United States Patent [19]

Schedrovitsky et al.

[11] **3,828,339**

[45] **Aug. 6, 1974**

[54] **CRANE OVERLOAD SAFETY DEVICE**

[76] Inventors: **Savely Solomonovich Schedrovitsky,** 13 Parkovaya ulitsa, 25, korpus 1, kv. 12; **Dmitry Matveevich Mash,** Leninskaya ulitsa, 14, kv. 34; **Zoya Ivanovna Golovko,** Chongrsky bulvar, 22, korpus 2, kv. 50; **Leonid Fomich Goncharevich,** Dmitrovskoe shosse, 145, korpus 3, kv. 36; **Alexei Pavlovich Lebedev,** Kursovoi pereulok 1, kv. 58; **Jury Mikhailovich Dubrovin,** Angarskaya ulitsa, 27, kv. 35, all of Moscow; **Nikolai Karlovich Suut,** ulitsa Revoljutsii, 31, kv. 7, Topki Kemerovskoi oblasti, all of U.S.S.R.

[22] Filed: **May 14, 1973**

[21] Appl. No.: **360,026**

[52] **U.S. Cl.** ..... **340/267 C,** 73/88.5 R, 212/39 A, 212/39 MS, 324/34 PS, 324/34 ST, 340/197, 340/282

[51] **Int. Cl.** **G08b 19/00**

[58] **Field of Search** ..... 340/267 C, 271, 282; 324/34 PS, 34 D, 34 ST; 73/88.5 R; 212/39 R, 39 A, 39 MS

[56] **References Cited**

UNITED STATES PATENTS

842,339	1/1907	Russo	340/267 C
2,231,702	2/1941	Burgwin et al.	324/34 ST
2,330,060	9/1943	Kuehni	340/267 C
2,992,373	7/1961	Golding	73/88.5 R
3,631,537	12/1971	Zibolski	340/267 C
3,723,862	3/1973	Wentzel et al.	340/282 X
3,742,340	6/1973	Kiedrowski	324/34 PS

FOREIGN PATENTS OR APPLICATIONS

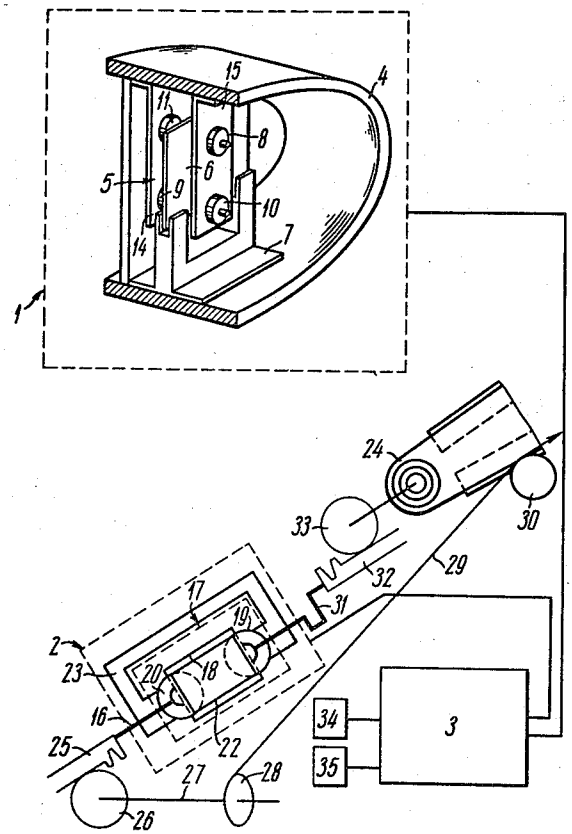
578,859	7/1946	Great Britain	324/34 ST
861,153	2/1961	Great Britain	324/34 D

Primary Examiner—David L. Trafton
Attorney, Agent, or Firm—Holman & Stern

[57] **ABSTRACT**

An overload safety device designed to variable-reach cranes is disclosed, said device comprising a load pick-up and a reach pick-up. The load pick-up has a means for sensing the load being hoisted and the reach pick-up has a means for sensing the reach or operating radius of the crane boom. Each pick-up also has a converter to change the mechanical movement of its respective sensing means into electrical signals. The converter of at least one pick-up has a screen mounted on the respective sensing means and also has primary and secondary coils which are wound on cores installed on one of said sensing means and are positioned so that there is a gap between them for the screen to freely move therein when load and reach changes take places. The primary coils are inserted in the circuit of a sine-wave generator. The secondary coils are wound differentially and connected to a detector.

8 Claims, 6 Drawing Figures



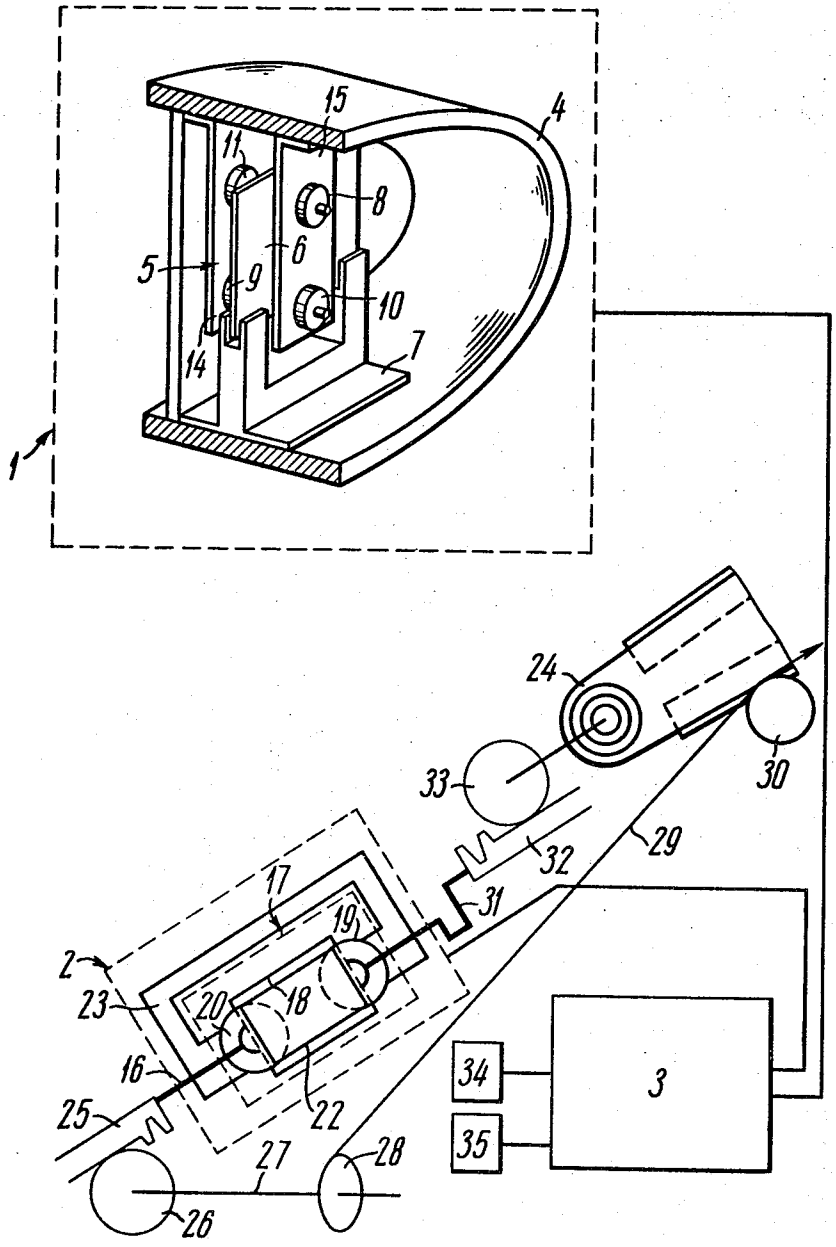

15
4
11
8
6
5
9
10
14
7
1
24
33
30
29
32
31
17
19
2
23
20
18
16
25
22
27
28
26
34
35
3

FIG. 1

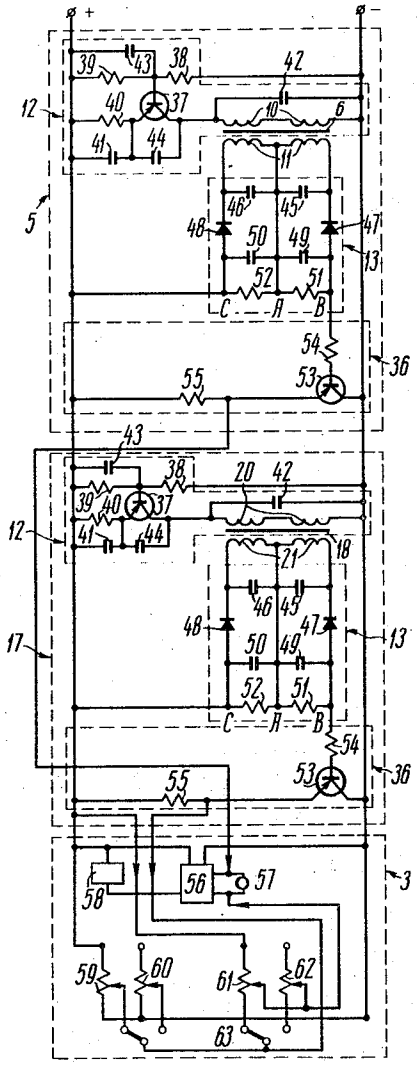

+
−
39
43
38
42
40
37
10
6
12
41
44
11
5
46
45
48
50
49
47
13
52
51
C
A
B
54
36
55
53
43
38
20
42
39
40
37
12
41
44
21
18
46
45
48
47
13
17
50
49
52
51
C
A
B
54
53
36
55
3
56
57
58
59
60
61
62
63

FIG. 2

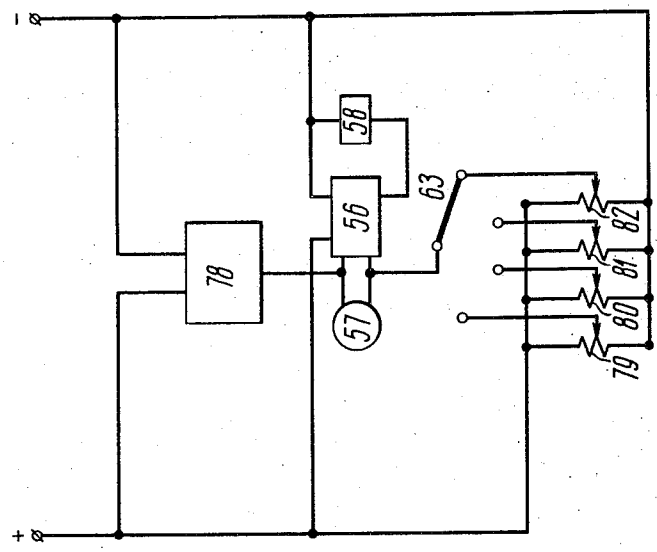


FIG. 6

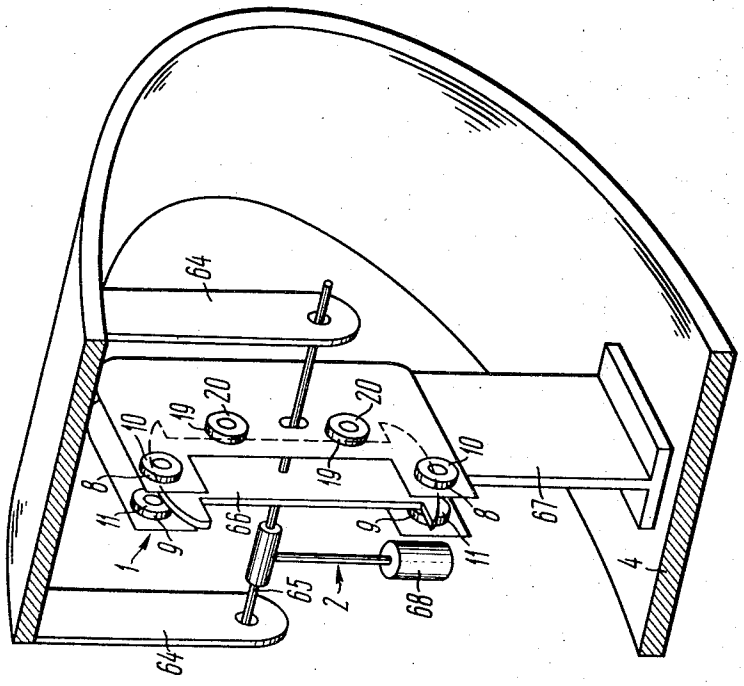


FIG. 3

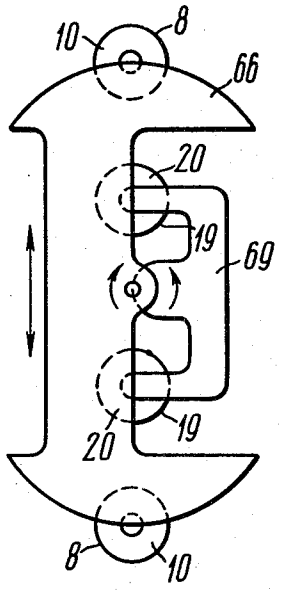


FIG. 4

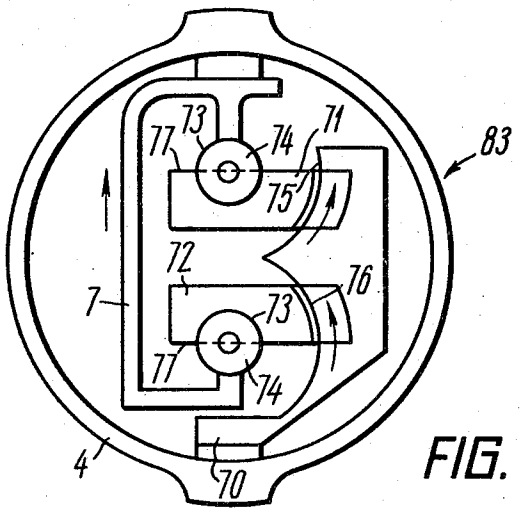


FIG. 5

CRANE OVERLOAD SAFETY DEVICE

BACKGROUND OF THE INVENTION

This invention relates generally to hoisting arrangements and more particularly, it relates to overload safety devices for variable-reach cranes, mainly for luffing-boom and tower cranes.

An overload safety device for variable-reach cranes is known at present, in which device are provided load and reach pick-ups having their respective means for sensing the load being hoisted and the reach or operating radius of the crane. The sensing means are connected to appropriate converters which change the mechanical movement of the sensing means into electrical signals. The pick-ups send the signals to a comparison circuit and the latter operates the crane overload warning devices and actuating arrangements.

The load sensing means of the overload safety device under consideration is made in the form of a resilient ring which flexes in proportion to the load being hoisted. The load pick-up has a converter which comprises a potentiometer and a wiper arm connected to the resilient ring by a linkage. When a load is applied to the resilient ring, it flexes and the flexure of the ring is translated by the linkage into the movement of the wiper arm over the potentiometer winding. Thereby the signals generated by the potentiometer vary in proportion to the load acting on the resilient ring.

The reach pick-up comprises a means for sensing the angle of the crane boom. This means is made in the form of a flanged shaft and is connected by a cam and a lever with a pin provided thereon to a converter comprising a potentiometer and a wiper arm. When the crane boom is raised or lowered, its pivital movement is transmitted through the shaft and its flange to the cam which turns through the same angle as the crane boom. The pin of the lever rides on the cam and thereby the cam movement is transmitted through the lever to the wiper arm, the latter sliding over the potentiometer winding.

The signals sent by the load and reach pick-ups are received by the comparison circuit which operates the crane overload warning devices and actuating arrangements.

The pick-ups described above fail to provide for sure and stable operation of the overload safety device inasmuch as they are prone to suffer from wear on the potentiometers and on the mechanical parts transmitting motion to the potentiometer wiper arms. Another drawback to the constructions of the pick-ups is the employment of kinematic pairs for transmitting drive from the load and reach sensing means to the respective potentiometers.

SUMMARY OF THE INVENTION

It is an object of this invention to provide a crane overload safety device which will surely function on variable-reach cranes, including telescopic boom cranes whose reach or operating radius varies with the boom angle and extension.

Another object of this invention is to provide a crane overload safety device the operating setting of which can be readily controlled.

These objects are accomplished by providing an overload safety device designed for variable-reach cranes, the device comprising load and reach pick-ups

which have respective means for sensing the load being hoisted and the reach or operating radius of the crane. These sensing means are connected to appropriate converters the function of which is to change the mechanical movement of the sensing means into electricals signals and send them to a comparison circuit which operates the crane overload warning device and actuating arrangements.

According to the invention, the converter of at least one of the pick-ups has a screen mounted on the sensing means of the respective pick-up and also has cores mounted on one of the sensing means. Primary and secondary coils are fitted in these cores. The converter also has a sine-wave generator and a detector. The primary coils are inserted into the circuit of the sine-wave generator. The secondary coils are wound differentially and connected to the detector. The primary and secondary coils are positioned so that there is a gap between them for the screen to move freely therein when a change in the load or reach takes place.

An embodiment of the overload safety device may be desirable within the cores of at least one converter are mounted on the sensing means of the respective pick-up.

Another embodiment of the overload safety device may be desirable wherein both converters have cores with coils and are provided with a common screen, the cores of the converters being fixedly mounted on the load sensing means.

A further embodiment of the overload safety device may be desirable wherein the reach pick-up converter is additionally provided with a movable element which mounts the cores and is kinematically connected to one of the sensing means, the movable element providing for correlated movement of the cores in the plane of the screen.

A still further embodiment of the overload safety device may be desirable wherein the reach pick-up converter has cores, coils and a screen, there being additionally provided a kinematic connection between the screen and a boom reach operating mechanism and a kinematic connection between the cores and another boom reach operating mechanism.

The crane overload safety device which constitutes the present invention is of simple construction, light, handy and suitable for a wide range of uses.

BRIEF DESCRIPTION OF THE DRAWINGS

Now the invention will be described in detail with reference to the accompanying drawings in which:

FIG. 1 is a schematic diagram of the first embodiment of the crane overload safety device according to the invention.

FIG. 2 is an electric circuit diagram of the first embodiment of the crane overload safety device according to the invention.

FIG. 3 is a general view of the second embodiment of the crane overload safety device wherein the load and reach pick-ups have a common screen (the view shows the resilient ring partially cut away).

FIG. 4 is a top view showing one of the embodiments of the crane overload safety device wherein the screen is mounted on a movable bracket.

FIG. 5 is a top view showing the third embodiment of the crane overload safety device wherein the load and reach pick-ups have a common screen and common coils.

FIG. 6 is an electric circuit diagram of the third embodiment of the crane overload safety device according to the invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The crane overload safety device which constitutes the present invention comprises a load pick-up 1 (FIG. 1), a reach pick-up 2 and a comparison circuit 3.

The load pick-up 1 comprises a means for sensing the load being hoisted and a converter 5 intended to change the mechanical movement of this load sensing means into electrical signals. In the embodiment under consideration the load sensing means is constructed in the form of a resilient ring 4. The converter 5 comprises a screen 6, which is mounted by means of a bracket 7 on the resilient ring 4, and cores 8 and 9 with two pairs of primary coils 10 and secondary coils 11 fitted therein, the cores having no common magnetic circuit. The converter 5 also comprises a sine-wave generator 12 (FIG. 2) and a detector 13. The primary coils 10 are inserted into the circuit of the sine-wave generator 12. The secondary coils 11 are wound differentially and connected to the detector 13. The electrical components of the converter 5 are mounted on a plate 14 FIG. 1 attached to the bracket 7.

The cores 8 and 9 are mounted on the resilient ring 4 by means a bracket 15 which is located diametrically opposite the bracket 7.

The primary coils 10 and the secondary coils 11 are positioned so that there is a gap between them for the screen 6 to freely move therein when a change in the load or reach takes place.

The resilient ring 4 flexes by the action of the load being measured and causes displacement of the screen 6 and the cores 8 and 9 with the coils 10 and 11. The resultant change in the relative positions of the screen 6 and the coils 10 and 11 causes alteration of the electrical signal generated by the load pick-up 1.

The reach pick-up 2 comprises a means for sensing the reach or operating radius of the crane and a converter 17 intended to change the mechanical movement of this reach sensing means into electrical signals. The reach sensing means is constructed in the form of a shaft 16. The converter 17 comprises a screen 18 mounted on the shaft 16, primary coils 20 fitted in cores 19 and secondary coils 21 fitted in cores (not seen in FIG. 1, being obstructed from view by the core 19). The converter 17 also comprises a sine-wave generator 12 and a detector 13 into the circuits of which are inserted the primary coils 20 and the secondary coils 21 in the same way as in the converter 5. The electrical components of the converter 17 are mounted on the plate 22 (FIG. 1).

The cores with the coils 20 and 21 (FIG. 2) are mounted on a common bracket 23 (FIG. 1) which is movably mounted on the shaft 16 and is arranged to be driven from the boom extension mechanism (not shown) through a drive constructed in the form of a worm 25 and a worm wheel 26. The worm wheel 26 is mounted on a shaft 27 which also carries a drum 28 connected by a cable 29 to a roller 30 engaged with the extendable part of a boom 24.

The screen 18 receives motion from the boom elevation mechanism (not shown) through a bracket 31, a worm 32 and a worm wheel 33, as the boom angle varies.

The load pick-up 1 and the reach pick-up 2 feed electrical signals to the comparison circuit 3 the output from which operates the crane overload warning device 34 which is essentially a warning horn, and crane actuating arrangements 35, which are essentially reverse contactor coils of the hoist and boom winches.

The circuitry of the crane overload safety device comprises the circuits of the converters 5 and 17 incorporated in the load pick-up 1 and reach pick-up 2 respectively and the comparison circuit 3.

The circuit of the load pick-up converter 5 comprises the sine-wave generator 12, the detector 13 and a matching emitter follower 36.

The sine-wave generator 12 comprises a transistor 37 the base bias circuit of which includes series-connected resistors 38 and 39 fed from the common power source. The current stabilization circuit of the transistor 37 consists of a resistor 40 inserted in the emitter circuit and a capacitor 41 connected in parallel with the resistor 40. The sine-wave generator 12 also comprises a capacitor 42 which, in conjunction with the primary coils 10, forms an oscillatory circuitry, a capacitor 43 connected in parallel with the resistor 39, and a capacitor 44 inserted in the circuit between the emitter and the collector, whereby the capacitor circuit of the sine-wave generator 12 is formed.

The detector 13 comprises capacitors 45 and 46 which, in conjunction with the secondary coils 11, form oscillatory circuits, diodes 47 and 48 connected in opposition to each other, capacitors 49 and 50 and resistors 51 and 52 connected in parallel with the capacitors 49 and 50 to act in conjunction therewith as filters.

The matching emitter follower 36 comprises a transistor 53 into the base circuit of which is inserted a resistor 54 connected to the resistor 51, a resistor 55 being inserted into the emitter circuit.

The circuit of the reach pick-up converter 17 is analogous to the circuit of the load pick-up converter 5.

The signals from the converters 5 and 17 are fed to the comparison circuit 3 comprising a comparison element 56, which is essentially a conventional semiconductor device, to the output of which is connected a voltmeter 57 to indicate the crane load. The output from the comparison element 56 is fed to an output relay 58. The comparison circuit 3 also comprises resistors 59, 60, 61 and 62 which are adapted to be selected by means of a multiposition switch 63 to preset the value of the signal sent out by the reach pick-up 2 (FIG. 1).

Another embodiment of the invention is possible wherein the load pick-up 1 and the reach pick-up 2 have a common screen.

With the overload safety device constructed according to this embodiment, the resilient ring 4 (FIG. 3), which serves as a load sensing means of the load pick-up 1, carries a bracket 64 which mounts a shaft 65 with a screen 66 attached thereto, the screen 66 being a common component of the load pick-up 1 and the reach pick-up 2. Another bracket 67 also attached to the ring 4 mounts the cores 8 and 9 with the coils 10 and 11 which are positioned so that there is a gap between them for the screen 66 to freely move therein.

In the embodiment under consideration, the reach sensing means of the reach pick-up 2 is constructed in the form of a weight 68 attached to the shaft 65 for the purpose of retaining the screen 66 in a vertical position. The cores 19 together with the primary coils 20 of the

pick-up 2 are also mounted on the bracket 67 (the secondary coils 21 and their cores, also mounted on the bracket 67, are obstructed from view on the drawing).

The flexure of the resilient ring 4 causes displacement of the screen 66 and the coil 10 and 11 of the load pick-up 1, the screen 66 moving into the gap in one pair of the coils and out of the gap in the other pair of the coils.

When the angular position of the boom 24 (FIG. 1) changes, the reach pick-up 2 turns relative to the constantly vertical screen 66. To nullify the influence of this change in the relative position of the pick-up 2, the ends of the screen 66 adjacent to the coils 10 and 11 are shaped to form part of a circle described about the axis of the shaft 65.

The displacement of the screen 66 by the flexure of the resilient ring 4 does not engender alteration of the signal sent out by the secondary coils 21 (FIG. 2) as the screen 6 equally moves into or out of the gap between the primary and secondary coils of the pick-up 2, whereas the rotation of the pick-ups 1 and 2 and the screen 66 relative to the shaft 65 results in the screen 66 moving into the gap in one pair of the coils of the reach pick-up 2 and out of the gap in the other pair of the coils.

The cater for telescopic-boom cranes wherein the reach or operating radius is varied by both luffing and telescoping the boom it may be desirable for the cores carrying the primary coils 20 (FIG. 4) and the secondary coils 21 (FIG. 2) of the reach pick-up 2 to be installed on a movable element constructed in the form of a common bracket 69 (FIG. 4) movably mounted on the ring 4 (FIG. 3) to provide for correlated movement of the cores along the plane of the screen 66.

In this case the position of the screen 66 relative to the coils 20 and 21 (FIG. 2) is determined by the total change of the boom reach. Alteration of the load being hoisted displaces the screen 66 (FIG. 4) linearly, variation of the beam angle causes the screen 66 to turn clockwise and variation of the boom length causes the screen 66 to turn counter-clockwise.

The electrical circuit of the second embodiment is analogous to that of the first embodiment described herein.

A further embodiment of the invention is possible wherein the load and reach pick-ups have a common screen and also common coils.

In this embodiment, the resilient ring 4, which serves as a load sensing means of a combined load and reach pick-up 83 (FIG. 5), carries a bracket 70 mounted on which is a common screen consisting of two parts 71 and 72. The bracket 7 attached to the ring 4 mounts cores 73 with common primary coils 74 (the cores with common secondary coils are not shown). The parts 71 and 72 of the screen are each mounted on curved guides 75 and 76 in such a manner that the center of rotation of parts 71 and 72 lies on the intersection of their working edges 77 and the line joining the centers of the cores 73. This excludes the mutual influence of rotation of the parts 71 and 72 and their rectilinear movement relative to the cores due to load variation.

In the embodiment concerned, the function of the reach sensing means is fulfilled by a conventional kinematic drive (not shown) through which variation of the boom reach is conveyed to the screen parts 71 and 72. Variation of the boom reach causes synchronous rotation of the screen parts 71 and 72. Variation of the load being hoisted causes linear motion of the screen parts.

The electrical circuit of this embodiment is substantially analogous to that described hereinbefore, except that the pick-ups 1 and 2 have a common converter 78 the output from which is fed to the comparison element 56 to be compared with a constant signal from a divider formed by variable resistors 79, 80, 81 and 82.

The crane overload safety device which constitutes this invention operates on the principle of comparing the measurement taken by the load pick-up with the value preset by the reach pick-up.

The device operates as follows:

When current is applied to the converters 5 (FIG. 1) and 17 of the load pick-up 1 and reach pick-up 2, the generator 12 (FIG. 2) produces oscillations the frequency of which is determined by the parameters of the circuit (the inductance of the primary coils 10 and 20 and the properties of the capacitor 42). These oscillations are transformed in the secondary coils 11 and 21. The value of the voltage in the secondary coils 11 and 21 is set by selecting the capacitance of the capacitors 45 and 46 which change the resonance properties of the secondary circuits. The alternating voltage in the secondary coils 11 and 21 is rectified by the diodes 47 and 48 and is smoothed by the filters formed of the capacitors 49 and 50 and the resistors 51 and 52. Thus, with equal voltages in the secondary coils 11 and 21, potentials equal with respect to the point "A," but of opposite sign, are built up at the points "B" and "C."These potentials are also equal when the screen 6, 18 is in the initial position between the primary coils 10, 20 and the secondary coils 11, 21, i.e. when the secondary coils 11, 21 are equally screened and their voltage is the same. When the screen 6, 18 is displaced, one of the secondary coils 11, 21 becomes screened more than the other. Accordingly, the voltage induced is lower in the former coil than in the latter one. The resultant change in the potentials at the points "B" and "C" gives rise to potential difference the sign of which is determined by the direction of movement of the screen 6, 18, i.e. by the voltage in each of the secondary coils 11, 21.

Inasmuch as the input signal in the load pick-up 1 (FIG. 1) and in the reach pick 2 varies only positively, the screen 6, 18 moves only in one direction from the initial position. Therefore, in the course of operation the sign of the potential difference between the points "B"and "C" remains unchanged, which makes it possible to employ the emitter follower 36 (FIG. 2) of simple layout. For the purpose the point "B" is connected through the resistor 54 to the base of the transistor 53 and the point "C" is connected to the positive feed busbar. The voltage across the resistor 55 varies with the potential difference between the points "B" and "C" and is fed to the comparison element 56.

The overload safety device is set to the various conditions of crane operation and duty by selecting the resistors 59, 60, 61 and 62 through the use of the switch 63.

The current flowing in the comparison element 56 varies with the load being hoisted and the boom reach at the given position of the switch 63. The voltage indicated by the voltmeter 57 represents the load being hoisted.

When there is no load or the load being hoisted is within the safe reach limit, the signal from the comparison element **56** will not initiate the operation of the output relay **58** which remains closed.

When the load being hoisted exceeds the safe reach limit, the comparison element **56** sends an overload signal to the relay **58** which switches on the warning horn and breaks the circuit of the crane actuating arrangements.

The two other embodiments of the overload safety device operate in the same way.

The crane overload safety device which constitutes the present invention features substantial advantages. Due to its versatility, it can be used on more than seventy types of cranes of various construction and provides up to sixteen working settings automatically governed by several parameters. The device also features simple construction and dependable operation along with precision and stability of the working characteristics due to the employment of countless converters.

What is claimed is:

1. An overload safety device designed for variable-reach cranes, said device comprising: a load pick-up; a reach pick-up; load sensing means incorporated in said load pick-up; reach sensing means incorporated in said reach pick-up; a converter incorporated in said load pick-up and adapted to change the mechanical movement of said load sensing means into electrical signals; a converter incorporated in said reach pick-up and adapted to change the mechanical movement of said reach sensing means into electrical signals; a load pick-up converter screen mounted on said load sensing means; load pick-up converter cores mounted on said load sensing means; primary and secondary coils fitted in said cores and positioned so that there is a gap formed therebetween for said screen to freely move therein when load change takes place; a sine-wave generator circuit in which said primary coils are inserted therein; a detector being connected to said secondary coils, said secondary coils being wound differentially; a comparison circuit the input of which is connected to the outputs of said load and reach pick-ups; an overload warning device connected to one of the outputs of said comparison circuit; and crane actuating arrangements connected to another output of said comparison circuit.

2. An overload safety device designed for variable-reach cranes, said device comprising; a load pick-up; a reach pick-up; load sensing means incorporated in said load pick-up; reach sensing means incorporated in said reach pickup; a converter incorporated in said load pick-up and adapted to change the mechanical movement of said load sensing means into electrical signals; a converter incorporated in said reach pick-up and adapted to change the mechanical movement of said reach sensing means into electrical signals; a reach pick-up converter screen mounted on said reach sensing means; reach pick-up converter cores mounted on said reach sensing means; primary and secondary coils fitted in said cores and positioned so that there is a gap formed therebetween for said screen to freely move therein when reach change takes place; a sine-wave generator circuit in which said primary coils are inserted therein; a detector being connected to said secondary coils, said secondary coils being wound differentially; a comparison circuit the input of which is connected to the outputs of said load and reach pick-ups; an overload warning device connected to one of the outputs of said comparison circuit; and crane actuating arrangements connected to another output of said comparison circuit.

3. An overload safety device as claimed in claim **2,** in which there is additionally provided a kinematic connection between said screen and a boom operating mechanism and a kinematic connection between said cores and another crane boom operating mechanism.

4. An overload safety device designed for variable-reach cranes, said device comprising: a load pick-up; a reach pick-up; a load sensing means incorporated in said load pick-up; reach sensing means incorporated in said reach pick-up; a converter incorporated in said load pick-up and adapted to change the mechanical movement of said load sensing means into electrical signals; a converter incorporated in said reach pick-up and adapted to change the mechanical movement of said reach sensing means into electrical signals; a load pick-up converter screen mounted on said load sensing means; a reach pick-up converter screen mounted on said reach sensing means; load pick-up converter cores mounted on said load sensing means; reach pick-up converter cores mounted on said reach sensing means; primary and secondary coils fitted in said load pick-up converter cores and positioned so that there is a gap formed therebetween for said load pick-up converter screen to freely move therein when load change takes place; a sine-wave generator circuit in which said primary coils fitted in said load pick-up converter cores are inserted therein; a detector being connected to said secondary coils fitted in said load pick-up converter cores, said secondary coils being wound differentially; primary and secondary coils fitted in said reach pick-up converter cores and positioned so that there is a gap formed therebetween for said reach pick-up converter screen to freely move therein when reach change takes place; a sine-wave generator circuit in which said primary coils fitted in said reach pick-up converter cores are inserted therein; a detector being connected to said secondary coils fitted in said reach pick-up converter cores, said secondary coils being wound differentially; a comparison circuit the input of which is connected to the outputs of said load and reach pick-ups; an overload warning device connected to one of the inputs of the comparison circuit; and crane actuating arrangements connected to another output of said comparison circuit.

5. An overload safety device as claimed in claim **4,** in which there is additionally provided a kinematic connection between said screen of said reach pick-up and a boom reach operating mechanism and a kinematic connection between said cores of said reach pick-up and another boom reach operating mechanism.

6. An overload safety device designed for variable-reach cranes, said device comprising: a load pickup; a reach pick-up; load sensing means incorporated in said load pick-up; a reach sensing means incorporated in said reach pick-up; a converter incorporated in said load pick-up and adapted to change the mechanical movement of said load sensing means into electrical signals; a converter incorporated in said reach pick-up and adapted to change the mechanical movement of said reach sensing means into electrical signals; a screen provided as a common component of said load pick-up converter and said reach pick-up converter

and being mounted on said load sensing means; load pick-up converter cores mounted on said load sensing means; reach pick-up converter cores also mounted on said load sensing means; primary and secondary coils fitted in said load pick-up converter cores and in said reach pick-up converter cores, said primary and secondary coils being positioned so that there is a gap formed therebetween for said screen to freely move therein when load and reach changes take place; a sine-wave generator circuit in which said primary coils fitted in said load pick-up converter cores are inserted therein; a detector being connected to said secondary coils fitted in said load pick-up converter cores, said secondary coils being wound differentially; a sine-wave generator circuit in which said primary coils fitted in said reach pick-up converter cores are inserted therein; a detector being wound differentially; a comparison circuit the input of which is connected to the outputs of said load and reach pick-ups; an overload warning device connected to one of the outputs of said comparison circuit; and crane actuating arrangements connected to another output of said comparison circuit.

7. An overload safety device as claimed in claim **6,** in which said converter of said reach pick-up is additionally provided with a movable element which mounts said cores of said reach pick-up and is kinematically connected to said load sensing means, said movable element providing for correlated movement of said cores along the plane of said screen.

8. An overload safety device as claimed in claim **6,** in which there is additionally provided a kinematic connection between said screen and a boom reach operating mechanism and a kinematic connection between said cores of said reach pick-up and another boom reach operating mechanism.

* * * * *