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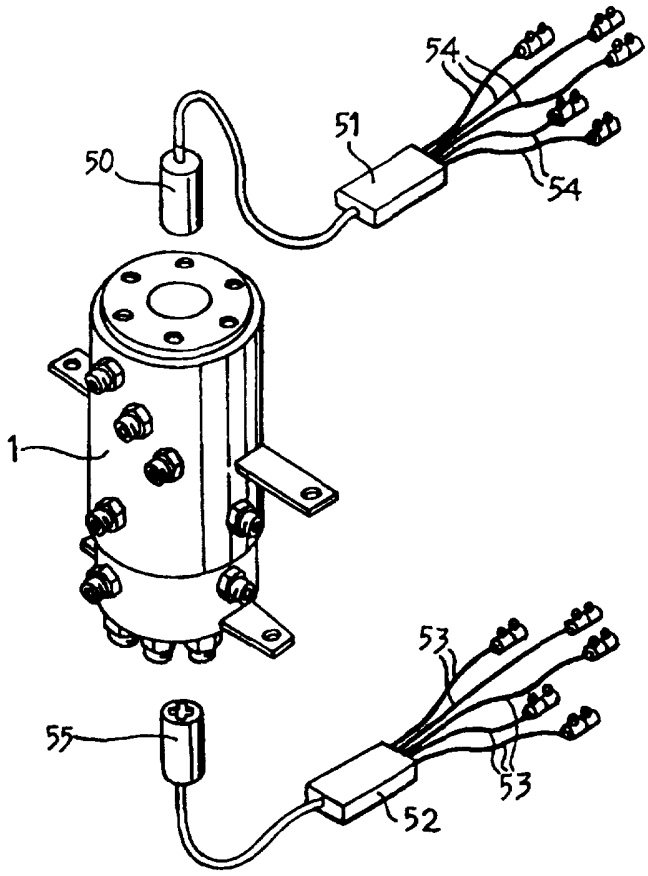
(54) Title: A ROTARY ELECTRIC COUPLING FOR MACHINES HAVING A ROTATABLE TURRET

(57) Abstract

A rotating electrical coupling for machines comprising a fixed part and a rotatable part comprises two electronic cards (51, 52) for modulation, demodulation and management of these signals, of which one is fixed to the fixed part and the other is rotatable with the movable part. Two cards (51, 52) communicate between one another by means of an optical signal beam so as to be uninfluenced by the relative angle between the fixed part and the rotatable part.



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A ROTARY ELECTRIC COUPLING FOR MACHINES HAVING A ROTATABLE TURRET

The subject of the present invention is a rotary electric coupling for machines comprising a fixed part and a rotatable part.

Such machines may be, for example, a crane or an excavator having a turret rotatable with respect to the frame.

In such machines there is a need for transferring driving power and control signals from one part to the other.

A known arrangement provides for the transmission of driving power by means of fluid under pressure (for example oil) and the transmission of control signals and information signals electrically.

The transfer of driving fluid is typically achieved with a rotary coupling having superimposed annular passages of pressure channels which communicate with the normal channels belonging respectively to the fixed part and to the rotating part.

It is typical in such known fluid pressure rotary couplings to have an axial hole of the smallest possible dimensions through which the conductors pass for

electrical signals to or from the electrical rotating coupling. The problem is evidently more complex the greater the number of conductors which must be taken into consideration in order to be able to manage all the operations and the data which must be exchanged between the fixed part and the movable part of the machine.

A typical configuration of electrical rotating couplings utilised up to now is that in which the electrical signals are made to pass through a system of superimposed rings made of conductive material, which are in sliding contact with the movable part via brushes. Obviously each conductive ring must be insulated from the structures and the other rings by the interposition of spacers of insulating material.

A known rotating coupling of this type is illustrated in Figure 1 of the attached drawings, in which the reference numeral 1 generally indicates a rotating coupling for pressurised fluid in which there is mounted, in a generally coaxial manner, the rotating coupling for electrical signals which comprises conductive rings 2 alternating with insulating rings 3. The conductors 7 of one part, for example the rotating part, lead directly to the brushes 4 which are carried by brush carriers 6 and slide on the conductive rings 2 from which extend the conductors 8 destined for the fixed part, for example by passing through a central hole of the pressurised fluid

coupling 1. Other known forms of electrical coupling provide for concentric rather than superimposed rings.

The present invention proposes to resolve the above-indicated problems and has for its subject a rotary electrical coupling for machines comprising a fixed part and a rotatable part the characteristic of which forms the subject of Claim 1.

The invention will now be described with reference to the attached drawings, in which:

Figure 1 is an exploded perspective view of a prior art coupling;

Figure 2 is a view similar to that of Figure 1 of a coupling according to the present invention; and

Figure 3 is an electrical diagram of one of the electronic cards illustrated in Figure 2.

In the example of Figure 2 the reference numeral 1 generally indicates a pressurised fluid rotary coupling and the reference numeral 54 generally indicates the conductors leading for example from the rotating part of the machine. The conductors 54 are conveyed to an electronic card 51 which processes the signal on each conductor according to the direction of action (for example to or from the fixed part) and the nature of the signal (analogue, on-off, digital) and multiplexes all these signals into a single complex signal which is sent

to a receiver/transmitter 50 which transforms these electrical signals into optical signals by means of transmitting photodiodes and receiving phototransistors. The light beam passes through the central hole in the fluid pressure coupling 1 and communicates all the data to a receiver/transmitter 55 situated, for example, on the fixed part of the device. The receiver/transmitter 55 communicates all the signals exchanged through a single cable to a card 52, similar to, and complementary to the function of the card 51, and the card 52 decodes them and sends them to the different utilisers via the conductors 53.

In the diagram of Figure 3, relating to one of the electronic cards 51 or 52, the rotatable optoelectronic coupling is indicated 1, two buffer amplifiers are indicated 12, 13, the reference numeral M indicates a microprocessor, a multiplexer for ON-OFF inputs is indicated 14, A/D convertors for analogue inputs are indicated 15, and buffers for digital inputs are indicated 16.

Transistor outputs for analogue signals are indicated 17, relay outputs for ON-OFF signals are indicated 18 and buffers for digital outputs are indicated 19.

Obviously the function is bidirectional which means that what has been described above can be thought of as

flowing from the card 52 towards the card 51, that is to say going from the fixed part for example to the rotary part of the device.

Given the small distance to cover, typically less than a metre, the optoelectronic transmitters and receivers can both be of very limited size and modest power. Moreover, the light beam communication system also makes it possible to exploit parts of the central hole of the fluid coupling 1 for other purposes such as, for example, for the passage of one or more conductors for electrical current, even of considerable power. This arrangement would be incompatible with the known arrangements because of the large cross-section of the conductor which would be difficult to organise in the small central hole of the coupling 1, already occupied by the multitude of small conductors intended to convey electrical control and command signals, and the conditions which the large conductor itself would impose in designing an adequate sliding contact.

Another significant advantage arises from the possibility of organising small receiver/transmitters directly within the hole of the fluid coupling 1, thus eliminating the bulk due to the rotating coupling for the electrical signals.

The use of the invention with a light beam immersed in a

transparent medium such as oil or air for the transmission of power also permits the redesign of the rotary fluid coupling 1 in such a way as to utilise the central hole for the contemporaneous passage of electrical signals and as one of the fluid channels, thus contributing to the reduction of the size of the coupling itself.

CLAIMS

1. A rotary electrical coupling for machines comprising a fixed part and a rotatable part, characterised in that it comprises two electronic cards (51, 52) for modulation, demodulation and management of the signals, of which one is fixed to the fixed part of the machine and the other is rotatable with the rotating part of the machine, the said two cards communicating between one another by means of an optical signal beam such as not to be influenced by the relative angle between the fixed part and the rotatable part of the machine.

2. An electrical coupling according to Claim 1, characterised in that the optical signal beam passes through a central hole of a coupling (1) for the transmission of power by means of a fluid under pressure.

3. An electrical coupling according to Claims 1 and 2, characterised in that it is coupled to a rotary coupling for pressurised fluid intended for the transmission of power between the fixed part and the rotatable part, and in that the conductors (54) from one of the parts, for example the rotating part, are lead to a first electronic card (51) which processes the signal of each conductor and multiplexes these signals into a single signal which is sent to a receiver/transmitter (50) which transforms these signals into an optical signal beam by transmitting

photodiode and receiving phototransistor means; the said signal beam traversing a central hole of the fluid pressure coupling (1) and communicating all the data to a receiver/transmitter (55) situated for example on the fixed part of the machine, and which through a single cable communicates with a second electronic card (52) which decodes these signals and sends them to corresponding utilisers via conductors (53).

4. An electric coupling according to Claim 3, characterised in that the receiver/transmitters (50, 55) are located directly in the interior of the rotating fluid pressure coupling (1).

FIG. 2

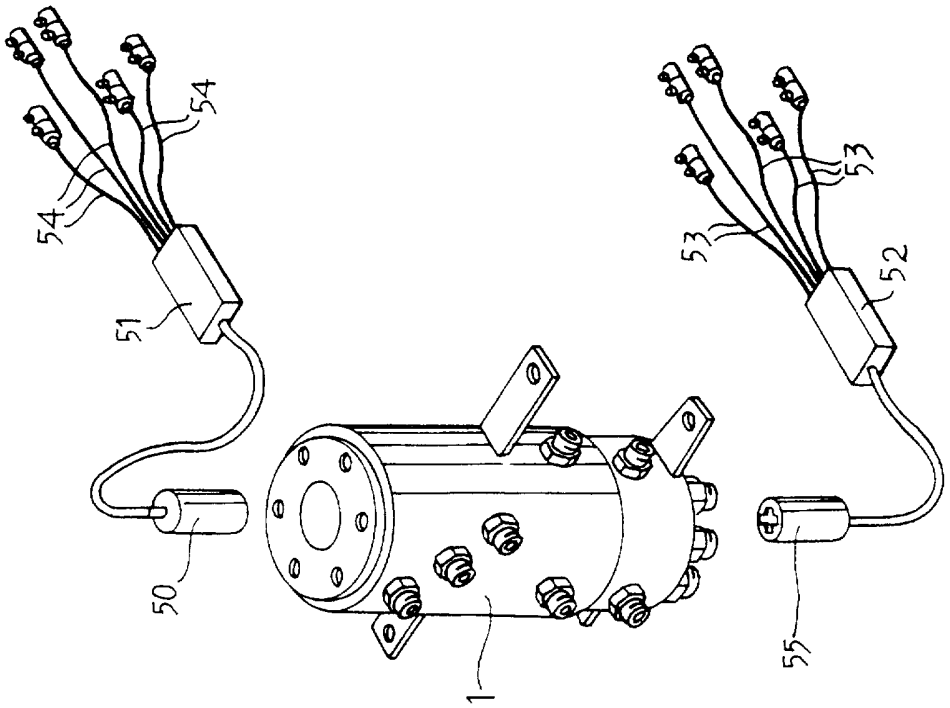
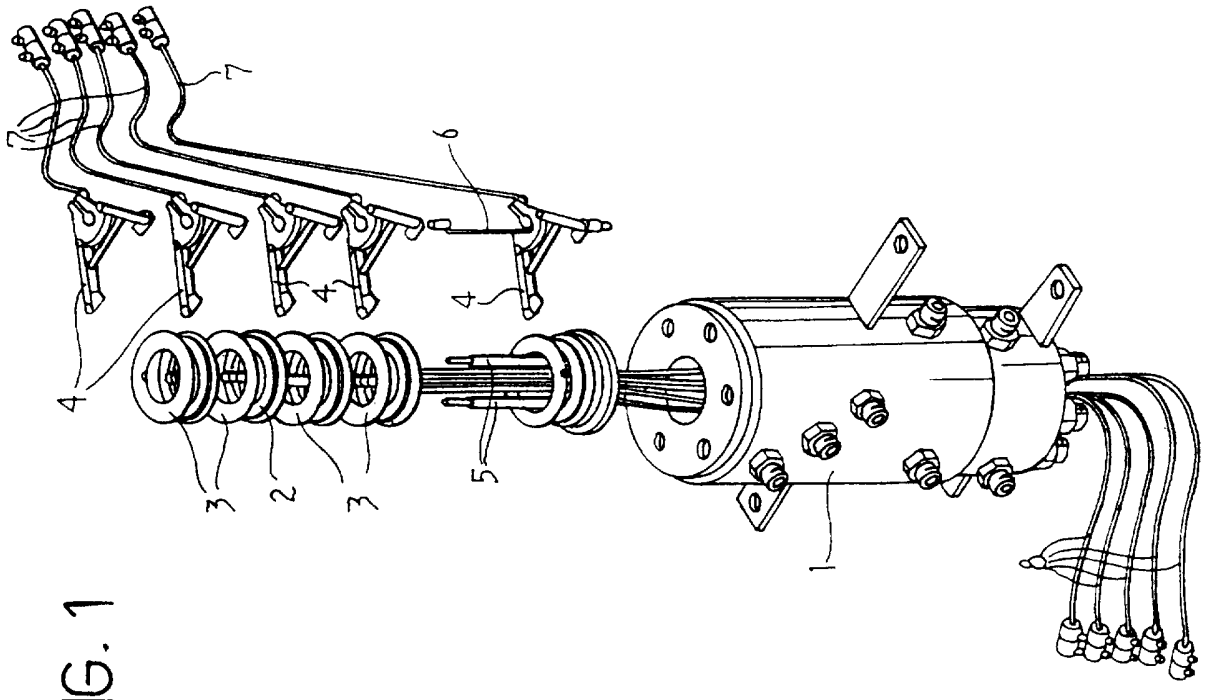


FIG. 1



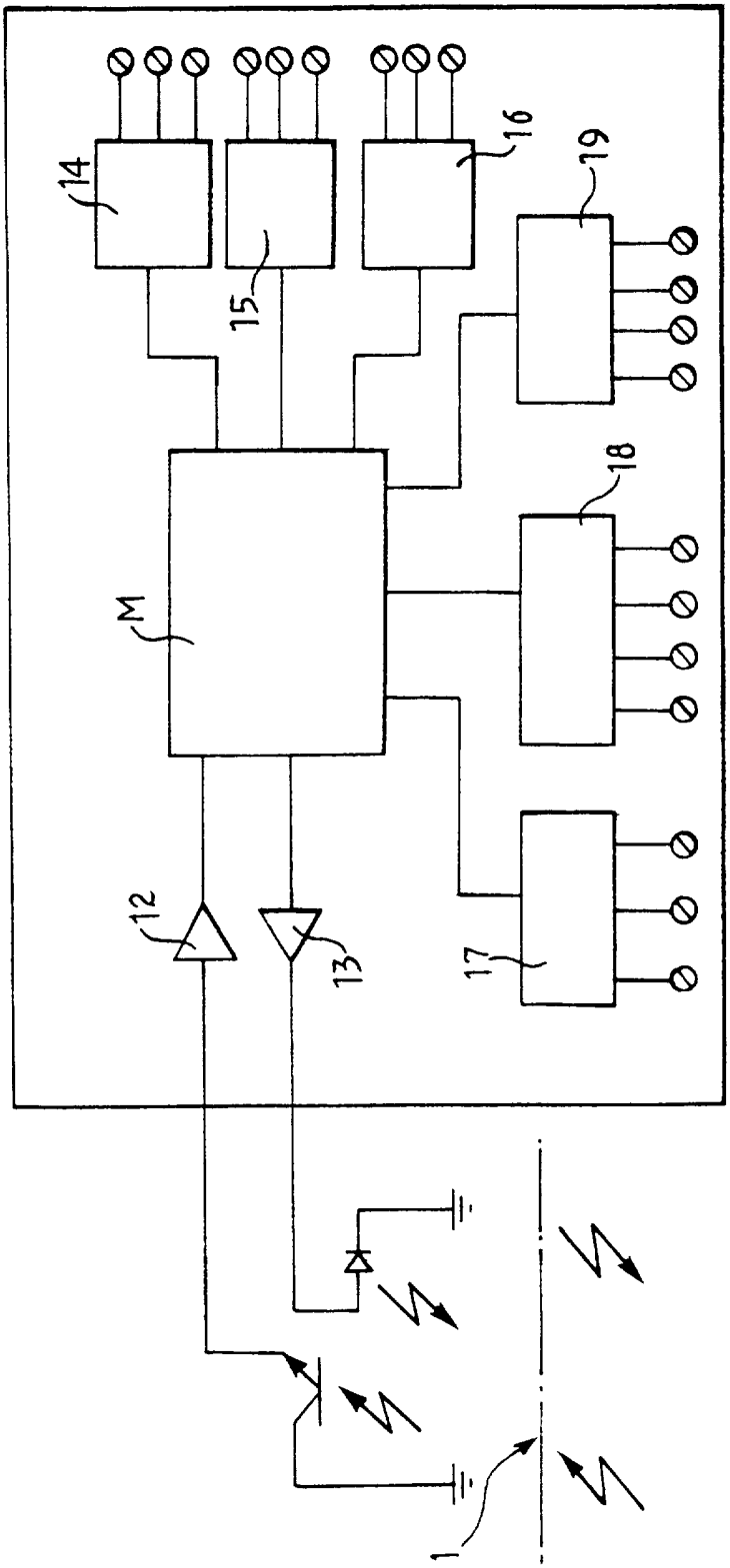


FIG. 3