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Focus on IFA's work

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Use of a modified joystick for the avoidance of crushing accidents on elevating work platforms

Problem

The number of occupational accidents occurring during work involving elevating work platforms has been conspicuously high for many years. Particularly notable are accidents in which operators become crushed between parts of their working environment and the control panel of the elevating work platform, sometimes with fatal results.

Activities

In response to an initiative by the German Social Accident Insurance Institution for the woodworking and metalworking industries and the materials handling and storage technology BG expert committee, a concept for supplementary safeguarding was developed at the IFA and implemented by which occupational accidents of this kind can be avoided or their effects reduced.

For this purpose, a safety function in the form of an emergency stop was added to the joystick used to control the movements of elevating work platforms. The objective was to modify the joystick in such a way that full deflection of the joystick lever triggered an emergency stop (see Fig. 1). Stopping the movement can be triggered deliberately by movement of the control actuator into the mid-position or by full deflection of it.

Full deflection can also be caused by a reflex action (such as unintended actuation in the wrong direction of movement) or by crushing of the operator onto the control actuator, thereby also bringing about the safe state.

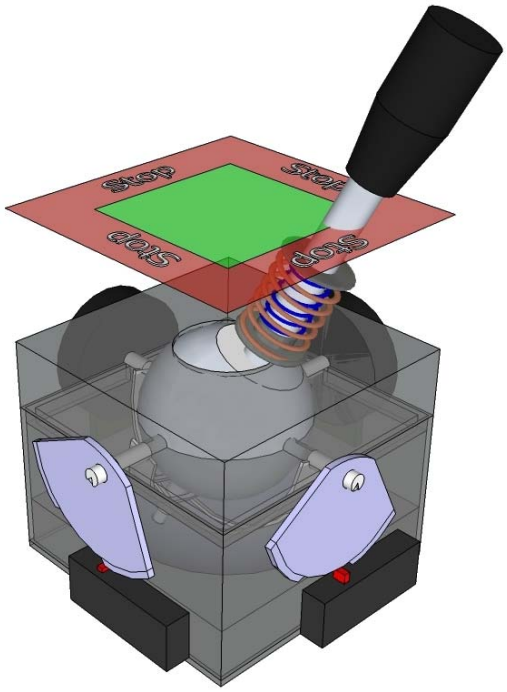

Figure 1: Modified joystick (green: normal operating range; red: range with emergency-stop function)

Even though crushing of the operator may not be completely avoidable in some circumstances, the severity of injury can at least be substantially reduced.

Different designs of joystick were first examined in order to determine the options for implementation. The following aspects had to be considered at this point:

- In order for high acceptance to be attained, the "normal" operating range (deflection of the joystick for control of the elevating work platform) is to be constrained (reduced) as little as possible.

- The emergency-stop functionality is to be triggered only by exertion of a force substantially higher than that for normal actuation (refer to the rise in actuating force shown in Figure 2). This is necessary in order to prevent an emergency stop from being triggered inadvertently.

- The emergency-stop safety function should be suitable for integration into the emergency-stop circuit of the elevating work platform without major expense.

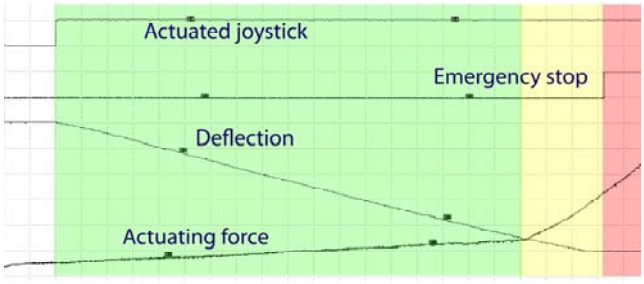

Figure 2: Record of measurements for a modified joystick. The figure shows the characteristics of the actuating force, the emergency-stop signal, and an actuation signal as a function of the deflection (green: normal operating range; yellow: range in which elevated force must be applied; red: range with emergency-stop function).

The mode of operation of the modified joystick resembles that of a three-position enabling switch on a machine tool, which halts movement when in the "panic" position.

Results and Application

Standard joysticks have now been modified and the force-distance behaviour studied in laboratory tests. Further joysticks are currently being converted in conjunction with the manufacturers of elevating work platforms, and their usability tested in the field.

Area of Application

Manufacturers, hirers and operators of elevating work platforms, test bodies, prevention departments of the German Social Accident Insurance Institutions

Expert Assistance

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