United States Patent

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[54] ARTICULATE WHEEL LOADER HYDRAULIC SYSTEM

7 Claims, 4 Drawing Figs.

[52] **U.S. Cl.** 214/140, 91/411
[51] **Int. Cl.** **E02f 3/62**
[50] **Field of Search** ..... 214/131, 132, 140; 180/79.2 B, 150; 91/411

[56] **References Cited**

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ABSTRACT: An articulated wheel loader having the main hydraulic controls for the bucket mounted on the front frame and the main hydraulic controls for vehicle operation mounted on the rear frame, with only low pressure, low volume, hydraulic lines extending from the front frame to the rear frame.

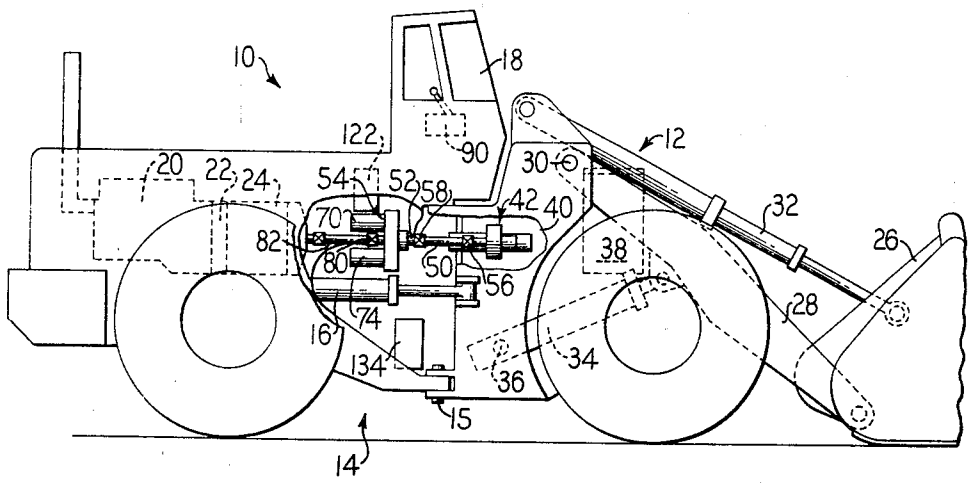

Fig. 1.

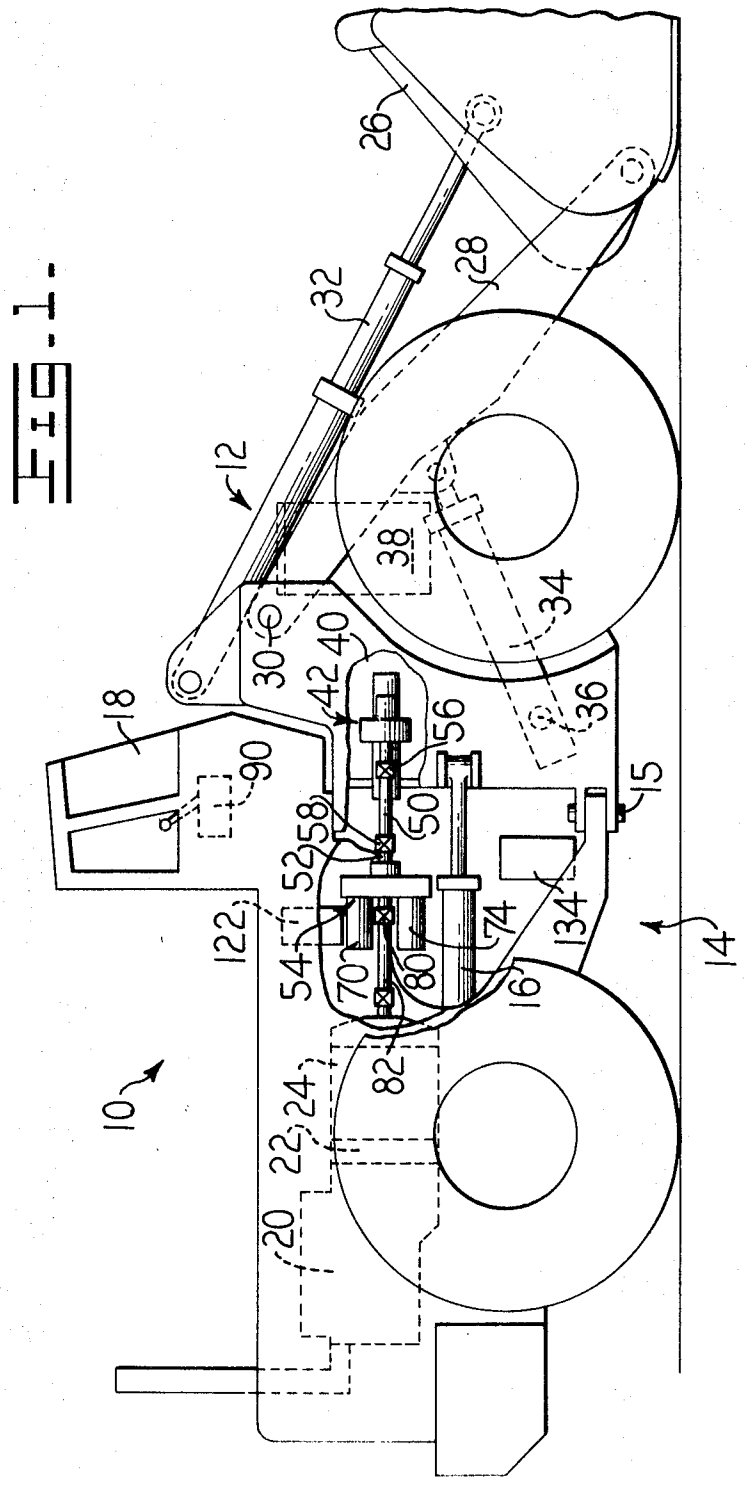

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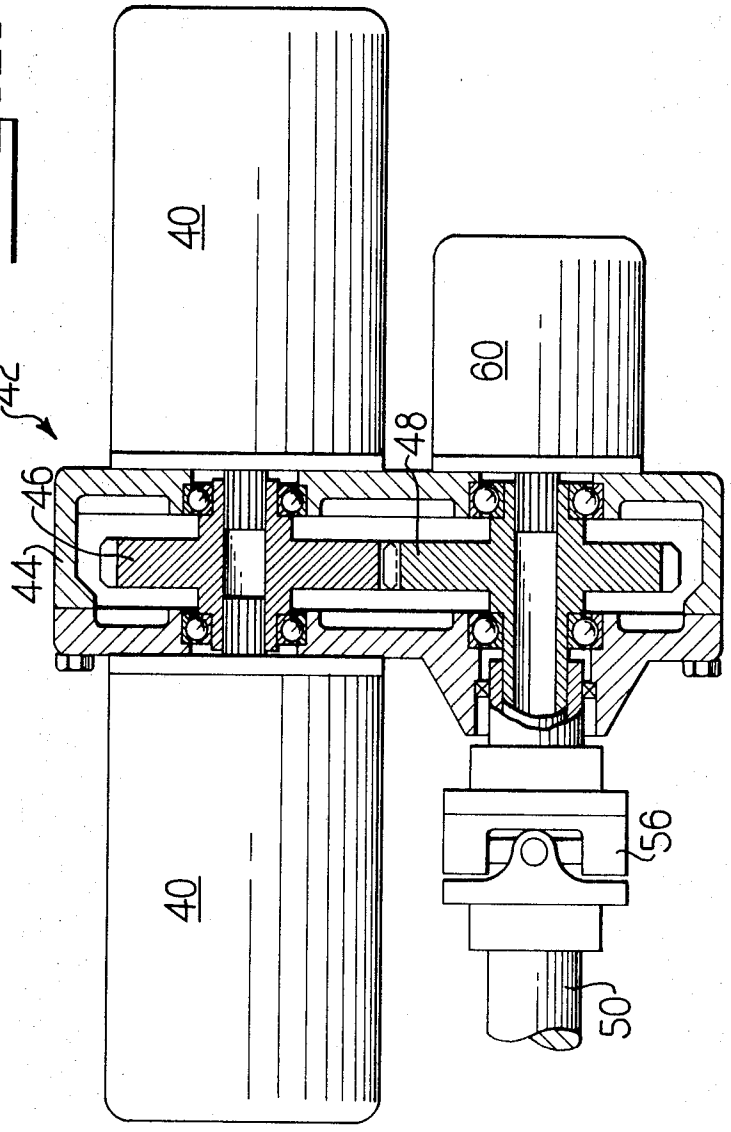
FIG. 2.



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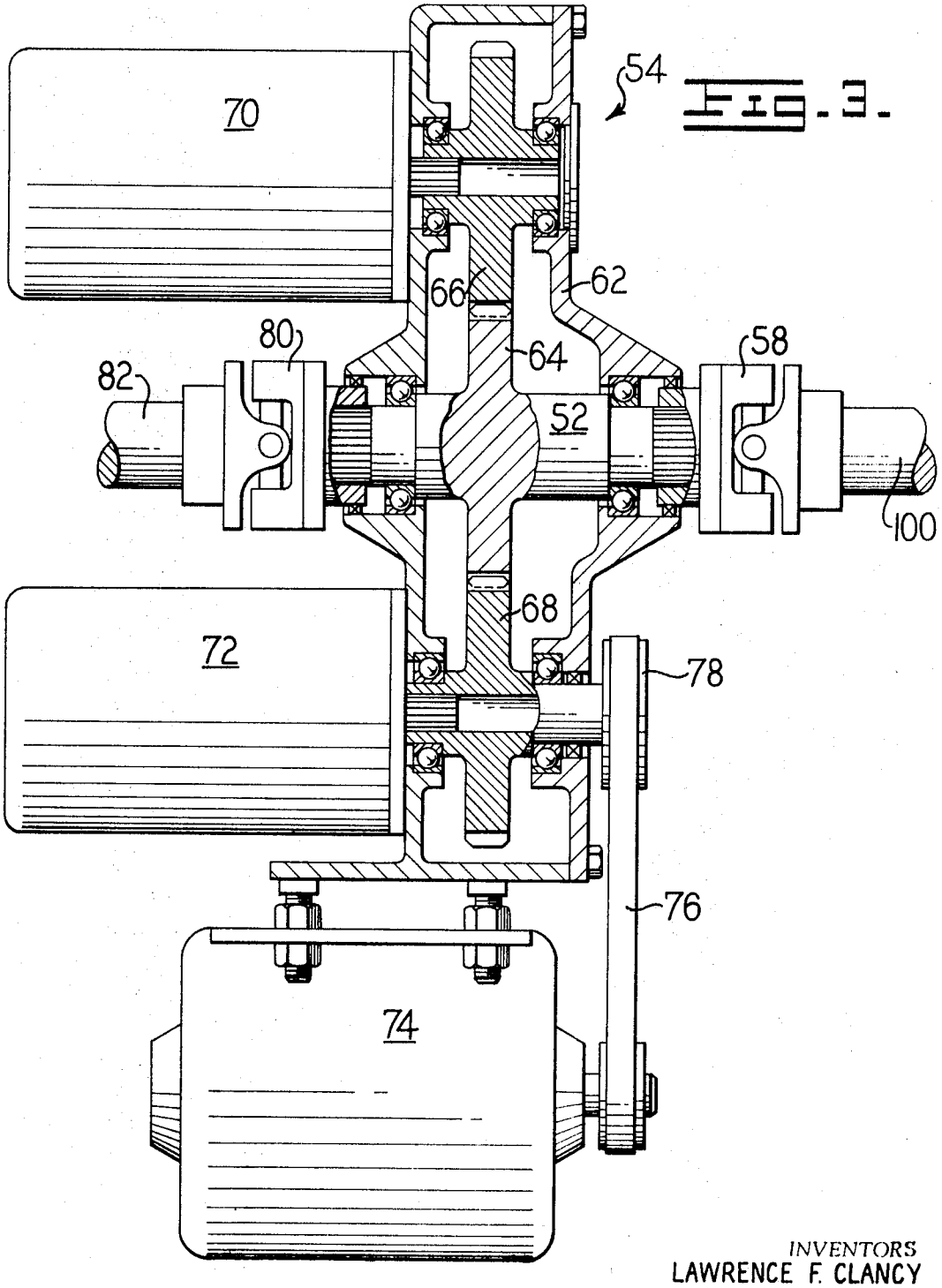

Fig. 3.

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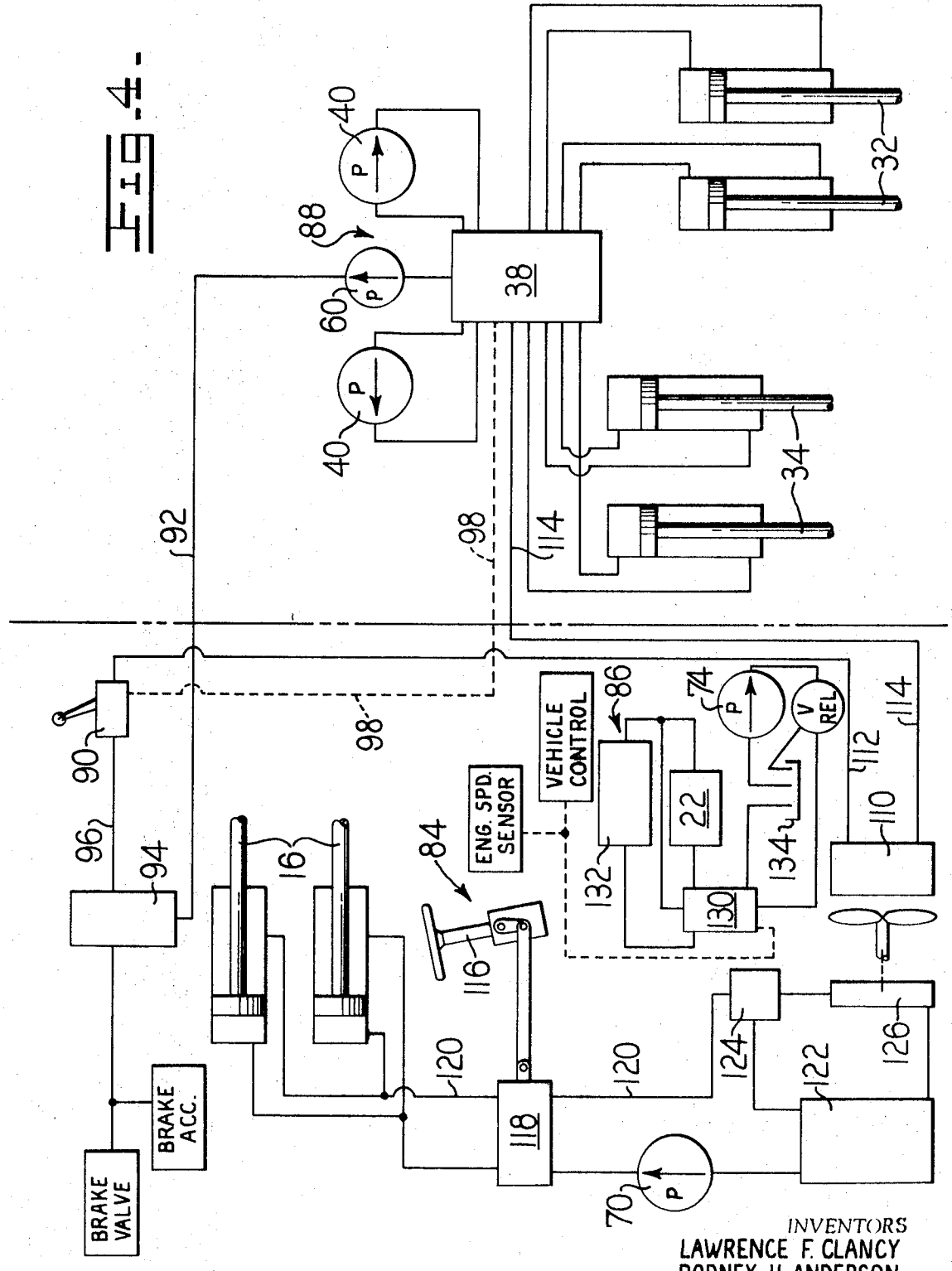
FIG. 4



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ARTICULATE WHEEL LOADER HYDRAULIC SYSTEM

BACKGROUND AND SUMMARY OF THE INVENTION

Many known articulated loaders have the operator's station, vehicle control, power unit, and hydraulic pumps located on the rear frame, with a bucket mounted on lift arms pivotally connected to the front frame. In such systems, a pair of hydraulic cylinders are employed to raise the lift arms while another pair of hydraulic cylinders are employed to tilt the bucket.

In such systems, it has, in the past, been necessary to provide several high pressure, high volume lines which extend from one frame to the other across the hitch. As loaders have become larger, the possibility of leakage and failure in these lines has become aggravated since the larger lines have limited flexibility.

The present invention obviates this problem by mounting the vehicle operation pumps on the rear frame and the bucket control pumps on the front frame, thereby eliminating the necessity of crossing the hitch with high pressured, high volume lines. More particularly, the bucket control hydraulic pumps, reservoir, and pilot operated main control valves are mounted on the front frame, while the main vehicle control steering pump, hydraulic retarder pump, reservoir, and control valves are mounted on the rear frame. A low pressure, low volume pump mounted on the front frame provides pressurized fluid to the control valve which directs the pilot pressure to the main control valve. In this manner, the only lines crossing the hitch are low pressure, low volume pilot lines.

It is therefore a general object of this invention to provide an articulated loader hydraulic system having a greatly reduced potential for hydraulic leakage and failure.

This invention, together with its further objects, advantages, modes, and embodiments, will become obvious to those skilled in the art by reference to the Detailed Description and accompanying drawings which illustrate what is presently considered to be the preferred embodiment of the best mode contemplated for utilizing the novel principles set forth in the claims.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevation, partly broken away to illustrate specific details, of an articulated wheel loader utilizing the instant invention;

FIG. 2 is a view, partly in section, of the drive system for the bucket control hydraulic pumps;

FIG. 3 is a view, partly in section, of the drive system for the vehicle steering and retarder pumps; and

FIG. 4 is a schematic illustration of the hydraulic system of the instant invention.

DETAILED DESCRIPTION

Referring now to the drawings in greater detail, and specifically to FIG. 1, an articulated wheel loader generally indicated at 10 has a front frame 12 pivotally connected to a rear frame 14 by pivot pins 15, one of which is shown, which permit hinging or steering movement of the front frame 12 relative to the rear frame 14 upon actuation of steering cylinders 16. An operator's station 18 is mounted on the rear frame 14, as is an engine 20, a hydraulic retarder 22, and a generator 14.

A bucket 26 is pivotally connected to a pair of lift arms 28 which are pivotally secured to the front frame 12 by pins 30. Tilting of the bucket is effected by a pair of cylinders 32, and the raising and lowering of the lift arms 28 is effected by cylinders 34 which are pivotally secured to the front frame at 36.

The hydraulic system is composed of three separate systems, each having its own pump, reservoir, and controls. The steering system and the retarder system are mounted entirely on the rear frame 14, while the bucket control system has components disposed on both the front and the rear frames.

The bucket control system is a pilot operated system having main control valves disposed within a hydraulic reservoir 38 mounted on the front frame. An example of a suitable pilot operated system may be found in U.S. Pat. application Ser. No. 731,212, filed May 22, 1968, now U.S. Pat. No. 3,486,418, and assigned to the assignee hereof.

The bucket system includes a pair of hydraulic pumps 40 mounted on a drive box 42 which is secured to the front frame 12. The main control valves within the reservoir 38 selectively direct the fluid from the pumps 40 to the lift cylinders 34 and to the tilt cylinders 32.

As shown in FIG. 2, the drive box 42 consists of a housing 44 in which a driven gear 46 and a drive gear 48 are disposed. The two implement pumps 40 are driven by the gear 46 and the drive gear 48 is driven by a drive shaft 50 which crosses the hitch and is attached to a shaft 52 extending from a gear box 54. A pair of universals 56 and 58 maintain flexibility within the drive connection so that the vehicle can pivot about the hitch.

As also shown in FIG. 2, a pilot circuit pump 60 is directly connected to the gear 48 so as to be driven by the shaft 50, for a purpose which will be described later.

Referring now to FIG. 3, the gear box 54 consists of a housing 62 in which a drive gear 64 and driven gears 66 and 68 are disposed. A steering pump 70 and a retarder pump 72 are suitably connected, as by splined engagements, to be driven by the gears 66 and 68 respectively. An exciter or auxiliary generator 74 is mounted on the housing 62 and is driven by a V-belt 76 driven by a pulley 78 suitably connected to the gear 68. The drive gear 64 is connected to the shaft 52 which, in turn, is connected by a universal connection 80 to a main drive shaft 82 which is connected by a universal connection to the main shaft of the generator 24.

Referring now to FIG. 4, the hydraulic system is shown as comprising a steering system generally indicated at 84, a retarder system generally indicated at 86, and a bucket control system generally indicated at 88.

The main control valves within the hydraulic reservoir 38 are pilot operated by fluid directed to them from a manually operated control valve 90 which is mounted within the operator station 18 on the rear frame 14. The operative fluid for the pilot circuit is directed from the pump 60 mounted on the drive box 42 on the front frame 12, through a line 92, across the hitch to a brake system valve 94, and thence to the control valve 90 through a line 96.

The control valve 90 has two spools (not shown) operatively connected by suitable means allowing the operator to selectively direct the fluid back across the hitch through a plurality of lines, one of which is indicated at 98, to the main control valves for actuation thereof. When control valve 90 is in the neutral position, the fluid is directed to an oil cooler 110 mounted on the rear frame 14 via a line 112 and the oil exhausted from the cooler crosses the hitch through a line 114 back to the hydraulic reservoir 38. Thus, the only bucket system lines which cross the hitch are low volume, low pressure lines employed for the pilot circuit and cooler.

The hydraulic steering system 84 is disposed entirely on the rear frame and includes a steering wheel 116 suitably connected to a steering control valve 118 which directs oil from the hydraulic pump 70 to the steering cylinders 16. Oil exhausted from the cylinders is returned through a conduit 120 to a reservoir 122 via a bypass valve 124 which directs a portion of the fluid through a cooler 126.

The hydraulic retarder system 86 is also entirely disposed on the rear frame and includes a control valve 130 which directs oil from the pump 74 to either the retarder 22 or an oil cooler 132 with the oil exhausted therefrom being communicated to a reservoir 134.

Thus, the Applicants have provided an embodiment of a new and improved concept in the articulated loader art which yields a true advance in that art. Many further modifications and alterations will be obvious to those skilled in the art, wherefore what we claim as the invention is:

1. In a loader having a front frame articulated to a rear frame, said front frame having mounted thereon

a loader bucket,

means for raising and tilting the bucket, a high pressure, high volume control system including pump means for controlling the bucket raising and tilting means, and

a low pressure, low volume pilot system for actuating the control system; said rear frame having mounted thereon

a control valve for actuating said control system; and

a low pressure, low volume hydraulic line connecting the control valve and control system.

2. In the articulated loader of claim 1,

the rear frame also having mounted thereon,

a hydraulic vehicle steering system, and

a hydraulic retarder system.

3. In the articulated loader of claim 2,

the rear frame also having mounted thereon,

a vehicle drive system, and

means connecting the vehicle drive system to the steering and retarder systems for powering them.

4. In the articulated loader of claim 3,

means connecting the vehicle drive system to the pilot system for powering it.

5. In the articulated loader of claim 3,

means on the front frame connecting the vehicle drive system to the control system for powering it.

6. In the articulated loader of claim 1,

the rear frame also having mounted thereon,

a pilot system oil cooler; and

a low pressure, low volume hydraulic line connecting the control system and the oil cooler.

7. In the articulated loader of claim 6,

the rear frame also having mounted thereon,

a pilot operated brake system, and

low pressure, low volume hydraulic lines interconnecting the control valve, the brake system, and the oil cooler.