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VISION SYSTEM TEST BENCH

STANOWISKO BADAWCZE SYSTEMU WIZYJNEGO

Summary: *The present paper is the third part in our consideration of the following issue: attempts to compare the work of the detection sensor with the ZFV vision system in the packaging labelling project.*

Keywords: *labeller, detection sensor, ZFV vision system, packaging*

Streszczenie: *Artykuł jest trzecią częścią w naszym rozpatrywaniu zagadnienia jakim jest próba porównania pracy czujnika detekcji z systemem wizyjnym ZFV w procesie etykietowania opakowań.*

Słowa kluczowe: *Etykieciarka, czujnik detekcji, system wizyjny ZFV, opakowania*

To perform the studies, the measuring test bench was completed on the grounds of ROTO labeller, designed by RMPAK company; it was modified for the research purposes. Its scheme is found in Fig. 1. The mentioned equipment was assembled as a whole at the territory of the company. It is constructed from the commercial elements, coming from contractors as well as being performed independently. RMPAK company deals with designing and construction of production lines for the needs of individual customer. In the period of striving at continuous improvements and seeking for optimal solutions, the mentioned company is interested in stating in what situation the vision camera should be installed and in what conditions the photoelectric sensor should be employed. It is also important to decide whether a type of the used label has the influence on the performance of the labelling line. In the tests, the following equipment was used ROTO labeller with the following elements:

- labelling head
- turntable
- separator
- transporter
- LCD screen

Their construction and the principle of operation are given below.

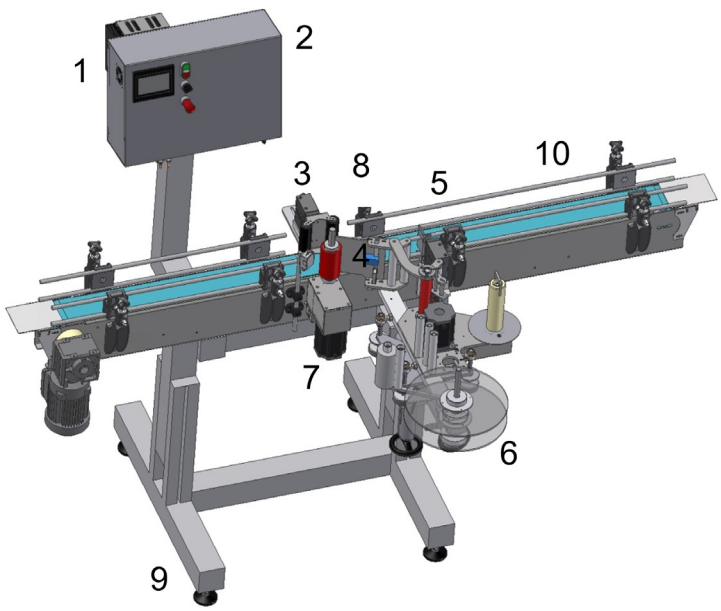

Fig. 1. ROTO labeller

The labeller has a stable foundation 9 with the possibility of regulating the height in order to adjust to the existing packing line. On the framework, transporter 10 with the adjustable rate of moving is assembled. The indicated set allows transport of packaging, one after another. The packaging is separated from the remaining ones using set of separators 5, and then it is transported to the site where the sensor of product 8 starts the sequence of labelling. Then, the pressure rollers 3 keep the packaging on turntable 7 which facilitates labelling of round packaging all around owing to introduction of rotary movement. The sensor of label 4 transmits the signal of readiness to labelling head 6. In the control cabinet 2 there is a control panel owing to which it is possible, in a simple way, to change the parameters of work of the equipment.

Before commencing the labelling of the products, it is necessary to adjust the successive sub-units to a specified product using regulations and to make appropriate adjustments in control panel. The next

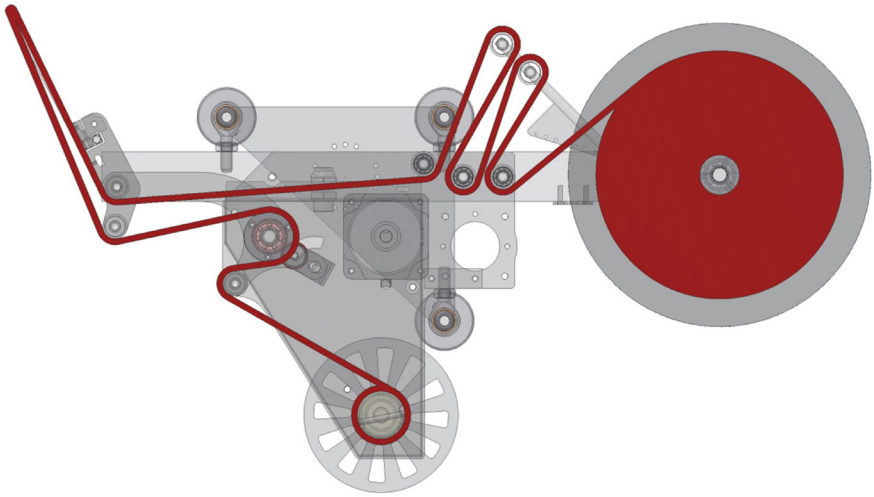

Fig. 2. Sticker as an instruction for the correct winding of the label tape

Photo 1. Sensor mounted on the articulated arm

Photo 2. Camera mounted on the articulated arm

stage includes verification whether the tape (ribbon) of the device is stretched and performance of the eventual regulation. The degree of the tape's tension is especially significant for the work of the equipment at higher speed. The correct application of the labelling tape has the effect on the efficient operation of the head; therefore, the instruction in a form of sticker is placed on the discussed set, what is illustrated in Fig. 2.

To conduct the tests, the measuring bench has been prepared; the materials for the tests have been collected, as well.

Within the frames of the conducted tests, the systems of camera and of photoelectric sensor were assembled on articulated Magic Arm. A special system of mounting for labeller was also performed and employed; it is illustrated in photos 1 and 2.

The mentioned arm enabled the stable positioning of the equipment in the required working space of the transporter. It assured the elimination of errors connected with the undesired vibrations of the sensors.

Photo 3. Camera setting panel assembled with adjustable mount

Photo 4. Switch box

Photo 5. Labeller ready to perform the tests

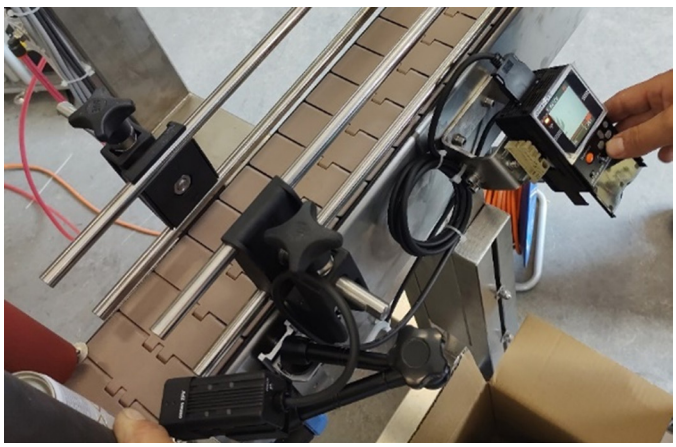

Photo 6. Calibration of the camera in the image from the label

Photo 7. A comparative set of labels prepared for measurements

After completion of the particular components, the total labeller was mounted; it is given in Photo 5. For the purposes of the discussed tests, the control panel was performed (Photo 4) facilitating the non-invasive change from the vision system to photoelectric system. It abbreviated significantly the time of retooling the machine for the successive tests.

In the final stage of preparations, camera should be calibrated and its control panel should be programmed what is illustrated in Photo 6.

For the tests, different types of labels were employed; their examples are given in Photo 7.

The following above labels, with the specified features were taken into consideration:

- label 1 – big, regular, on paper substratum,
- label 2 – small, regular, on paper substratum,
- label 3 – small, low and long, on paper substratum,
- label 4 – medium, 3D print, on foil substratum,
- label 5 – medium, transparent, on film substrate,
- label 6 – big, irregular shape, on paper substratum.

The application of labellers is justified when we have to deal with production above 10 000 pcs. Due to the mentioned reasons, a series consisting of 100 pcs of packaging was used in comparative studies; they were appropriately labelled. Then, the correctness of packaging labelling was checked and the calculations were carried out. On the grounds of the calculations, the diagrams concerning quality of labelling were plotted in percentage values. It enabled drawing the conclusions. When changing the adjustments of working parameters of the transporter and labelling head, we may obtain different speed of labelling, according to a type of packaging and size of the label. Therefore, a different speed of transporter work was employed during the measurements in order to check whether the rate had the influence on the correctness of labelling the packaging.

The labels used in the tests are shown in photos 8–13.

Photo 8. Label no. 1

Label 1 has big dimensions and regular shape as its height is similar (in value0 to its width. It is employed on packaging made from plastics, e.g. 2-litre container destined for liquid for cleaning the floor. It is die-cut on paper substratum, it contains flat print with a distinct contrast of colours and also, with characteristic images.

Photo 9. Label no. 2

The successive label, marked with number 2 is small and has a rectangular shape. It is mainly employed on small glass packaging, such as varnish for nails. It is wound on paper substratum, without characteristic images; it has a distinct black band. The print on the label is flat.

Photo 10. Label no. 3

Label no. 1 is characterized by a great disproportion between a small height and a significant length and is printed with a flat print. It is coloured in soft shades; it contains, however, a black rectangle and some pictures. It has a paper substratum and is employed on metal packaging such as, for example, tins for preserved food products.

Photo 11. Label no. 4

Label marked with number 4 has rounded corners; its upper edge has also a shape of arc. It is produced with the application of 3D overprint technology. Its graphic layout is abundantly decorated and multicoloured. The substrate is made from foil because it is mainly applied on plastic or glass bottles intended for beverages.

Photo 12. Label no. 5

Label no. 5 is transparent, so it is diaphanous and is also employed on foil substratum. Its medium dimensions are quite similar each other, in two-colour shades. It is applied on packaging made from plastics or paper, intended for the products with a lowered temperature and containing e.g. ice-cream.

Photo 13. Label no. 6

Label marked with number 6 has irregular shape and is big. It is applied on big plastic packaging with oval cross-section such as e.g. container for liquid intended for cloth rinsing. It is multicoloured, with few characteristic symbols. The substratum is made from paper.

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