Modular push-button controller for a crane.

A modular push button controller (1) for a crane, consisting of a push button unit (2) and at least one module (41...44) attached to it with a detachable joint (27) and transmitting or sending a control signal (6, 11, 14, 17) to the crane. The detachable joint (27) permits each one of the modules to be separately attached to and detached from the same push button unit (2). The modules transmitting or sending a control signal are provided with plug-and-socket connectors (9), each one of which is compatible with the corresponding connector in the push button unit (2).

The signal sent to the crane by the modules is a parallel signal (6), a serial signal (11), a radio signal (14) or an IR light signal (17) and the module may contain a signal converter (8) between itself and the push button unit (2).

Fig. 1
The present invention relates to a push-button controller for a crane and to a crane control apparatus connected to it via a signal link.

Crane controllers are traditionally built as units fitted to suit a particular crane. This means that the controllers for e.g. three cranes using identical machineries but different control methods are each fitted individually to match the crane machineries. Thus the control signals of a normal contactor-controlled crane are taken directly from the crane controller's push buttons via a cable to the control apparatus of the crane.

If a crane of the same type is equipped e.g. with a radio control system, the controller is traditionally manufactured as a complete set with push buttons and radio transmitter integrated in a common controller box.

If a crane of the same type is equipped with an infrared control system, the push buttons and infrared transmitter are traditionally integrated with the box as single unit.

Corresponding integration is also employed in the equipment used for the handling of the signals in the crane itself. For example, the receiver for radio control is integrated with the parallel interface from which the signals are taken in parallel form to the crane drives.

A drawback in known technology is the difficulty of changing the control method. Another notable drawback of known technology is the difficulty of achieving a uniform appearance and image of the controller because the whole controller with all its equipment is handled at the same time. Achieving a uniform appearance and image of the controller is of course possible, but it is expensive.

The object of the present invention is to eliminate some of the drawbacks of previously known technology and to achieve a crane control method that permits easier and cheaper transition to a different control method, which can be utilized e.g. in the renovation of cranes.

The invention is characterized by what is said in the characterization part of claim 1.

The invention has the following advantages. The push button unit is always the same regardless of the control method, allowing a uniform appearance and image of the controllers to be maintained irrespective of the control method.

The control method of a crane is easy to change when the circumstances change, e.g. from cable control to wireless control.

Some parts of the push button controller, e.g. the push button unit 2, can be manufactured in larger quantities, which means that e.g. the cost of the required plastic moulding tools per controller is lower and therefore the whole push button controller becomes cheaper.

The requirement of customers and the safety regulations of many countries that there should be an alternate control method for radio control can be fulfilled more easily than using controllers previously known in the art.

In the following, the invention is described in detail in the light of an embodiment by referring to Fig. 1, which presents a modular push button controller system as provided by the invention.

Fig. 1 shows a push button controller 1 connected via a signal link to the electric system 26 of the crane and consisting of a push button unit 2 and at least one module 41, 42, 43, 44 which is in immediate contact with it and which transmits the control signals to the electric system of the crane and, if necessary, also processes them. The modules can be attached with a detachable joint 27 to the same push button unit 2. The detachable joint 27 connects the module and the push button controller together without a large clearance and the joint can be secured with a self-locking mechanism. Between the push button unit 2 and the module there is a detachable electric connection 9 for the control signals. A 'detachable electric connection' means an electric connection permitting easy disconnection, preferably implemented as a plug-and-socket connector. The detachable electric connectors of all modules 41...44 are compatible with the corresponding connectors in the push button unit 2. The detachable joint 27 between the modules 41...44 and the push button unit 2 can be provided with a sealing 28 to protect it against environmental effects. The control buttons 3 of the push button unit 2 are typically push buttons, control switches and signal lamps. Correspondingly, the reception of control signals in the electric system of the crane is also implemented using modules 18, 20, 21, 23 corresponding to the control method, and the modules for different control methods can be easily changed in the electric system 26 of the crane by normal operational measures.

Inserted into the push button unit 2 is a module 41 for a parallel communication cable 5. The control signals 6 issued from the control buttons 3 are transmitted via the detachable electric connection 9 to the module 41 and further through the cable 5 to the crane. In the crane the cable 5 is connected to a signal-transmitting cable module 18 for parallel communication which transmits the control signals 6 via another detachable electric connection 91 to the crane drives 25 in the control apparatus 26 of the crane. This second detachable electric connection is also preferably implemented as a plug-and-socket connector and it can be protected with a sealing if necessary.

When the control method is to be changed into one based on serial communication, a serial com-
munication module 42 is connected to the push button unit 2. The serial communication module consists of a first signal converter 8, in this case a parallel/serial converter 8, and a serial communication cable 7. The control commands issued from the control buttons 3 are transmitted via the detachable electric connection 9 to the serial/parallel converter and further as a parallel signal 11 via a cable 10 to a serial communication cable module 20 in the crane. From this module, the control commands are transmitted to another signal converter 19 (serial/parallel converter) and further via a second detachable electric connection 91 in serial form to the crane drives 25 in the control apparatus 26.

When the control method is to be changed into radio control, a radio control module 43 is connected to the push button unit 2. The radio control module 43 consists of a first signal converter 8 (parallel/serial converter) and a radio transmitter 12 with an aerial 13. The control commands issued from the control buttons 3 are transmitted via the detachable electric connection 9 to the parallel/serial converter and further in serial form to the radio transmitter module 12 and as a wireless signal from its aerial 13 to a radio receiver 21 on the crane, via the receiving aerial 22. The control commands are converted into parallel form by a second signal converter 19 (serial/parallel communication module) and passed in parallel form via a second detachable electric connection 91 to the crane drives 25 in the control apparatus 26 of the crane.

When the control method is changed to IR control (infrared transmitter/receiver), the push button unit 2 is provided with an infrared control module 44. The infrared control module 44 consists of a first signal converter 8 (parallel/serial converter) and an IR transmitter 15. The control commands issued from the control buttons 3 are transmitted via the detachable electric connection 9 to the parallel/serial converter and further in serial form to the IR transmitter 15. From here, the control commands are transmitted as an IR signal 17 via a light source 16 to an IR receiver 23 on the crane, the receiver being provided with one or more IR detectors 24. The control commands are then converted into parallel form by a second signal converter 19 (serial/parallel communication module) and passed in parallel form via a second detachable electric connection 91 to the crane drives 25 in the control apparatus 26 of the crane.

The signal converter 8 contained in modules 42...44 can also be constructed as a separate module which is connected via a detachable electric connection, e.g. plug-and-socket connectors, to the serial communication cable component 7, radio transmitter 12 or IR transmitter 15 which transmits the signal to the crane. No parallel/serial converter is needed for the parallel communication cable module 41 because the signals received from the control buttons 3 are already in parallel form, but module 41 is still provided with a detachable electric connection 9 (e.g. plug-and-socket connectors) compatible with the detachable electric connection (plug-and-socket connectors) of modules 42...44.

The modules 41...44 and the push button unit 2 are preferably provided with a casing of a totally enclosed type. The casing material is preferably plastic, the sealings being advantageously flexible.

Items of equipment such as supporting ropes, holds and the like which may be needed in the controllers are not presented because they are outside the scope of the invention.

A modular implementation as described above is also employed in the crane control apparatus 26 in the crane itself. Push button controllers 1 with their modules 41...44 employing different control methods can be connected separately to the control apparatus 26 of the crane via compatible detachable connections. Similarly, the signal converters 19 can be connected to their receivers 20, 22, and 23 via a detachable electric connection such as a plug-and-socket connection.

Claims

1. Push button controller (1) for a crane and a crane control apparatus (26) connected to it via a signal link, characterized in that the push button controller (1) consists of a push button unit (2) and at least one module (41, 42, 43, 44) attached to it with a detachable joint (27) and transmitting or sending a control signal (6, 11, 14, 17) to the crane.

2. Push button controller (1) according to claim 1, characterized in that each one of the modules (41, 42, 43, 44) transmitting or sending a control signal can be separately attached to and detached from the same push button unit (2) by means of a detachable joint (27).

3. Push button controller (1) according to claim 1 or 2, characterized in that the detachable joint (27) between the push button unit (2) and the module (41, 42, 43, 44) transmitting or sending a control signal is provided with a detachable electric connection (9), preferably a plug-and-socket connection, and that any one of said modules (41, 42, 43, 44) transmitting or sending a control signal can be alternatively connected to the push button unit (2).

4. Push button controller (1) according to claim 2 or 3, characterized in that the detachable...
5. Push button controller (1) according to any one of claims 1...4, **characterized** in that the module (41, 42, 43, 44) transmitting or sending a control signal sends to the crane a parallel signal (6), a serial signal (11), a radio signal (14) or an IR light signal (17).

6. Push button controller (1) according to any one of claims 1...5, **characterized** in that the module (41, 42, 43, 44) transmitting or sending a control signal contains a signal converter (8), such as a parallel/serial converter, between itself and the push button unit (2).

7. Push button controller (1) according to claim 6, **characterized** in that the signal converter (8) is a separate unit between the push button unit (2) and the module (42...44) transmitting or sending a control signal and that said signal converter (8) is provided with a detachable electric connection (9) both on the side of the push button unit (2) and on the side of the module (42...44) transmitting or sending a control signal.

8. Crane control apparatus (26) receiving the control signal transmitted or sent by a push button controller (1) according to any one of claims 1...7, **characterized** in that the control apparatus (26) comprises a module (18, 20, 21, 23) transmitting or receiving the control signal (6, 11, 14, 17), said module being connected to the control apparatus (26) of the crane either directly or via a signal converter (19).

9. Crane control apparatus (26) according to claim 8, **characterized** in that the connection between the module (18, 20, 21, 23) transmitting or receiving the control signal and the crane control apparatus (26) is implemented using a second detachable electric connection (91), e.g. a plug-and-socket connection, and that these detachable electric connections (91) are of a uniform design such that any one of said modules (18, 20, 21, 23) transmitting or receiving the control signal can be alternatively connected to the second detachable electric connection (91) in the control apparatus (26) of the crane.
European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 94 11 8617

DOCUMENTS CONSIDERED TO BE RELEVANT

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<thead>
<tr>
<th>Category</th>
<th>Citation of document with indication, where appropriate, of relevant passages</th>
<th>Relevant to claim</th>
<th>CLASSIFICATION OF THE APPLICATION (Int.Cl.)</th>
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<tbody>
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<td>X</td>
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TECHNICAL FIELDS SEARCHED (Int.Cl.6)

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The present search report has been drawn up for all claims

Place of search | Date of completion of the search | Examiner
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