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Push-buttons with Material Classification based on Spectral Signatures

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ABSTRACT

In this paper, we introduce an optical sensor system, which is integrated into an industrial push-button. The sensor allows to classify the type of material that is in contact with the button when pressed into different material categories on the basis of the material's so called "spectral signature". An approach for a safety sensor system at circular table saws on the same base has been introduced previously on SIAS-2007 /5/. This contactless working sensor is able to distinguish reliably between skin, textiles, leather and various other kinds of materials. A typical application for this intelligent push-button is the use at possibly dangerous machines, whose operating instructions include either the prohibition or the obligation to wear gloves during the work at the machine. An example of machines at which no gloves are allowed are pillar drilling machines, because of the risk of getting caught in the drill chuck and being turned in by the machine. In many cases this causes very serious hand injuries. Depending on the application needs, the sensor system integrated into the push-button can be configured flexibly by software to prevent the operator from accidentally starting a machine with - or without gloves, which can decrease the risk of severe accidents significantly. Another benefit of material-classifying push-buttons is a higher protection against tampering of safety equipment. Especially two-hand controls are incentive to manipulation for easier handling /3/. By equipping both push-buttons of a two-hand control with material classification properties, the user is forced to operate the controls with his bare fingers. That limitation disallows the manipulation of a two-hand control by a simple rodding device.