



(19) **United States**

(12) **Patent Application Publication**
Burton

(10) **Pub. No.: US 2003/0197420 A1**

(43) **Pub. Date: Oct. 23, 2003**

(54) **ATTACHMENT FOR SKID STEER LOADER OR OTHER SIMILAR WORK VEHICLE HAVING LOCAL FLUID POWER SYSTEM**

(52) **U.S. Cl. 299/39.5**

(75) **Inventor: Paul Burton, Lee, IL (US)**

(57) **ABSTRACT**

Correspondence Address:
LEYDIG VOIT & MAYER, LTD
6815 WEAVER ROAD
ROCKFORD, IL 61114-8018 (US)

A local fluid power system is provided on a attachment for a skid steer loader or other commercial work vehicle. The local fluid power system can supplement the existing hydraulic power system provided by the commercial work vehicle or skid steer loader. The local fluid power system may comprise a hydraulic reservoir and a hydraulic pump fluidically connected to the hydraulic reservoir for providing a hydraulic power source. The local fluid power system may drive a first hydraulic actuator that acts upon the work attachment tool. The attachment may include a second actuator that is not driven by the local fluid power system, but instead by the existing hydraulic system provided by the commercial work vehicle.

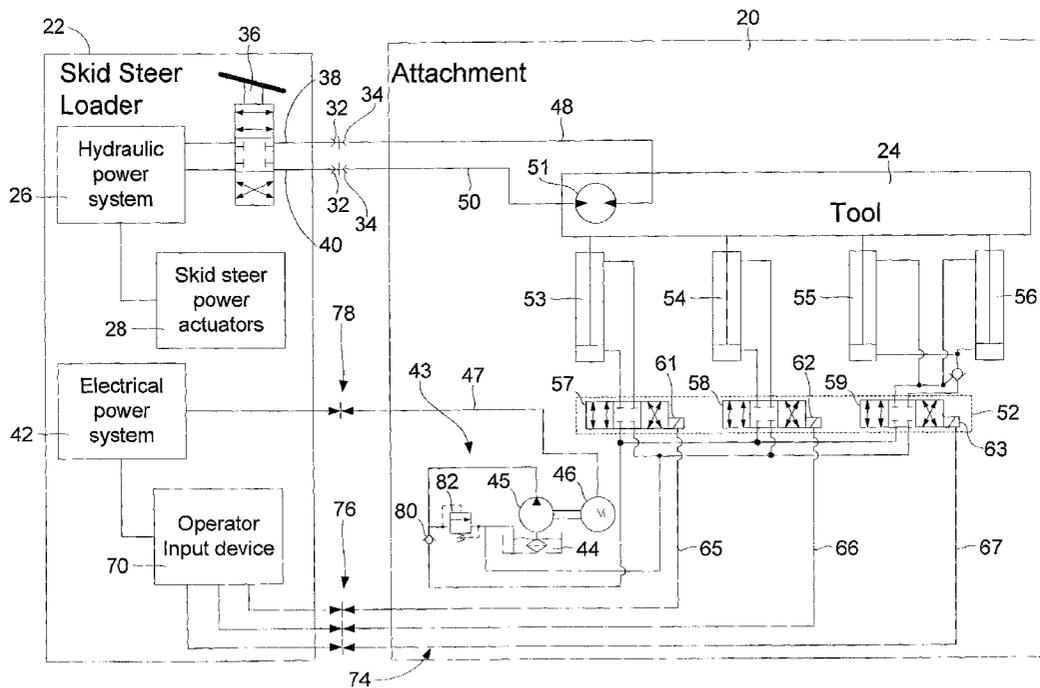
(73) **Assignee: Farmers' Factory Company, Lee, IL**

(21) **Appl. No.: 10/126,236**

(22) **Filed: Apr. 19, 2002**

Publication Classification

(51) **Int. Cl.⁷ E21C 25/00**



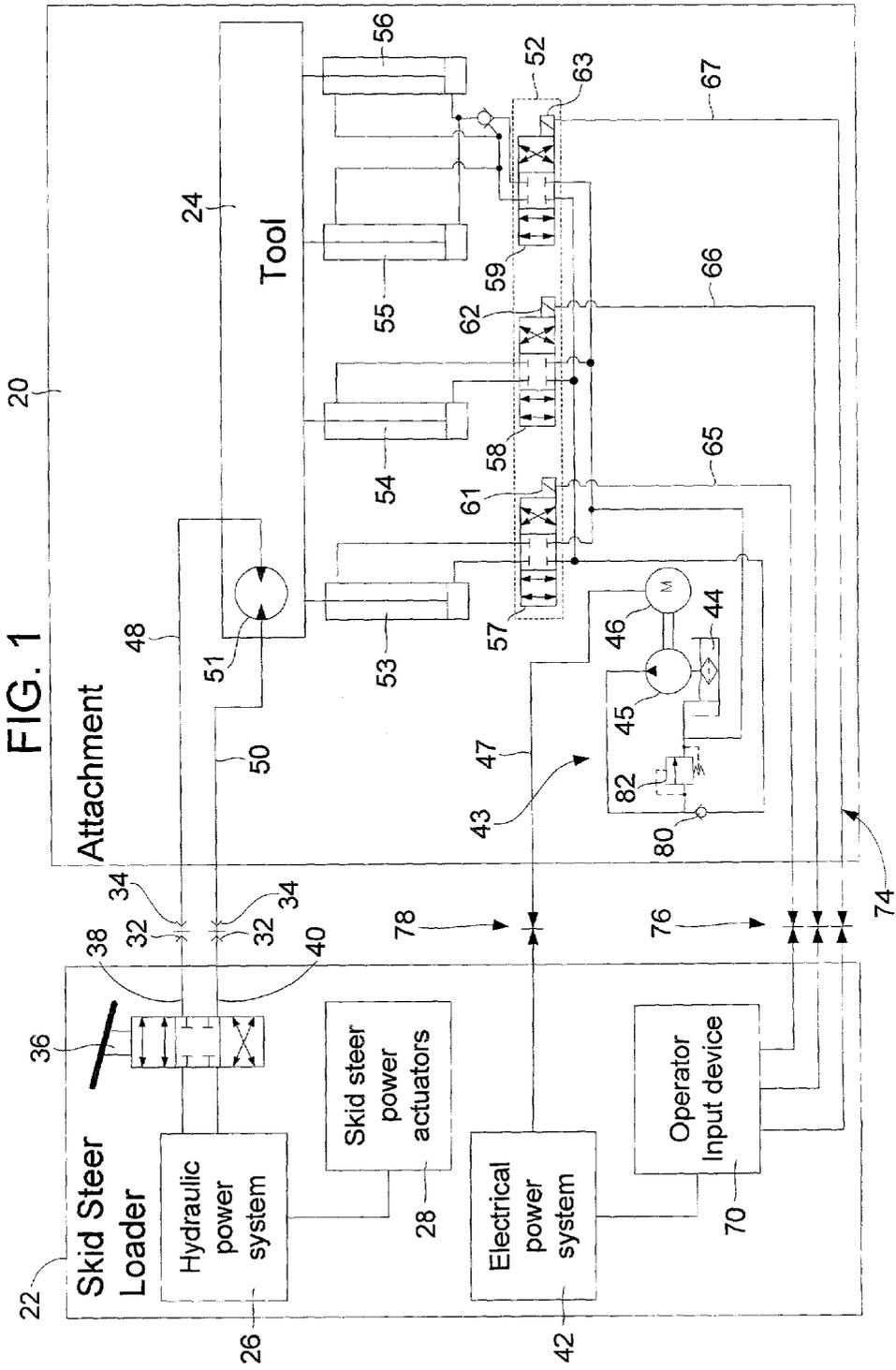


FIG. 2

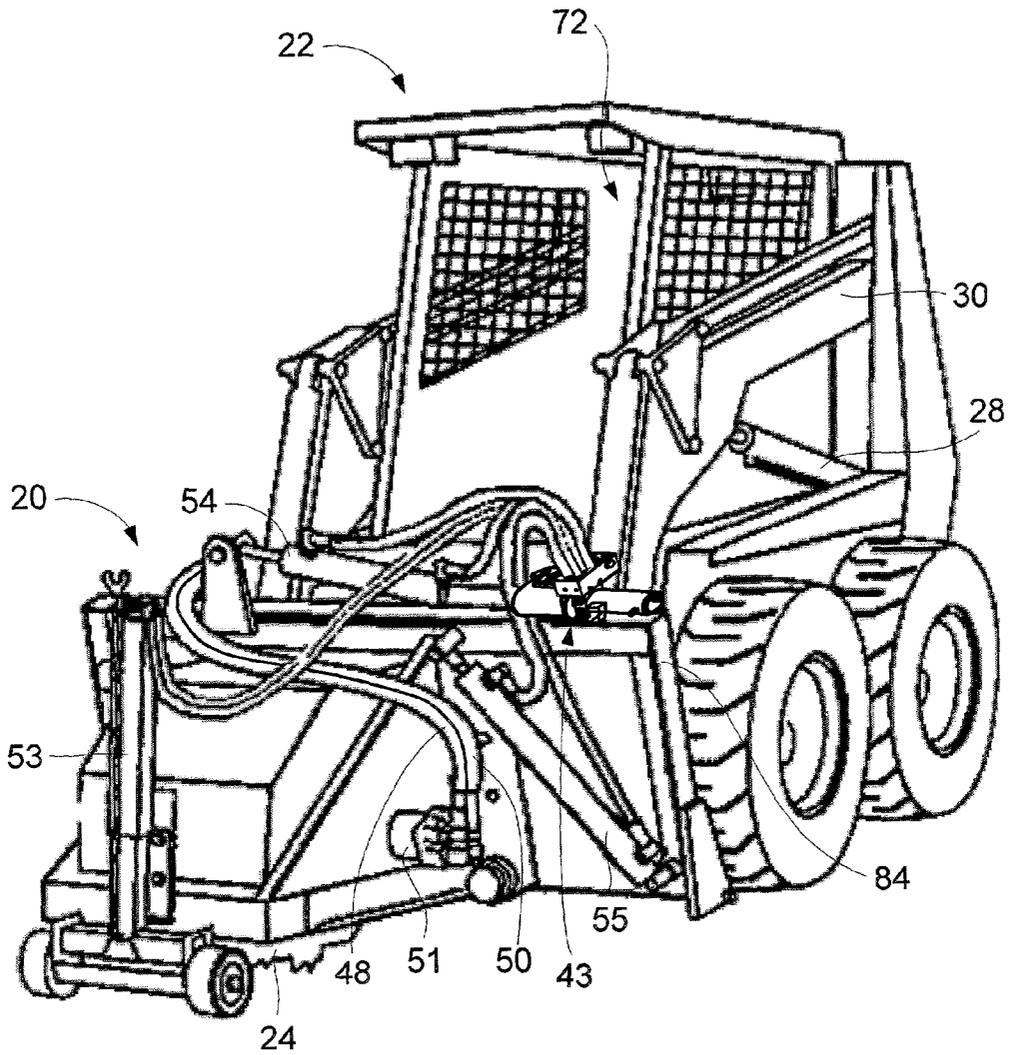
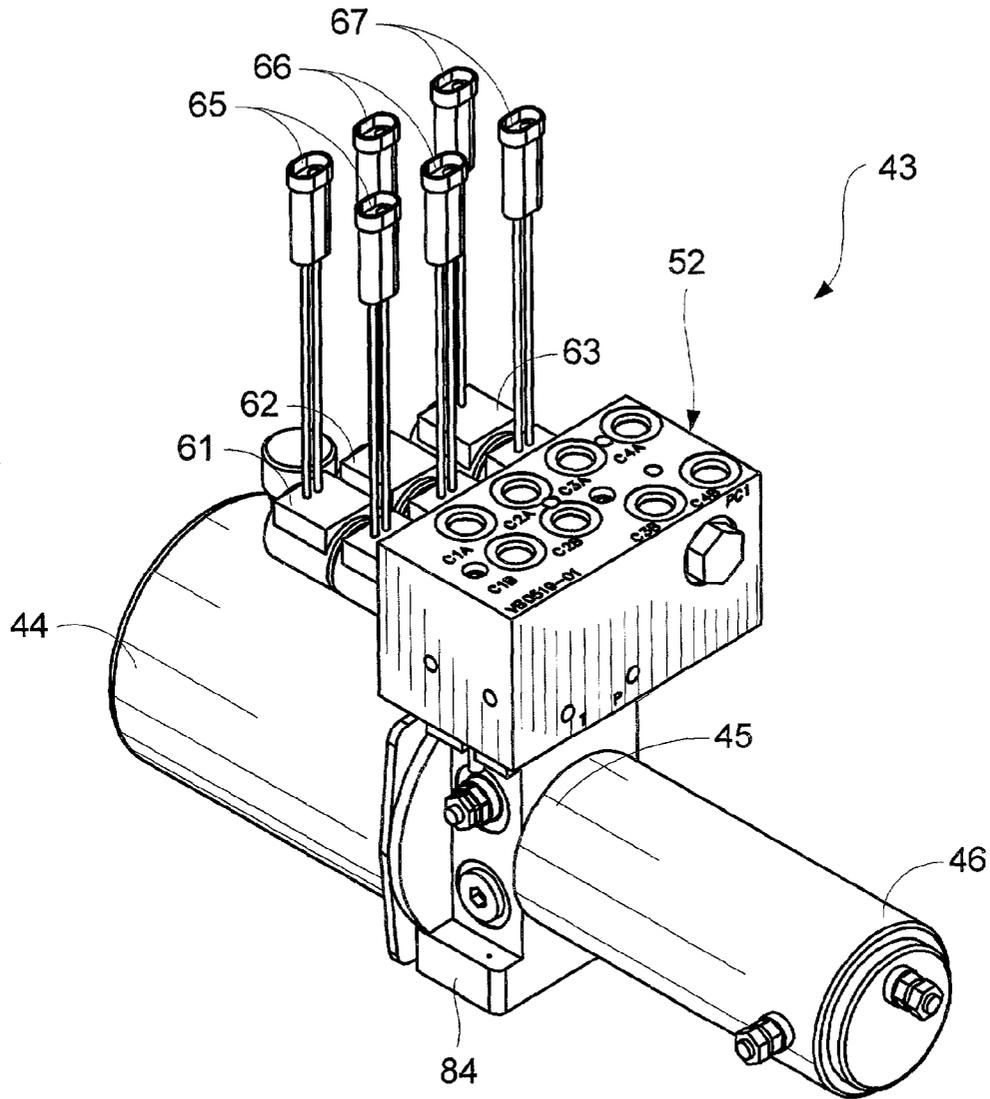


FIG. 3



ATTACHMENT FOR SKID STEER LOADER OR OTHER SIMILAR WORK VEHICLE HAVING LOCAL FLUID POWER SYSTEM

FIELD OF THE INVENTION

[0001] The present invention relates generally to attachments for work vehicles, and more particularly relates to fluid power systems for driving actuators on such attachments.

BACKGROUND OF THE INVENTION

[0002] Commercial work vehicles such as skid steers, loader tractors and other similar heavy equipment vehicles are commonly used for many industrial, agricultural, and landscaping operations. Many of these work vehicles often have two laterally spaced loader arms that extend in front of the vehicle that are adapted to attach to a wide variety of attachments. Commercial work vehicles may also have a three point hitch at their back end. A number of attachments can be selectively attached and detached from the loader arms or the three point hitch to make these work vehicles applicable to a wide variety of applications. For example, a bucket is commonly provided to dig, dump and transport loose materials such as dirt, sand and gravel. The loader arms are hydraulically driven to raise and lower the attachment and pivot the attachment about a horizontal axis.

[0003] Skid steer loaders and other work vehicles commonly have a single hydraulic hook-up which comprises a pair of hydraulic quick connect couplings (one for pressurized hydraulic flow and the other for return flow). The hydraulic hook-up can be utilized by the attachment for a desired powering purpose. A control lever is provided in the operator cab for controlling hydraulic flow to the attachment through the hydraulic couplings. One common use of the hydraulic output includes positioning the attachment tool (e.g. shifting the tool left or right about a vertical axis to effect a windrow and/or to direct dirt, gravel or debris, or raising and lowering or tilting the tool). The hydraulic output may also be used for hydraulically driving an engaging device such as the rotary rake of a rock raking attachment, a rotary blower of a snowblower or a rotary planner of a cold planner.

[0004] More complex attachments include two or more hydraulic functions or actuators. For example rotary broom attachments, snow-blower attachments, back-hoes, cold planners are some of the attachments that have two or more hydraulic functions or actuators. U.S. Pat. No. 5,299,857 to Zanetis, U.S. Pat. No. 5,957,213 to Loraas et al. disclose some of the various types of attachments with multiple hydraulic functions for which the invention can be applicable, and as such these patents are hereby incorporated by reference in their entireties. These attachments may include one or more hydraulic cylinders for tilting or rotating the tool about one or more axes; and/or one or more hydraulically driven motors that rotate a tool (e.g. a broom, snow-blower or cold planner).

[0005] When hydraulically positioning a hydraulically driven rotating tool, hydraulic power is typically diverted away from the main rotary motor of the tool. This can undesirably slow down the rotary speed of the tool. Currently, there is no ideal solution for maintaining a constant

full or complete supply of hydraulic power to the main actuator or rotary motor of the tool.

[0006] A further deficiency existing in the art as will be appreciated once the present invention is understood, is the lack of available options with respect to driving fluid actuators on attachments for skid steer loaders or other similar work vehicles.

BRIEF SUMMARY OF THE INVENTION

[0007] In light of the above, it is a general aim of the present invention to provide an alternative way to actuate fluid driven actuators on an attachment for a skid steer loader or other similar work vehicle.

[0008] In accordance with these and other objectives, the present invention is directed toward a local fluid power system on a attachment for a skid steer loader or other commercial work vehicle. The local fluid power system can supplement the existing hydraulic power system provided by the commercial work vehicle or skid steer loader.

[0009] The local fluid power system may comprise a hydraulic reservoir and a hydraulic pump fluidically connected to the hydraulic reservoir for providing a hydraulic power source. The local fluid power system may drive a first hydraulic actuator that acts upon the work attachment tool. The attachment may include a second actuator that is not driven by the local fluid power system, but instead by the existing hydraulic system provided by the commercial work vehicle.

[0010] Other objectives and advantages of the invention will become more apparent from the following detailed description when taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] The accompanying drawings incorporated in and forming a part of the specification illustrate several aspects of the present invention, and together with the description serve to explain the principles of the invention. In the drawings:

[0012] **FIG. 1** is a schematic of a power machine comprising in combination a skid steer loader and a skid steer attachment having a local fluid power system according to an embodiment of the present invention.

[0013] **FIG. 2** is a perspective illustration of a power machine comprising in combination a skid steer loader and a skid steer attachment according to the schematic arrangement shown in **FIG. 1**.

[0014] **FIG. 3** is an isometric drawing of a local fluid power system assembly for mounting to the skid steer attachment shown in **FIG. 2**.

[0015] While the invention will be described in connection with certain preferred embodiments, there is no intent to limit it to those embodiments. On the contrary, the intent is to cover all alternatives, modifications and equivalents as included within the spirit and scope of the invention as defined by the appended claims.

DETAILED DESCRIPTION OF THE INVENTION

[0016] Referring to **FIGS. 1 and 2**, an embodiment of the present invention has been illustrated schematically as incor-

porated in a cold planner attachment 20 to illustrate one application of the present invention. The cold planer attachment 20 mounts to a commercial work vehicle shown as a skid steer loader 22. The attachment 20 includes a tool 24 for performing a work operation, in this case grinding pavement. However, it will be understood that the invention is applicable to any one of a variety of attachments such as a back-hoe, a rotary broom, a snow-blower, a tree spade, grapples, or other such similar implements. One common element of each of the attachments to which the present invention pertains is that these attachments have one or more fluid powered actuators (typically either hydraulic cylinders or hydraulic rotary motors, although the invention may also be applicable to local pneumatic power systems).

[0017] As shown schematically in FIG. 1, the skid steer loader 22 includes a conventional hydraulic power system 26 that is driven by the engine of the work vehicle. The hydraulic power system 26 supplies hydraulic power to various hydraulic actuators 28 on the skid steer loader 22, such as those used to raise, lower and tilt the lift arms 30 (see FIG. 2). The lift arms 30 typically carry a conventional quick attach plate (not shown) to which the skid steer attachment 20 can quickly mount and dismount. The hydraulic power system 26 also includes a hydraulic power output at quick disconnect hydraulic couplings 32 that can attach with quick disconnect hydraulic couplings 34 of the skid steer attachment 20 to supply the skid steer attachment 20 with hydraulic power. A control valve 36 is often provided in the work vehicle to reverse or stop flow through the hydraulic lines 38, 40. The control valve 36 may be a manually operated rocker lever valve or electrically controlled via an operator input device or other suitable valve device. The skid steer attachment 20 has a pair of hydraulic hoses 48, 50 for receiving and returning hydraulic oil to the skid steer loader 22. The hoses 48, 50 terminate in the quick disconnect couplings 34 to provide for fast attachment and detachment from the hydraulic power system 26 of the skid steer loader 22. The skid steer loader 22 also includes a conventional electrical power supply system 42 which is used to power various electrical functions on the skid steer loader 22.

[0018] In accordance with the present invention, the attachment 20 includes a local hydraulic power system 43 to provide a second source of fluid power separate from the hydraulic power system 26 of the skid steer loader 22. In the disclosed embodiment, the local hydraulic power system 43 includes a hydraulic reservoir 44 and a hydraulic pump 45. The hydraulic pump 45 is driven by an electrical motor 46. The electrical motor 46 is in turn powered by the electrical power system 42 of the skid steer loader 22 through an electric supply wire 47 running therebetween.

[0019] The attachment 20 includes multiple hydraulic functions. FIGS. 1 and 2 illustrate the attachment 20 as having five actuators including one hydraulic rotary motor 51 and four hydraulic cylinders 53-56. In the disclosed embodiment, the hydraulic power system 26 of the skid steer loader 22 is dedicated to driving the rotary motor 51 and therefore rotating the tool 24, while the local hydraulic power system 43 of the attachment 20 is dedicated to positioning the four hydraulic cylinders 53-56.

[0020] Because there are multiple hydraulic cylinders 53-56, the hydraulic oil output of the local hydraulic power

system 43 is typically routed to a hydraulic control block 52 where it can be distributed (equally or disproportionately) as desired. The control block 52 may include three corresponding control valves 57-59, one for controlling the flow to each different hydraulic cylinder 53-56, respectively (valve 59 controls flow to two cooperating hydraulic cylinders 55 and 56). The control block 52 centralizes flow, distribution and/or return of hydraulic fluid to the local hydraulic reservoir 44.

[0021] As shown, each valve 57-59 has an electrical solenoid control mechanism 61-63 (which actually comprises two solenoids for each valve and often return springs to center the valve), respectively, for valve position control. Each valve 57-59 is also shown as being of the four way, three position type with blocked center. It will be appreciated that the types of valves 57-59 and their control may be different depending upon the particular needs of the attachment 20. The valves 57-59 may also be of the variable position type with a variable position electrical control device that takes variable positions corresponding to the magnitude of the electrical signal on respective electrical control lines 65-67, respectively.

[0022] The positions of each of the valves 57-59 are controlled via electrical signals conveyed along electrical wires or control lines 65-67. In FIG. 1, the lines 65-67 receive control signals from an operator input device 70 mounted in the cab 72 of the skid steer loader 22 for access by the work vehicle operator. The operator input device 70 typically will receive power from the electrical power system 42 of the skid steer loader 22. The electrical wires 65-67 are contained within a wire harness 74 that includes a wire coupling 76 interposed thereon to provide for easy coupling and de-coupling when the attachment 20 is attached and detached from the skid steer loader 22. Similarly the electric supply wire 47 includes a wire coupling 78 interposed thereon for a similar purpose. Although hard wiring is shown, it will be appreciated that wiring can be removed if desired and replaced with wireless communication and a local battery or power supply system on the attachment.

[0023] As shown in FIG. 1, the local hydraulic power system 43 may preferably include a check valve 80 to ensure one way flow from the hydraulic pump 45 to the hydraulic control block 52 and a pressure relief valve 82 to relieve excess pressure and/or bypass hydraulic oil to the reservoir 44 when desired.

[0024] As shown in FIG. 3, the reservoir 44, the pump 45, the electrical motor 46 and the hydraulic control block 52 are provided in a compact unit and supported by a common support flange or mount 84. This centralizes the hydraulic system on the attachment and allows all of these elements to be easily mounted or dismounted from the attachment 20. As shown in FIG. 2, the support flange or mount 84 can be fastened or secured directly to the support frame 86 of the skid steer attachment 22, the back side of which provides the quick attach plate mechanism for mounting and dismounting to the quick attach plate of the lift arms 30 of the skid steer loader 22.

[0025] Although a local hydraulic power system 43 is shown herein, it will be appreciated that in other embodiments, the local fluid power system may be pneumatic and include a compressor that pressurizes a compressed air reservoir. In such embodiments, compressed air may be used for driving actuators.

[0026] Another possible use of a local hydraulic power system 43 is for hydraulic power boosting. Currently, most commercial work vehicles are able to supply up to about 3300 psi to work attachments. However, many hydraulic cylinders can be driven at about 5000 psi or more. In certain applications such as rock crushing or other applications requiring large hydraulic power requirements, the relatively moderate hydraulic power supply afforded to the attachment by the work vehicle may not be sufficient. The local hydraulic system 43 may thus be used to provide a greater and higher hydraulic power supply to drive hydraulic cylinders for hydraulic functions that need a higher hydraulic power source. In such an application, the local hydraulic power system 43 may be independent of the work vehicle hydraulic system or the local hydraulic system 43 may be provided in series with the hydraulic system of the work vehicle and thereby no local hydraulic reservoir may be needed. With this type of a system, when the local hydraulic system is boosting the power, it may be temporarily disconnected either automatically, manually or when determined by appropriate sensors from the hydraulic power system of the vehicle when excess hydraulic power is required to drive a hydraulic actuator.

[0027] All of the references cited herein, including patents, patent applications, and publications, are hereby incorporated in their entireties by reference.

[0028] The foregoing description of various embodiments of the invention has been presented for purposes of illustration and description. It is not intended to be exhaustive or to limit the invention to the precise embodiments disclosed. Numerous modifications or variations are possible in light of the above teachings. The embodiments discussed were chosen and described to provide the best illustration of the principles of the invention and its practical application to thereby enable one of ordinary skill in the art to utilize the invention in various embodiments and with various modifications as are suited to the particular use contemplated. All such modifications and variations are within the scope of the invention as determined by the appended claims when interpreted in accordance with the breadth to which they are fairly, legally, and equitably entitled.

What is claimed is:

1. A power machine, comprising, in combination:
 - a skid steer loader vehicle having a pair of lift arms and a first hydraulic system, the lift arms being actuated by hydraulic lift arm cylinders, the first hydraulic system powering the hydraulic lift arm cylinders; and
 - an attachment having a work tool, the attachment being removably mounted to the lift arms, the attachment further including a local hydraulic system comprised of:
 - a hydraulic reservoir;
 - a hydraulic pump fluidically connected to the hydraulic reservoir, the hydraulic pump adapted to provide a hydraulic power source; and
 - a first hydraulic actuator acting upon the work tool, the first hydraulic actuator adapted to be driven by said hydraulic power source.
2. The power machine of claim 1 wherein the skid steer loader vehicle further includes an electrical power system, wherein the local hydraulic system further includes an

electrical motor driving the hydraulic pump, further comprising an electrical wire connecting the electrical motor to the electrical power system of the skid steer loader, wherein the hydraulic pump is powered by the electrical power system of the skid steer loader vehicle.

3. The power machine of claim 2 wherein the electrical wire includes a first wire segment connected to the electrical power system, a second wire segment connected to the electrical motor, and disconnectable electrical coupling between the first and second wire segments.

4. The power machine of claim 1 wherein the local hydraulic system comprises a plurality of said first hydraulic actuators, the local hydraulic system further including an electrical control valve block distributing the hydraulic power source to the first hydraulic actuators.

5. The power machine of claim 4 wherein the first hydraulic actuators are linearly reciprocating cylinders adapted to position the work tool relative to the skid steer loader vehicle.

6. The power machine of claim 4 further comprising an electrical remote control having a manual operator input, the electrical remote control being mounted in an operator cab of the skid steer loader vehicle in electrical communication with the electrical control valve block, the electrical remote control operating the electrical control valve block to distribute the hydraulic power source to the first hydraulic actuators.

7. The power machine of claim 1 wherein the first hydraulic system of the skid steer loader vehicle includes a hydraulic output, wherein the attachment further includes a second actuator acting upon the work tool and hydraulic hoses fluidically connecting the second actuator to the hydraulic output.

8. The power machine of claim 7 wherein the first hydraulic system of the skid steer loader vehicle includes a control valve controlling hydraulic flow through the hydraulic output.

9. The power machine of claim 7 wherein the second actuator is a rotary hydraulic motor adapted to rotate the tool and wherein the first hydraulic actuator is a linear hydraulic cylinder adapted to position the tool, wherein the local hydraulic power system prevents draws of hydraulic power from the hydraulic power output to maintain a substantially constant supply of hydraulic power to the rotary hydraulic motor.

10. The power machine of claim 9 wherein the attachment is a cold planner adapted to grind pavement surfaces.

11. A power machine, comprising, in combination:
 - a work vehicle having a first hydraulic system; and
 - an attachment having a work tool, the attachment being removably mounted to the work vehicle, the attachment further including a local hydraulic system comprised of:
 - a hydraulic reservoir;
 - a hydraulic pump fluidically connected to the hydraulic reservoir, the hydraulic pump adapted to provide a hydraulic power source; and
 - a first hydraulic actuator acting upon the work tool, the first hydraulic actuator adapted to be driven by said hydraulic power source.

12. The power machine of claim 11 wherein the work vehicle further includes an electrical power system, wherein

the local hydraulic system further includes an electrical motor driving the hydraulic pump, further comprising an electrical wire connecting the electrical motor to the electrical power system of the skid steer loader, wherein the hydraulic pump is powered by the electrical power system of the work vehicle.

13. The power machine of claim 12 wherein the electrical wire includes a first wire segment connected to the electrical power system, a second wire segment connected to the electrical motor, and disconnectable electrical coupling between the first and second wire segments.

14. The power machine of claim 11 wherein the local hydraulic system comprises a plurality of said first hydraulic actuators, the local hydraulic system further including an electrical control valve block distributing the hydraulic power source to the first hydraulic actuators.

15. The power machine of claim 14 wherein the first hydraulic actuators are linearly reciprocating cylinders adapted to position the work tool relative to the work vehicle.

16. The power machine of claim 14 further comprising an electrical remote control having a manual operator input, the electrical remote control being mounted in an operator cab of the work vehicle in electrical communication with the electrical control valve block, the electrical remote control operating the electrical control valve block to distribute the hydraulic power source to the first hydraulic actuators.

17. The power machine of claim 11 wherein the first hydraulic system of the work vehicle includes a hydraulic output, wherein the attachment further includes a second actuator acting upon the work tool and hydraulic hoses fluidically connecting the second actuator to the hydraulic output.

18. The power machine of claim 17 wherein the first hydraulic system of the work vehicle includes a control valve controlling hydraulic flow through the hydraulic output.

19. The power machine of claim 17 wherein the second actuator is a rotary hydraulic motor adapted to rotate the tool and wherein the first hydraulic actuator is a linear hydraulic cylinder adapted to position the tool, wherein the local hydraulic power system prevents draws of hydraulic power from the hydraulic power output to maintain a substantially constant supply of hydraulic power to the rotary hydraulic motor.

20. The power machine of claim 19 wherein the attachment is a cold planner adapted to grind pavement surfaces.

21. A work attachment for a work vehicle, the work vehicle comprising a hydraulic system, a pair of lift arms and an electrical power system, the lift arms being actuated by hydraulic lift arm cylinders, the hydraulic system powering the hydraulic lift arm cylinders, the work attachment, comprising:

a work tool;

an attach mechanism adapted to be removably mounted to the lift arms, the attach mechanism carrying the work tool;

a local fluid power system adapted to provide a local fluid power source; and

a fluid driven actuator acting upon the work tool and powered by the local fluid power source.

22. The work attachment of claim 21, wherein the local fluid power system includes an electrical motor, a fluid

reservoir adapted to hold fluid for use by the fluid driven actuator, and a fluid pump, the electrical motor driving the fluid pump to provide the local fluid power source.

23. The work attachment of claim 22, further comprising an electrical wire connected to the electrical motor and adapted to be connected to the electrical power system of the work vehicle, wherein the hydraulic pump is adapted to be powered by the electrical power system of the work vehicle.

24. The work attachment of claim 22, wherein the electrical motor and the fluid pump are mounted on the quick attach plate.

25. The work attachment of claim 22, wherein the local fluid power system utilizes hydraulic fluid stored in the fluid reservoir.

26. The work attachment of claim 21 further comprising a plurality of said fluid driven actuators, wherein the local fluid power system comprises a plurality of said fluid driven actuators, the local fluid power system further including means for distributing the local fluid power source to the fluid driven actuators.

27. The work attachment of claim 26 wherein the fluid driven actuators are linearly reciprocating cylinders adapted to position the work tool relative to the work loader vehicle.

28. The work attachment of claim 26 further comprising an electrical remote control having a manual operator input, the electrical remote control being mounted in an operator cab of the work vehicle in electrical communication with the electrical distributing means, the electrical remote control operating the distributing means to distribute the fluid power source to the fluid driven actuators.

29. The work attachment of claim 21 wherein the hydraulic system of the work vehicle includes a hydraulic output, wherein the attachment further includes a hydraulic actuator acting upon the work tool and hydraulic hoses adapted to connect the hydraulic actuator to the hydraulic output, the hydraulic actuator being powered independent of the local fluid power system.

30. The work attachment of claim 29 wherein the hydraulic actuator is a rotary hydraulic motor adapted to rotate the work tool and wherein the fluid driven actuator is a linear cylinder adapted to position the work tool, wherein the local fluid power system prevents draws of hydraulic power from the hydraulic power output to maintain a substantially constant supply of hydraulic power to the rotary hydraulic motor.

31. The power machine of claim 21 wherein the work attachment is a cold planner adapted to grind pavement surfaces.

32. The power machine of claim 21 wherein the work vehicle has an hydraulic output adapted to be used by work attachments, and wherein the local fluid power system provides a hydraulic power supply of greater magnitude than the hydraulic output of the work vehicle.

33. The power machine of claim 21 wherein the work vehicle has an hydraulic output connecting to the work attachment to drive the fluid driven actuator of the attachment, wherein the local fluid power system includes a hydraulic pump in series with the hydraulic output to boost the power of the hydraulic output and thereby provide said local fluid power source.