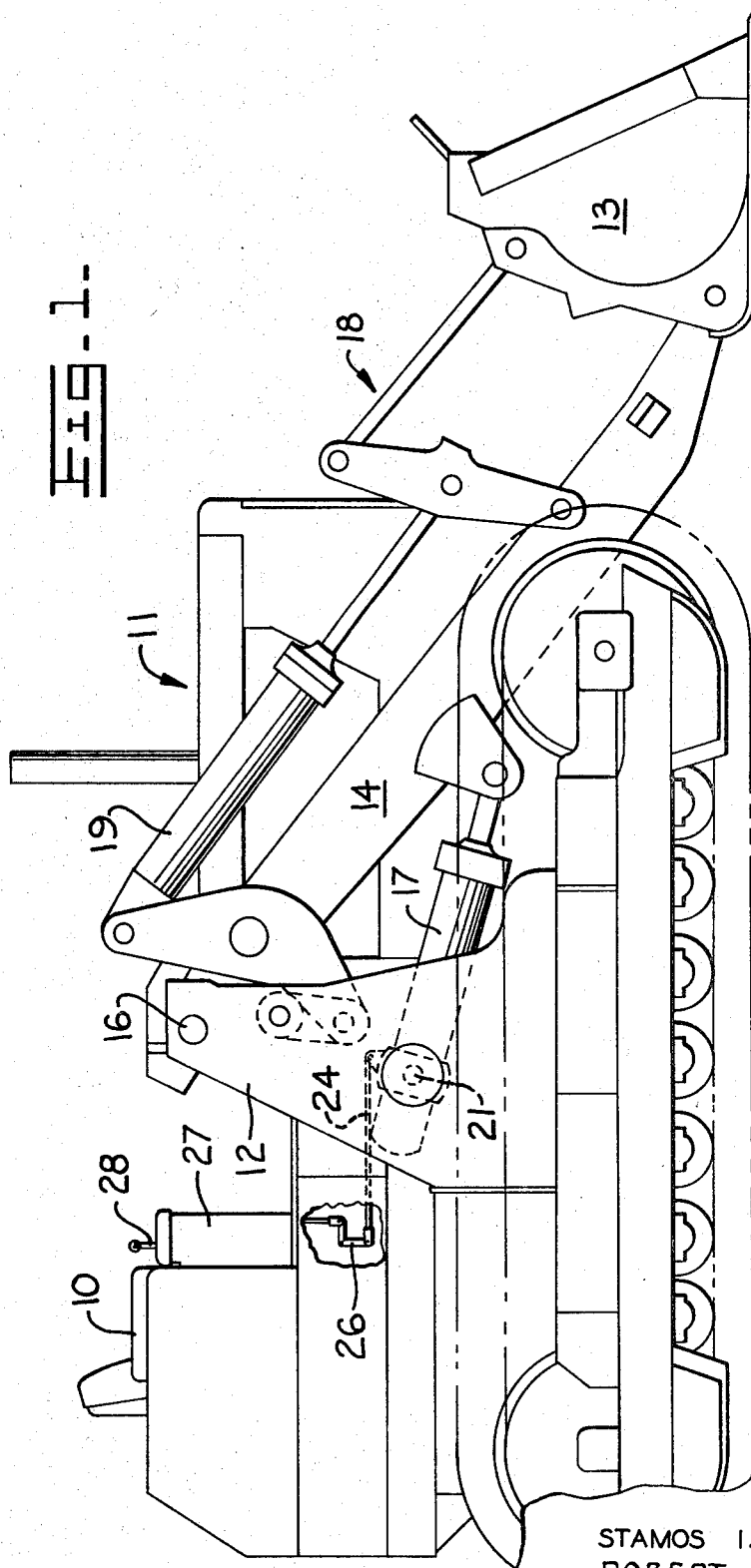
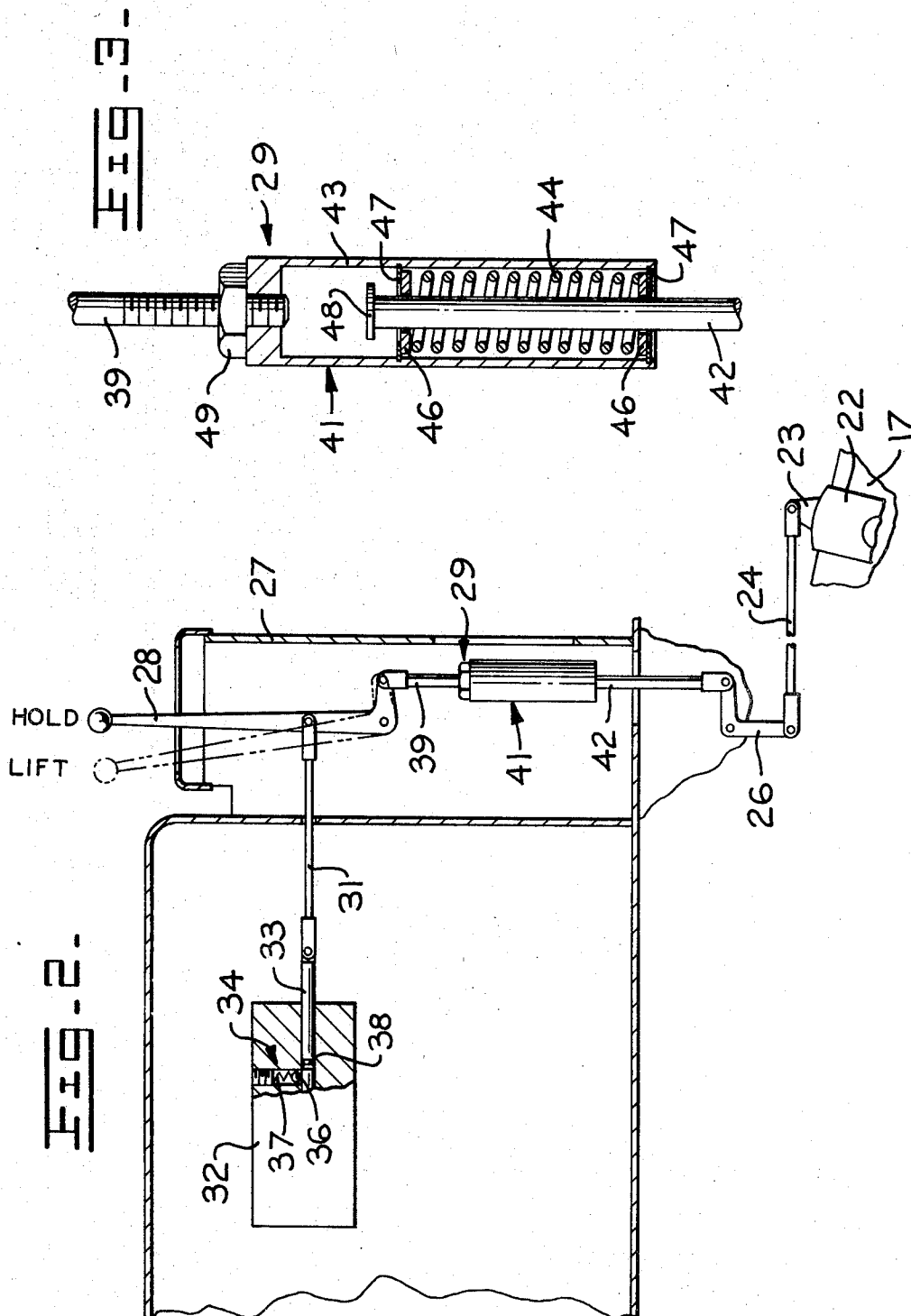


Fig. 1-

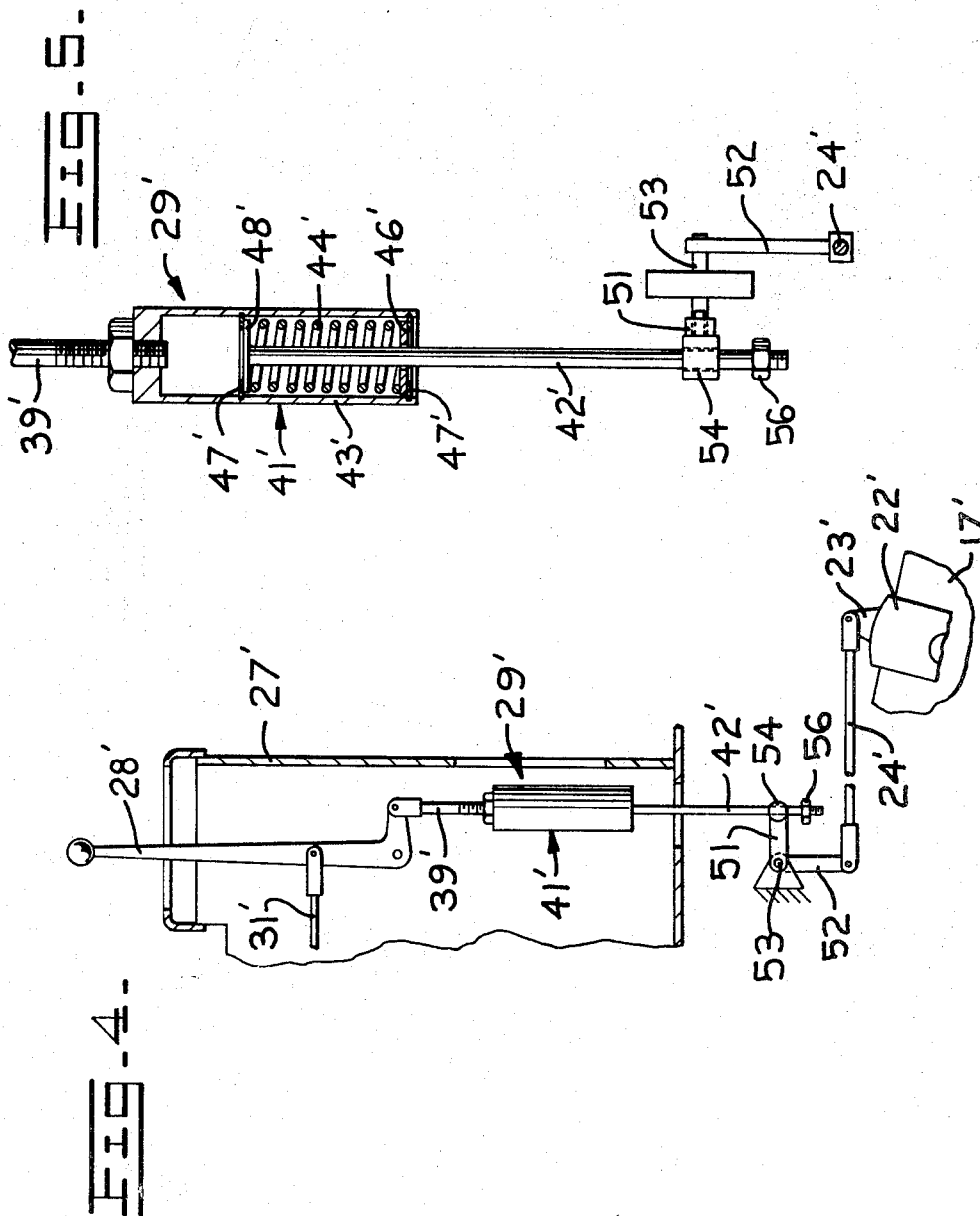
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AUTOMATIC VALVE CONTROL MECHANISM FOR VEHICLE MOUNTED IMPLEMENTS

BACKGROUND OF THE INVENTION

This invention relates to automatic means for controlling the height to which a loader bucket or other implement is raised including a detent mechanism for holding a control valve in a position which causes raising of the bucket and automatically releasing the control valve toward a neutral or hold position when the bucket attains a desired height.

The operation of present-day earthmoving equipment requires operator attention to numerous controls in addition to driving of the vehicle upon which implements are mounted.

For example, in a tractor-mounted loader, after the bucket is loaded by crowding into the material to be handled, it must be racked back to a carry position by operation of one valve, raised by lift arms which are pivotally attached to the tractor by operation of another valve, and transported by manipulation of the tractor controls and thereafter dumped, also by operation of a valve. Raising of the bucket requires the time and attention of the operator to insure that the motion of the lift arms is stopped when the bucket has attained a proper height. Consequently, operator time and the duration of a complete operating cycle can be shortened by means for automatically discontinuing the raise cycle or stopping the bucket at a predetermined height. One such mechanism for controlling the bucket position is illustrated in our Assignee's U.S. Pat. No. 3,358,860, issued to Jaruseski et al for "Automatic Valve Control Mechanism for Tractor Mounted Loaders."

The predetermined height to which a bucket is raised varies with the operation to be accomplished. For example, in loading a truck or bin, the bucket would be raised only to that height which is required to insure that all of its contents are deposited in the truck or bin without the necessity of lowering the bucket before dumping its contents. Furthermore, in operating in mines, tunnels, or other locations with height-limiting overhead structures, there is an inherent limit imposed upon the height to which the bucket may be raised. In many operations, it is essential that the height at which the bucket is stopped be varied many times during the normal working day and it is, therefore, desirable that the means for adjusting the height and controlling mechanisms be readily available to and easily operable from the operator's station.

Although the mechanism disclosed in the patent referred to above provides a height adjustment means, the predetermined height at which the bucket travel is interrupted can be varied only by a very limited amount. To adjust the kickout height beyond that obtainable with the adjustment means provided with the Jaruseski et al device, the floor plates of the vehicle must be removed and a rod located therebeneath lengthened or shortened.

SUMMARY AND OBJECTS OF THIS INVENTION

It is, therefore, an object of this invention to provide an automatically operating bucket control means which can be readily adjusted to provide an infinitely variable range of predetermined positions at which the bucket travel is interrupted.

Another object of the invention is to provide a mechanism with adjustable means to determine the height at which the bucket travel is interrupted, and at the same time permit further upward movement under the control of the operator.

A still further object of the invention is to provide a height adjustment means which does not interfere with the operation of the control valve for other loader functions.

BRIEF DESCRIPTION OF THE DRAWINGS

Other objects of this invention will become apparent from the following description and accompanying drawings wherein:

FIG. 1 is a side elevation view of a tractor-mounted loader having a control mechanism constructed in accordance with the present invention;

FIG. 2 is an enlarged fragmentary sectional view illustrating in greater detail the control mechanism, a part of which is shown in FIG. 1;

FIG. 3 is an enlarged, partly cut away, detail view of a portion of the control mechanism shown in FIG. 2;

FIG. 4 is an enlarged fragmentary view illustrating a modified form of a portion of the control mechanism illustrated in FIG. 2; and

FIG. 5 is an enlarged detail, partly broken away to show constructional features, of a portion of the control mechanism shown in FIG. 4.

DESCRIPTION OF THE PREFERRED EMBODIMENT

In FIG. 1, a conventional tractor is illustrated as having an operating station 10, engine compartment 11, and supporting frames, one of which is shown at 12 for mounting a loader bucket 13. The bucket is carried on lift arms 14 pivoted to the frame 12 at 16 and adapted to be raised and lowered by means of a double-acting hydraulic jack 17. Tilt linkage, generally indicated at 18, is operated by another double-acting hydraulic jack 19 to position or adjust the bucket angle with respect to the lift arms. The lift arms, tilt linkages and jacks are generally provided in pairs, the other members of each pair being disposed on the opposite side of the tractor. The lift jacks 17, which are employed to raise the bucket from a loading position illustrated in FIG. 1 to an elevated or carry position, are mounted on trunnions as shown at 21 and in raising and lowering of the lift arms, the jack will oscillate about the centers of the trunnions as will also a trunnion band, a portion of which is shown at 22 in FIG. 2.

In accordance with the present invention, a bracket 23 is fixed to the trunnion band and will oscillate with the jack. Such oscillation of the bracket 23 imparts reciprocal movement to a connecting link 24 which is pivotally connected between the bracket and a bellcrank 26 pivotally mounted beneath the control console shown at 27 in FIGS. 1 and 2. The other end of the bellcrank 26 is connected to the lower end of an actuating lever 28 through an automatic control link assembly 29, the function of which will be hereinafter disclosed.

The actuating lever 28 is connected by a link 31 to a lift jack control valve 32. This is a spool valve of conventional construction which is urged by a centering spring (not shown) to a neutral or hold position in

which communication with both ends of the lift jack 17 is closed, thus holding the loader bucket in the position to which it has been adjusted. Raising of the lift arm is accomplished by manual movement of the control lever 28 to the phantom line position shown in FIG. 2. This movement of the actuating lever moves a spool 33 of valve 32 towards the left to direct fluid under pressure in a well known manner to the head end of the jack 17, and in so doing extends the jack and imparts a raising movement to the lift arms. The valve spool 33 is held in the operational position by a detent mechanism shown generally at 34 which includes a ball 36 which is urged downwardly by a spring 37. The ball bears against the spool 33 and engages an annular groove 38 thereon to prevent return movement of the spool.

The automatic control link assembly 29 includes a first rod member 39, a lost-motion link means 41 and a second rod member 42. As best seen in FIG. 3, the lost-motion link assembly or means 41 includes a cylindrical housing 43 threadably secured at one end to the rod member 39. A spring 44 is disposed within the housing 43 and is retained therein in a precompressed state by a pair of spacers 46 and snap rings 47, one pair being adjacent to the open end of the housing while the other pair is intermediate the ends. The upper end of rod member 42 is slidably received coaxially within the other end of housing 43 and has an enlarged head portion 48. Head portion 48 is generally circular in configuration and of a diameter which is less than that of the internal diameter of snap ring 47 through which it must pass in order to compress spring 44. The cooperating spacer 46 has an opening therethrough slidably receiving rod 42, which opening has an internal diameter which is less than the diameter of the rod head portion to permit the head portion to contact the spacer and thereby compress the spring.

The effect of the detent mechanism is overcome by the automatic control link assembly when the bucket is adjusted to a predetermined position as follows. As best shown in FIG. 2, the link assembly 29 is illustrated in the position occupied when the bucket is lowered with the position of the housing 43 and rod member 42 best shown in FIG. 3. As the bucket is raised, the second rod member 42 is freely moved downwardly a finite distance by the linkage previously described until the enlarged head portion 48 contacts the spacer above the spring 44. As the rod member 42 continues to move downwardly, the precompressed force of spring 44 is sufficient to force the control lever 28 toward its hold position, thereby overcoming the force of the detent mechanism 34; and the control valve is returned to its hold position by the valve centering means. Thus, the raising movement of the bucket is discontinued at a predetermined point. This point is established by the effective length of the link assembly 29. The kickout point may be readily varied by loosening a nut 49 and rotating the housing 43 to either lengthen or shorten the effective length of link assembly 29.

Generally, the kickout height is set somewhat below the maximum height to which the bucket is inherently capable of reaching. With the present arrangement, the maximum height can still be obtained by the operator manually moving the control lever 28 and holding it in its lift position against the force of spring 44 so as to override the automatic mechanism. In so doing, the en-

larged head portion 48 of the rod member 42 moves a finite distance against the biasing force of the spring. As soon as the lever is again released, the spring 44 will operate to force the lever back to its hold position. Sufficient space is provided in the housing above the enlarged head portion 48 so the kickout mechanism does not prohibit the movement of lever 28 to its other operating positions.

A second embodiment of the control mechanism is shown in FIGS. 4 and 5 wherein levers 51 and 52 are secured to the opposite ends of a pivot shaft 53 in an analogous manner to the bellcrank 26 of the first embodiment. It may be parenthetically noted that primes are used throughout the following discussion to designate structure which finds its analogous counterpart in the first embodiment. The upper end of the rod member 42' is suitably secured to the head 48' above the spring 44' contained within the housing 43' while its lower end is slidably received within a slip collar 54 pivotally secured to the lever 51. The diameter of head 48' is greater than the internal diameter of snap ring 47' against which it abuts. Thus, as the bucket is raised, the levers 51 and 52 are rotated in a clockwise direction, thus causing slip collar 54 to freely slip downwardly on rod member 42' a finite distance until it engages a nut 56 threadably fixed on the lower end of rod member 42'. At this point, link assembly 29' overcomes the force of the detent mechanism and rotates the control lever toward the hold position. As with the previously described first embodiment, the operator can manually override the force of spring 44' by moving the control lever against the bias of the spring a finite distance and holding the control lever in its raised position to raise the bucket beyond the predetermined kickout height.

Although this invention is described as controlling the height of a bucket mounted on a loader, it is to be understood that it can also be used for controlling the angle of the bucket with respect to the lift arms or for controlling hydraulically-actuated implements on other vehicles such as bulldozers, rippers, plows, etc.

It is to be further understood that the foregoing description is merely illustrative of preferred embodiments of the invention and that the scope of the invention is not to be limited thereto, but is to be determined by the scope of the appended claims.

What is claimed is:

1. In a vehicle having implement means mounted on pivotal support means and adapted to be raised by a hydraulic jack means pivotally connected to the vehicle, a valve for directing fluid to said jack means upon movement of the valve away from a neutral position to raise the implement, detent means to hold said valve means in a position for operating the jack means so as to raise the implement, and means to disengage the detent means so as to allow the valve to return to its neutral position when the implement reaches a predetermined position, said last named means including a valve-actuating lever, a control link assembly comprising a connecting link means responsive to implement position, and a lost-motion link means, said lost motion link means allowing movement of said connecting link means which is unrestrained and unbiased by said lost-motion link means for a finite distance corresponding with the raising of the implement to said

5

predetermined position whereupon said lost-motion link means is operable upon the implement reaching said predetermined position to disengage the detent means whereby said valve returns to its neutral position to hold said implement at said predetermined position, said lost-motion link means further including biasing means providing biased travel after the implement has reached said predetermined position for a further finite distance whereby said lost-motion link means may be manually overridden by movement of said valve actuating lever against the force of said biasing means so as to further raise the implement beyond the predetermined position, said biasing means further operating to return said valve actuating lever and thereby said valve to the neutral position upon manual release of said valve actuating lever and wherein said lost-motion link means comprises a housing having means adjustably securing the housing to a first rod member of said control link assembly, said biasing means comprising a spring contained within said housing, a second rod member of said control link assembly, one end of said second rod member being received in said housing and having means thereon whereby movement of said second rod member incident to overriding the lost-motion link means causes the spring to be compressed.

2. The combination of claim 1 further including means to adjust the detent disengaging means.

3. The combination of claim 1 wherein said housing is a generally cylindrical member having a closed and an open end thereof, said first rod member being secured thereto at said closed end, said second rod member being received in said open end, said spring being contained within said housing between a first means mounted in said housing and a second means defining an aperture through which said second rod member is received located adjacent said open end of said housing.

4. The invention of claim 3 wherein said first means mounted in said housing also has an aperture therethrough and wherein said one end of said second rod member extends therethrough, said means on said end of said second rod member being a head dimensioned so as to pass through said first means and engage a third means defining an aperture located between an end of said spring and said first means defining an aperture so as to bias said spring as said second rod member is moved from said housing.

5. The invention of claim 3 wherein said means on said end of second rod member is a head located 50

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between said end of said housing and said first means mounted in said housing.

6. The combination of claim 3 wherein the other end of said second rod member is slidably received in a slip collar operatively connected to said means actuating said control link assembly, and further including stop means secured to said second rod member for engaging said slip collar upon the implement reaching said predetermined position.

7. In a vehicle having implement means mounted on pivotal support means and adapted to be raised by a hydraulic jack means pivotally connected to the vehicle, a valve for directing fluid to said jack means upon movement of the valve away from a neutral position to raise the implement, detent means to hold said valve means in a position for operating the jack means so as to raise the implement, and means to disengage the detent means so as to allow the valve to return to its neutral position when the implement reaches a predetermined position, said last named means including a valve actuating lever, a control link assembly comprising a lost-motion link means operable upon the implement reaching said predetermined position to disengage the detent means whereby said valve returns to its neutral position to hold said implement at said predetermined position, wherein said lost-motion link means comprises a housing having means adjustably securing said housing to a first rod member of said control link assembly, a spring means contained within said housing, a second rod member of said control link assembly, said second rod member having one end received within said housing and having means thereon whereby said rod is biased by said spring means, said second rod member having a second end slidably received within a slip collar operatively connected to said means actuating said control link assembly, and stop means secured to said second rod member that engages said slip collar upon the implement reaching said predetermined position.

8. The combination of claim 7 wherein said housing is a generally tubular member closed at one end to which said first rod member is adjustably attached, said housing having means defining an opening at its other end through which said one end of said second rod member extends and wherein said means on said one end comprise an enlarged head portion, and wherein said spring means is contained between said means defining an opening and said enlarged head portion of said second rod member.

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