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(54) Slew control system

(57) A slew control system for an excavator having a superstructure rotatably mounted on a chassis comprises first and second detectors positioned at circumferential locations on one of the superstructure or chassis and a marker located on the other of the chassis or superstructure. The marker and the detectors produce a signal at a predetermined limit of slew to divert power from the slew drive motor. The motor is preferably hydraulic and is controlled by a spool valve (40) in response to an operator's handle (42) via lines (44a, 44b). Solenoid diverter valves (46a, 46b) are provided to disable the slew motor in the event of slewing to a limit defined by the detectors such as proximity switches (30). A slew brake (50) is activated simultaneously.

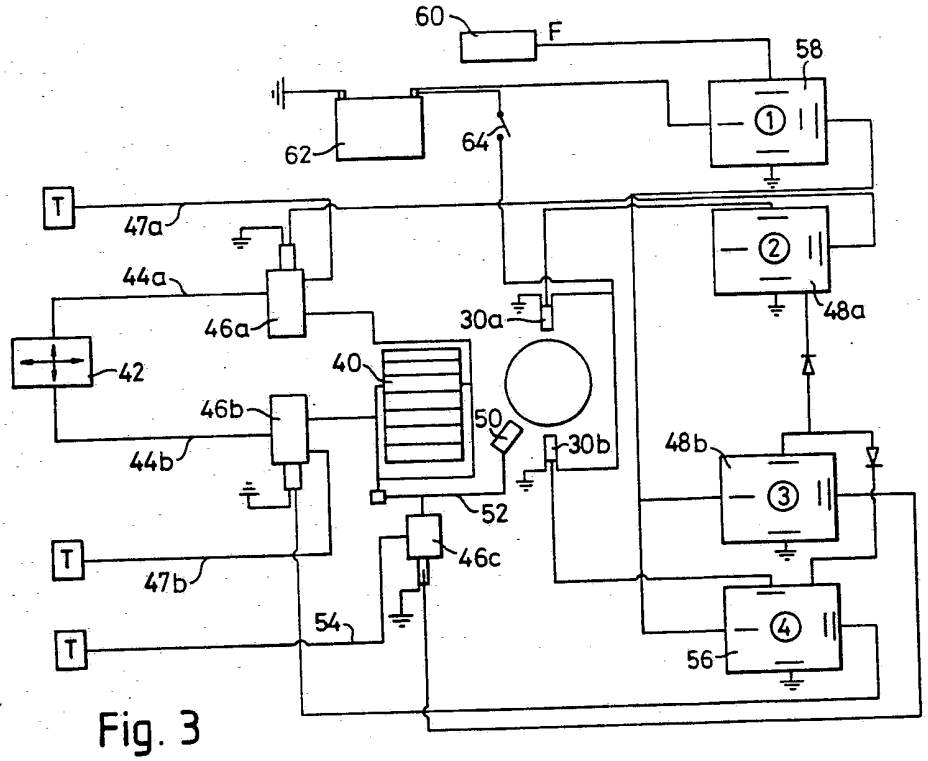

Fig. 3

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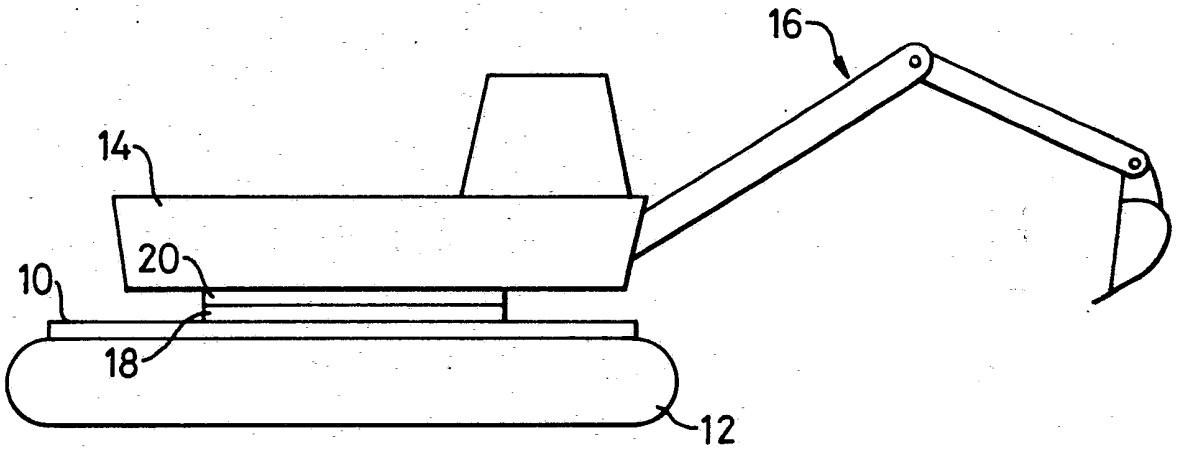

Fig. 1

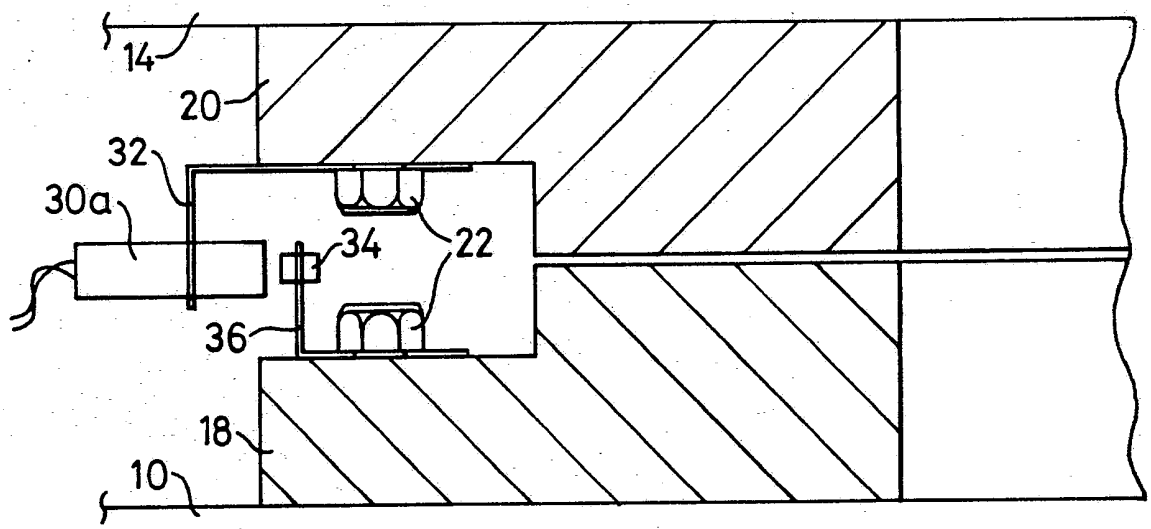

Fig. 2

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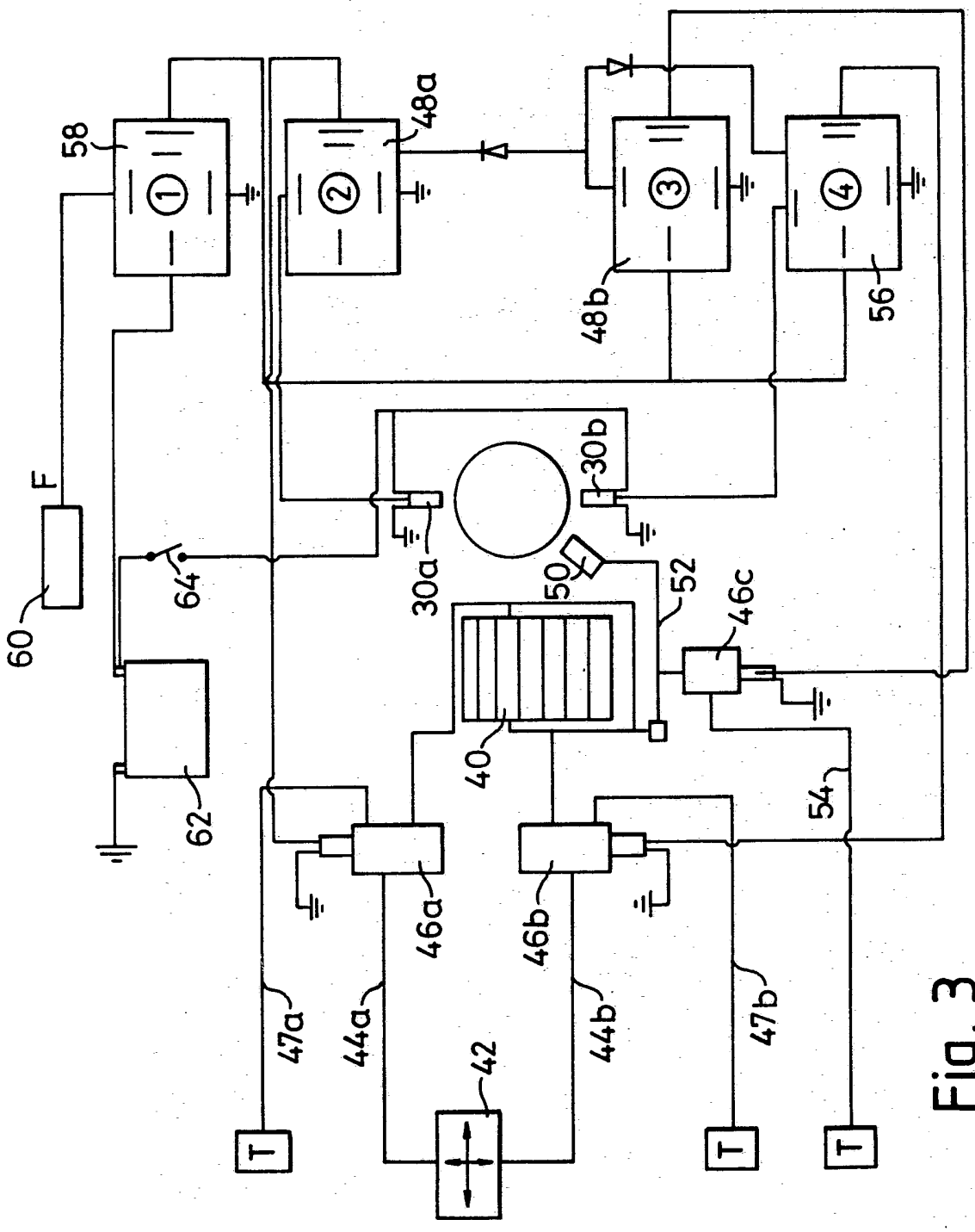

Fig. 3

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"Slew control system"

This invention relates to a system for controlling the permissible slewing motion of earthworking and construction machines, and is particularly of relevance to tracked excavators with 360° slewing.

Tracked excavators with 360° slewing, for example the JCB 800 range, can be used for a wide variety of site work and are therefore popular with contractors. In some situations, however, the availability of 360° slewing can be dangerous. For example when working at the side of a road or railway which is in use, forgetfulness or inadvertence on the part of the operator could lead to the excavator being wrongly slewed to move the jib into the path of traffic. In some instances this danger has led to stretches of road or railway being closed during adjacent excavation, which is obviously expensive and inconvenient.

It is therefore an object of the present invention to provide a system which can be applied to an excavator or like machine with 360° slewing so as to limit slewing motion to a predetermined arc.

Accordingly, the present invention provides a slew control system for a machine having a chassis and a superstructure which can be slewed relative to the chassis by means of a slew motor, the system comprising first and second detector means positioned at predetermined circumferential locations on one of the chassis and superstructure, marker means at a predetermined circumferential location on the other of the chassis and superstructure, the detector means and marker means cooperating to produce a detector output when a respective detector means is aligned with the marker means, and diverter means in a power supply to the slew motor responsive to the detector means to divert power from the slew motor on the occurrence of a detector output.

Preferably, the slew motor is a hydraulic motor with a hydraulic servo control, and the diverter means comprises diverter valves in the right and left servo lines.

Preferably also, the machine includes a slew brake which is biased on and hydraulically powered off, and the system comprises a further diverter valve in the hydraulic supply to the slew brake, the further diverter valve operating in response to outputs from either of the detector means.

The detector means may be magnetic proximity switches, and are suitably mounted on brackets adapted to be secured beneath bolts mounting a ring bearing of the machine.

In particularly preferred embodiment, the diverter valves are solenoid valves which are powered to position permitting slewing, and are controlled by the detector means via relays which are arranged to cut out in the event that the main power source of the machine becomes inoperative.

An embodiment of the invention will now be described, by way of example only, with reference to the drawings, in which:

Fig 1 is a schematic side view of a crawler mounted excavator;

Fig 2 is a detail of the excavator of Fig 1 showing the mounting of part of the system of the present invention; and

Fig 3 illustrates the electric and hydraulic circuits of one embodiment of the invention.

Referring to Figs 1 and 2, an excavator comprises a chassis 10 mounted on crawler tracks 12, and a superstructure 14 carrying an excavator jib 16. The superstructure 14 can be slewed through 360° relative to the chassis 10, bearing rings 18,20 being provided on the

two parts. The bearing rings 18,20 are secured by circumferentially spaced bolts such as 22 (Fig 2).

The present embodiment makes use of proximity switches 30a and 30b, one of which is seen in Fig 2. Each switch 30 is mounted on a bracket 32 which can be secured under a selected one of the bolts 22 on the superstructure 14. The switches 30 are of a known type opened by a metal plate 34 which is mounted on bracket 36 secured under a selected bolt 22 on the chassis 10, the switch 30 opening in response to the plate 34 entering a magnetic field produced by the switch.

Thus the plate 34 and switches 30 can be positioned to define a permissible arc of slewing relative to the fore-and-aft line of the excavator.

Turning to Fig 3, the slewing motion is produced by a hydraulic slew motor (not shown) controlled by spool valve 40, which in turn is controlled by operator's handle 42 in a hydraulic servo arrangement known per se. Movement of handle 42 to the right connects hydraulic pressure via line 44a to the spool valve 40 which moves to connect hydraulic pressure to the slew motor to produce slewing to the right. The corresponding action for left slewing occurs via line 44b.

Solenoid valves 46a, 46b are interposed in the control lines 44a, 44b such that when powered on the handle 42 is in communication with the spool valve 40, but when no power is present flow from the handle 42 is closed off at solenoid valves 46a, 46b, and servo oil from the spool valve 40 is diverted to exhaust lines 47a, 47b to neutralise the spool valve 40 diverted to exhaust lines 47a, 47b. The solenoid valves are controlled by respective relays 48a, 48b controlled by the proximity switches 30a, 30b.

The slewing motion is also provided with a brake, indicated at 50, which is hydraulically powered off and spring biased on. The brake 50 is connected to control

lines 44a, 44b by line 52 so as to be released when slewing motion is selected. The line 52 can be diverted to exhaust 54 by solenoid valve 46c controlled by relay 56 which is connected to receive the outputs from relays 46a and 46b.

The three relays 48a, 48b and 56 are connected to the vehicle battery 62 via a power relay 58 which is controlled on by the output of the vehicle alternator 60. The proximity switches 30 are connected to the battery 62 via a switch 64.

Thus, when the slewing motion is used within the permissible arc its operation is conventional. If, however, an end of the permissible arc is reached, the plate 34 opens the appropriate switch 30 causing the respective relay 48 to open and de-energise the respective solenoid valve 46; this diverts the hydraulic control pressure to the spool valve 40 and terminates the slewing drive. At the same time, relay 56 opens causing the brake 50 to be immediately applied.

It will be appreciated that the system is powered to the condition where slewing motion is possible. Thus any power failure or component failure terminates slewing motion and the system fails safe. The provision of the power relay 58 ensures that the system is activated at all times when the engine is running.

Modifications may be made to the above embodiment within the scope of the invention. For example, position detectors other than magnetic proximity switches may be used, eg microswitches or optical detectors. The diverting valves could be positioned in hydraulic power lines rather than servo lines, although this would be less convenient and require higher-capacity hardware. The invention may also be applied to slewing machinery other than excavators, for example truck-mounted or tower cranes.

CLAIMS

1. A slew control system for a machine having a chassis and a superstructure which can be slewed relative to the chassis by means of a slew motor, the system comprising first and second detector means positioned at predetermined circumferential locations on one of the chassis and superstructure, marker means at a predetermined circumferential location on the other of the chassis and superstructure, the detector means and marker means cooperating to produce a detector output when a respective detector means is aligned with the marker means, and diverter means in a power supply to the slew motor responsive to the detector means to divert power from the slew motor on the occurrence of a detector output.

2. The system of claim 1, in which the slew motor is a hydraulic motor with a hydraulic servo control, and the diverter means comprises diverter valves in the right and left servo lines.

3. The system of claim 2, in which the machine includes a slew brake which is biased on and hydraulically powered off, and the system comprises a further diverter valve in the hydraulic supply to the slew brake, the further diverter valve operating in response to outputs from either of the detector means.

4. The system of claim 2 or claim 3, in which the diverter valves are solenoid valves which are powered to a position permitting slewing, and are controlled by the detector means via relays which are arranged to cut out in the event that the main power source of the machine becomes inoperative.

5. The system of any preceding claim, in which the detector means comprises magnetic proximity switches.

6. The system of claim 5, in which said switches are mounted on brackets adapted to be secured beneath bolts mounting a ring bearing of the machine.

7. A slew control system substantially as herein described with reference to and as illustrated in the drawings.

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