

телевизионной аппаратуры. Министерство радиопромышленности.

7. 1954 г.: Телевизионный обзор железнодорожных станций. Станции Лосиноостровская и Люблино Московской железной дороги.

8. 1954 г., июль: Проверка возможности считывания номеров вагонов поездов на ст. Сортировочная Октябрьской железной дороги (под Ленинградом). ЛИИЖТ им. В. Н. Образцова.

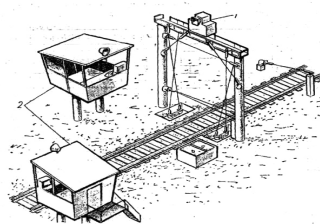
9. 1959 г.: Эксплуатация железнодорожной телевизионной установки ЖТУ-3 для обзора путей. Ст. Лосиноостровская, Московской железной дороги, ЦНИИ, КБ ЦШ МПС.

10. 1973–1975 гг.: Разработка и использование способа считывания номеров вагонов и локомотивов поездов, идущих на скоростях более 15 км/ч. Михайлов В. В., Косилов Р. А. ВЗИИТ.

11. 2006 г.: Испытания образца системы видеоконтроля обстановки на железнодорожном переезде из кабины машиниста локомотива. Косилов Р. А., сотрудники ООО «НТЦ Трансвидео», Октябрьская железная дорога.

12. 2010 г., июнь: Испытания ТВ системы передачи сигналов изображений на ст. Брянск-Орловский Московской железной дороги. Михайлов В. В. (МИИТ), сотрудники ст. Брянск-Орловский.

13. 2010 г., июль: Испытания ТВ системы передачи сигналов изображений в вагонном



**Рис. 2. Совмещённая телевизионная система считывания номеров и коммерческого осмотра вагонов поезда.**

**Pic. 2. Combined television system of reading of numbers and commercial inspection of cars.**

депо ст. Смоленск Московской железной дороги. Михайлов В. В. (МИИТ), сотрудники ст. Смоленск.

## ЛИТЕРАТУРА

1. Киногазета. — 1936. — № 6.
2. Косилов Р. А., Михайлов В. В. Устройство контроля проследования поезда. Авторское свидетельство на изобретение № 424754 от 24.12.1973 г.
3. Косилов Р. А., Михайлов В. В. Устройство для считывания информации с транспортного средства. Авторское свидетельство на изобретение № 477878 М. Кл. В61 1 25/02 БИ № 27 от 28.03.1975 г.
4. Косилов Р. А. и другие. Авторское свидетельство № 753705 М. Кл. В61 25/02 БИ № 29 от 07.08.80.
5. Косилов Р. А., Михайлов В. В. Применение телевидения на железнодорожном транспорте. // Сборник научных трудов. Вып. 64. — М.: ВЗИИТ, 1973. — С. 21–25.
6. Михайлов В. В. и др. Средства отображения информации коллективного пользования: Монография. Регистрационное свидетельство № 20701 от 11 ноября 2010 г.
7. Косилов Р. А., Богачёв А. П. и др. Радиотелевизионная система предотвращения наезд. // Локомотив. — М.: — 2008. № 10 (622), С. 29.

## TELEVISION SETS ON RAILWAYS

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### ABSTRACT

With the development of television broadcasting, an industry branch of a new electronic information industry was created. Railways were among the first industries that began to use the opportunities of black-and-white television (monochromatic) in image signals transmission systems of objects to control the functioning and transport safety and security. The article provides an overview of scientific and technological achievements in this field and chronological dates associated with them.

### ENGLISH SUMMARY

#### Historical review.

Application of image signals transmission systems on railways began in the mid 30-ies of the last century. The country's first experimental television set at the Belarusian railway station in Moscow became a system for scanning of station tracks and platforms [1], equipped with simple technology. In 1937 the construction of two electronic television centers: Leningrad (with image decomposition on 240 lines and transmission at 25 fps) and Moscow

(with transmission of 343 lines for the same number of frames) was completed.

World War II interrupted the development of television. Only after its end, after almost four years, television broadcasting has received a new life, more sophisticated technology and also a standard of image definition at 625 lines have appeared.

In July 1954, at the station Sortirovochnaya near Leningrad was conducted a test of technical capability to read numbers of cars on a moving train and watch sorting yards and areas of the station, using the means of television.

Later television on railways developed mainly in the direction of development of devices for scanning of sorting yards and areas of stations. In 1959 began production of ZHTU-3 (railway television set, version 3). Since the mid-1970s for various industrial purposes industrial television sets (ITS) are applied [3].

There are three main groups of ITS on railways: visual, semi-automatic, automatic.

Visual television sets are used to monitor and control the processes in sorting yards, platforms, crossings, equipping and container areas. To monitor remote objects, television cameras with long lenses are used.



These facilities include also television devices of passenger service. [6] They are attachments of television broadcasting at stations and in trains.

Semi-automatic television devices and systems have been used to solve two problems: image registration of tail car with delivery of the frame to the station operator (control of moving train integrity) and recording the image signals of numbers of cars on the recorder with subsequent rendition for a wheel report.

Television control of delivery of tail car signals in conjunction with the existing lines of communication between train stations serves as the basis for automating the process of controlling the movement of trains in areas with semi-automatic blocking and enhanced security.

Controlling the camera, optics and turning device is remote-acting. Diaphragm control is automatic. But ZHTU-3 failed to implement reading the numbers of cars and locomotives at speeds of over 15 km/h, although certain improvement measures were carried out since 1954.

The solution was found in the 1970s, when videotape records of image signals of numbers from fast moving trains began to play back and examine, slowing the tape down to low speeds (Pic. 1). The novelty of this method is confirmed by two inventor's certificates [2, 3].

The scheme, shown on Pic. 1., operates as follows. In the yard neck are located: system of projectors 11, illuminating a train, and transmitting camera 1, aimed at cars perpendicular to the direction of motion. The image signal from the camera is directed to the industrial television set (ITS) 2, located in one of the surrounding buildings. The video signal from the ITS output is transmitted by cable to the freight office building, where it is videotaped 4. Entire system is in standby mode and is set in motion with automatic switching unit 8 as a result of response of floor unit 10 from the staples of oncoming train through the scheme of signaling control system 9.

After the passage of the train projectors turn off and the video recorder stops, transmitting camera and ITS again switch to standby mode. When the record is done, freight office agent rewinds the tape of video recorder and starts it at a low speed. The agent can carry out a stop-frame (stop an

image), and then again continue viewing. While watching a video, the agent writes numbers of cars and locomotives.

Image signals transmission systems are used for commercial inspection of the train (Pic. 2, where 1, 3 – transmitting TV cameras, 2 – stations of commercial inspection of cars) using television sets. This system was confirmed by inventor's certificate [4].

It should be noted that to read the numbers of cars and for security purposes, black-and-white TV is used, having a higher resolution capability than color.

Chronology:

1. 1936: Testing of experimental television set at the Belarusian railway station in Moscow to monitor railway tracks and platforms.

2. 1937: The construction of television centers is completed. Moscow, Leningrad.

3. 1938: Opening of the regular broadcast television programs in the country.

4. 1948: Experimental television scanning of rail slides, tracks of sorting yards.

5. 1949: Start of TV broadcasting with standard of image decomposition in 625 lines. Moscow television laboratory, television center.

6. 1951: Foundation of Moscow television equipment factory. Ministry of Radio Industry.

7. 1954: Television scanning of railway stations. Losinoostrovskaya and Lublino stations of Moscow railway.

8. 1954, July: Test of capability to read the numbers of cars at Sortirovochnaya station, Oktyabrskaya Railway (near Leningrad).

9. 1959: Operation of the railway television set ZHTU-3 for overview of rail tracks at Losinoostrovskaya station.

10. 1973–1975.: Development and use of a method of reading numbers of cars and locomotives of trains moving at speeds of over 15 km/h.

11. 2006: Tests of a sample video control system at a railway crossing from the driver's cabin of the locomotive.

12. 2010, June: A Tests of TV image signals transmission systems at Bryansk -Orlovsky station.

13. 2010, July: Tests of TV image signals transmission systems in the train depot at Smolensk station.

**Keywords:** railway, history, television apparatus, reading of moving trains numbers, chronology.

## REFERENCES

1. Kinogazeta, 1936, № 6.
2. Kosilov R. A., Mikhailov V. V. Control device of trains movement. Inventor's certificate № 424754 of 24.12.1973 [*Ustroystvo kontrolya prosledovaniya poezda. Avtorskoe svidetel'stvo na izobretenie № 424754 ot 24.12.1973 g.*].
3. Kosilov R. A., Mikhailov V. V. Device for reading information from a vehicle. Inventor's certificate № 477878M. Kl. V61 I 25/02 BI № 27 of 28.03.1975 [*Ustroystvo dlya schityvaniya informatsii s transportnogo sredstva. Avtorskoe svidetel'stvo na izobretenie № 477878M. Kl. V61 I 25/02 BI № 27 of 28.03.1975g.*].
4. Kosilov R. A. and others. Inventor's certificate № 753705M. Kl. V61 25/02 BI № 29 of 07. 08. 80

[*Avtorskoe svidetel'stvo № 753705M. Kl. V61 25/02 BI № 29 ot 07. 08. 80*].

5. Kosilov R. A., Mikhailov V. V. Use of television on railways [*Primenenie televideniya na zheleznodorozhnom transporte*]. Sbornik nauchnyh trudov. Issue. 64. Moscow, VZIT, 1973, pp. 21–25.

6. Mikhailov V. V. and others. Means of information display for collective use [*Sredstva otobrazheniya informatsii kollektivnogo pol'zovaniya*], Monograph, Registration certificate № 20701 of 11th November 2010.

7. Kosilov R. A., Bogachev A. P. and others. Radio-television system will prevent run-over [*Radiotelevizionnaya sistema predotvratit naезд*]. *Lokomotiv*, Moscow, 2008, № 10 (622), p.29.

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