DEVICE CHECKING AND MONITORING THE FAILURE OF ROLLERS OF A SLOT FURNACE

L. S. Zil'bert, I. M. Sakhartov, and V. N. Smirnova

UDC 666.3.041

The VIASM has worked out a contrivance for the slot furnaces of the Sverdlovsk Ceramics Factory, that checks and monitors the failure of elements of the roller conveyor. Laboratory tests of the device have shown that it operates reliably.

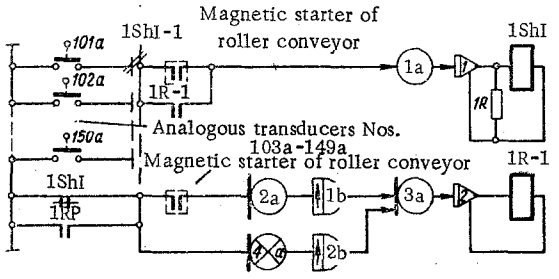

Fig. 1

The rollers are checked by special electromechanical transducers that are mounted to each roller at its nondriven end. The transducer has a contact group of a stationary and a movable contact.

An ShI-50/4 step-by-step selector checks on whether the contact group of the transducer opens and closes periodically.

The control system is made up of contactless ÉLM and VUM logical elements manufactured by the Kalinin Electrical Instruments Factory. Magnetic logical elements

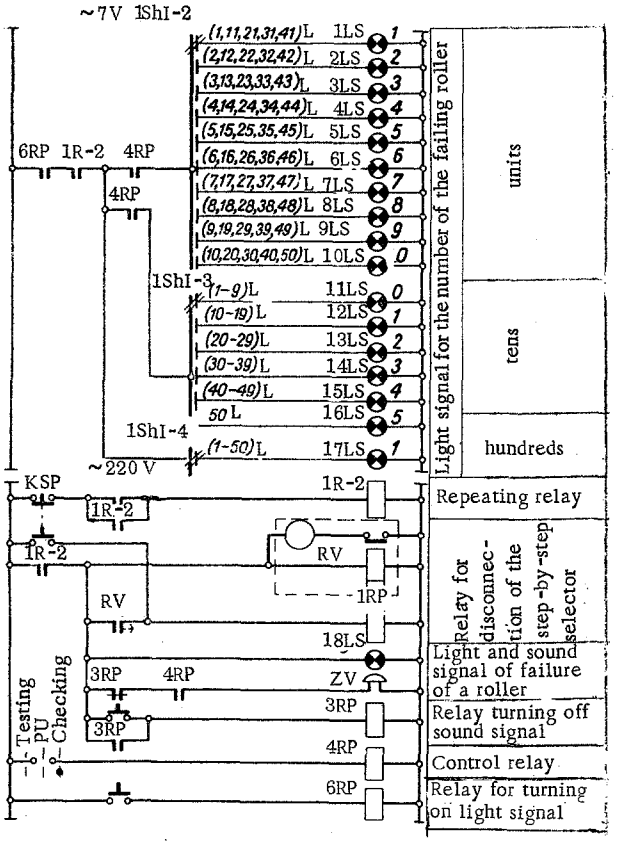

Fig. 2

All-Union Scientific Research Institute for the Planning and Design of Automatic Units for the Building Materials Industry (VIASM). Translated from Steklo i Keramika, No. 5, pp. 35-36, May, 1968.

are more reliable, need no servicing, and have a practically indefinite lifetime. The logical elements carry out operations that result in output signals of "Yes" or "No" (ouput voltage or no output voltage).

PP-21Msb.9 optical cells project the number of the failing roller upon a screen. One optical cell can give the figures 0 through 9 to the screen. A combination of N optical cells makes it possible to obtain any N-place numeral on the screen. For longer life of the tubes in the cells they are turned on by merely pressing a button.

Let us consider how the checking and failure monitoring system works.

The system can be used for checking any number of rollers. They are divided into groups of 50 pieces each, according to the number of transducers that can be connected to the contact plates of the ShI-50/4 step-by-step selector.

As an example, Fig. 1 shows a control system for 50 rollers with numbers from 101 to 150, and Fig. 2 shows the system of failure indication.

When the roller conveyor is in operation, the contact of its magnetic starter PM is closed. As the rollers turn, the contacts of the transducers will periodically open and close. The relay 1R-1 of the failure indication will in this case not be put into action since the delay time for closing at the ÉLM-51-type logical elements (positions 1b, 2b) is greater than the normal closing (opening) time of a transducer contact. When a roller fails, its contact can remain in either of the two positions: long closed or long open. Supposing that the failure of a roller leaves the transducer contact in an open position (position 101a), the electromagnet of the step-by-step selector 1ShI will be without current and, hence, its contact will close.

When there is a signal at the input of the logical element 4a, there will be no signal at its output. The relay 1R-1 will be excited with a delay from the logical element 1b in the sequence: closed contact of 1ShI, contact of magnetic starter PM, logical elements 2a, 1b, 3a, magnetic amplifier 2.

The closing of the otherwise open contact of the 1R-1 relay puts the repeating relay 1R-2 into action which locks-up itself. The otherwise open contact of the relay 1R-2 turns on the light (18LS) and the sound (ZV) signals of failure. At the same time, the otherwise closed contact of the relay 1R-2 in the control circuit of the roller conveyor motor shuts off the electromotor and all mechanisms connected with it. The contact PM opens. To find out the number of the failing roller and to turn off the sound signal, the attendant presses the button 2KSS.

In this way, those lamps of the optical cell (1-17LS) which correspond to the number of the failing roller are supplied with current through the contact plates of the step-by-step selector 1ShI-2, 1ShI-3, 1ShI-4, and a brush. After the number has been noted, the indicator is turned off by pressing the button KSP.

When the contact of the roller transducer remains closed, the system works in the following way.

The electromagnet of the step-by-step selector 1ShI is in this case under current, its contact is open, and the relay of the failure indication is excited in the following sequence: logical element of the "No" position 4a, logical elements 2b, 3a, magnetic amplifier 2. The other operations of the monitoring system are similar to the ones described above for the case when the contact remains open.

As the electromagnet of the step-by-step selector is not designed to be loaded for any length of time, the system provides its shut-off with a delay of 15-20 min. The time relay RV serves for this purpose. With a delay after its contact has closed, it excites the relay 1RP. The contact of the relay 1RP closes and gives a signal to the input of the logical element 4a; hence, there will be no signal at its output. The relay 1R-1 shuts off and, with its otherwise open contact, shuts off the electromagnet of the step-by-step selector. The light and sound signals remain in this case. However, the chance of failure of a roller with the transducer contacts closed is, owing to its particular construction, not more than 20% of the possible number of failures.

This device for checking and monitoring the failure of rollers eases the work of the attendants considerably, shortens the standstill time of the furnace, and reduces the quantity of rejected material.