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PERFECTION OF METHODS OF DETERMINATION OF TYPE OF DEFECT AT THE ULTRASONIC CONTROL OF ELEMENTS OF ROLLING STOCK OF RAILWAYS

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S u m m a r y. In the article a method allowing to promote authenticity of methods of determination of type of defect at diagnosing of elements of carriage part of rolling stock of railways by an ultrasonic impulsive echo-method is developed.

K e y w o r d s : rolling stock of railways, acoustic methods of nondestructive control, ultrasonic control, ultrasonic fault detector, piezoelectric transformer, ultrasonic impulsive echo-method.

INTRODUCTION

In the last decades speed-up development of industry is accompanied by the steady rise of intensity of exploitation of railway transport. The increase of intensity of vehicular process intensifies the problem of providing of safety of motion on the ferrous road. On safety of motion the state of rail way, clear work of the system of automation, signaling and communications, has influence, quality of rolling stock (RS) carrying out a vehicular process.

One of the most responsible systems RS, from which safety of motion on the ferrous road depends above all things, there is carriage part. The indexes of quality of elements of the carriage part RS are mortgaged at planning, will be realized at making and show up in exploitation. For providing of quality of elements of the carriage part RS at making the complex of measures of the technical diagnosing is conducted.

In the complex of measures of the technical diagnosing the great number of control operations is included, including ultrasonic nondestructive control of elements of the carriage part RS on absence of internal defects [2-19].

OBJECTS AND PROBLEMS

For the rise of authenticity and informing of results of ultrasonic control with the purpose of receipt of more than complete information about the diagnostic signs of describing the technical state of object of diagnosing new methods of receipt of information about parameters are developed discovered as a result of ultrasonic control defects.

In work [20] by an author the method of determination of type (by a volume or flat) of found out the ultrasonic control of elements of carriage part of the RS railways of defect as a result is developed. A method is based on measuring of peak description of echo-signal from a defect on two frequencies – a 2,5 and 5,0 Mega Cycle per a second, determination of coefficient, presenting from itself a difference between peak descriptions of echo-signals on two frequencies and comparison of this coefficient with the scope values expected on got in work analytical dependences for a flat and by a volume defect.

In work [1] by authors by an experimental-analytical way the method of determination of angle of slope of flat defect to the surface of input of ultrasonic wave and computation of coefficient of adjustment of sensitiveness of ultrasonic apparatus for the rise of authenticity of ultrasonic control of elements of carriage part of the RS railways was developed, with the purpose of non-

admission in exploitation of elements of carriage part with defects. A method is based on measuring of peak description of echo-signal from a defect at the use of direct piezoelectric transformer and sloping transformer of longitudinal waves with the corner of input 18^0 and further computation on the analytical dependences got in work, angle of slope of defect and coefficient of adjustment of sensitiveness of ultrasonic apparatus.

Conducts the analysis of the higher presented works it is possible to come to conclusion, that criteria, on which a point by a volume defect is determined can walk up to the point flat defect inclined to the surface of input of ultrasonic wave.

Development of method of determination is the purpose of the given work, whether there is the defect discovered as a result of ultrasonic control by an echo-method in the element of the carriage part RS by a volume or flat, located parallel to the surface of input of ultrasonic wave, or flat, inclined to the surface of input of ultrasonic wave.

RESULTS OF EXPERIMENTAL RESEARCH

A method consisting of the following is offered:

- at the discovery by the direct transformer of echo-signal from a point defect in the controlled good, the search of maximum of peak description of echo-signal from this defect at the use of the combined transformer P131-2,5-0i18-VO-04 (fig. 1) of included on 18^0 is carried out (fig. 2-4, position of the *I* transformer);
- by a next stage the search of maximum of peak description of echo-signal from a defect at the location of the transformer P131-2,5-0i18-VO-04 opposite primary position is carried out (fig. 2-4, position of the *II* transformer);
- in the case when peak description of echo-signal from a defect in position of the *I* and *II* transformer are approximately identical (fig. 2, 3), a defect is either by a volume, or flat, located parallel to the surface of input of ultrasonic wave. Determination of type of defect is carried out by a method offered in work [20] with the use of the software product NDTRT-3;
- in the case when peak description of echo-signal from a defect in position of the *I* and *II* transformer echo-signals are different are located on a different depth (fig. 4), a defect is flat and is located under a corner to the surface of input of ultrasonic wave. The angle of slope of defect and coefficients of adjustment of sensitiveness of ultrasonic apparatus are determined by a method offered in work [1] with the use of the software product NDTRT-2.

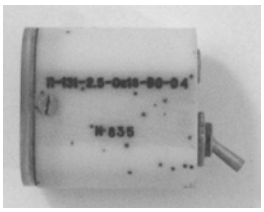

Fig. 1. Combined transformer P131-2,5-0i18-VO-04

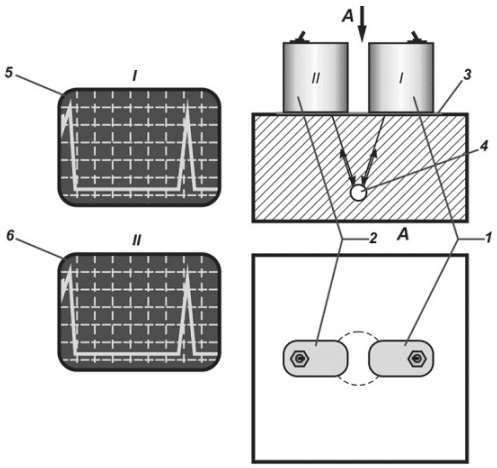

Fig. 2. Layout chart of transformer and types of echo-signal of reflected from a by a volume defect: 1 – location of transformer in the position *I*; 2 – location of transformer in the position *II*; 3 – contact liquid; 4 – model of defect; 5 – type of echo-signal from a defect at position of the transformer *I*; 6 – type of echo-signal from a defect at position of the transformer *II*

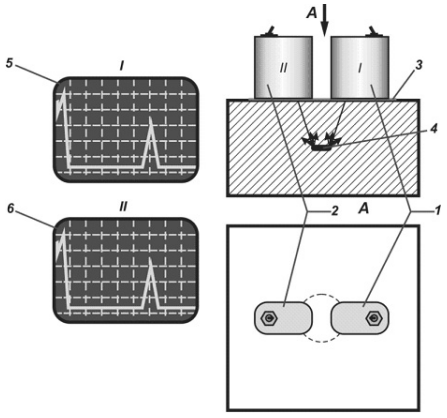

Fig. 3. Layout chart of transformer and types of echo-signal of reflected from the flat defect located parallel to the surface of input of ultrasonic wave

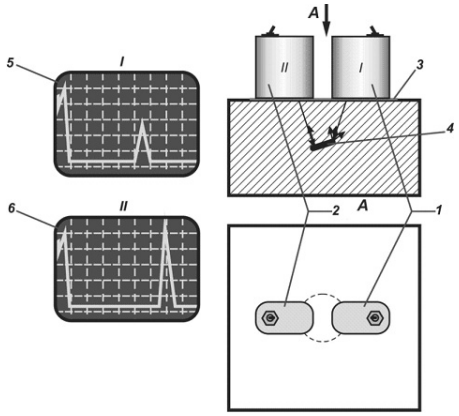

Fig. 4. Layout chart of transformer and types of echo-signal of reflected from the flat defect of located under a corner to the surface of input of ultrasonic wave

CONCLUSIONS

The analysis of methods of determination of type of defect at diagnosing of elements of carriage part of the RS railways showed an ultrasonic echo-method, that at determination of type of found out the ultrasonic control of defect as a result criteria on which a by a volume defect is determined can walk up to the flat defect located under a corner to the surface of input of ultrasonic wave.

The method of determination was developed in this connection, whether there is the defect discovered as a result of ultrasonic control by an echo-method in the element of the carriage part RS by a volume or flat, located parallel to the surface of input of ultrasonic wave, or flat, inclined to the surface of input of ultrasonic wave.

The developed method is inculcated in PJSC «Luganskteplovoz» in the process of diagnosing of elements of carriage part of hauling by the RS ultrasonic impulsive echo-method.

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СОВЕРШЕНСТВОВАНИЕ МЕТОДОВ ОПРЕДЕЛЕНИЯ ТИПА ДЕФЕКТА ПРИ УЛЬТРАЗВУКОВОМ КОНТРОЛЕ ЭЛЕМЕНТОВ ПОДВИЖНОГО СОСТАВА ЖЕЛЕЗНЫХ ДОРОГ

Андрей Киреев, Ирина Кириченко

Аннотация. В статье разработан метод, позволяющий повысить достоверность методов определения типа дефекта при диагностировании элементов экипажной части подвижного состава железных дорог ультразвуковым импульсным эхо-методом

Ключевые слова: подвижной состав железных дорог; акустический метод неразрушающего контроля; ультразвуковой контроль; ультразвуковой дефектоскоп; пьезоэлектрический преобразователь; ультразвуковой импульсный эхо-метод.