

FIRST ANTENNAS FOR RELAY STATIONS

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Abstract

In December, 2014, it was 115 years from the date Emile Guarini Foresio invented directed antennas for a radio relay repeater. This paper gives the brief history of antennas for relay stations.

Key words: Emile Guarini Foresio; directed antennas, relay repeater.

1. INTRODUCTION

The History of Radio Relay Communication began in 1898 from the publication by Johann Matthes in Austrian Journal *Zeitschrift für Electrotechnik* (v. 16, 35 - 36) [1]. But his proposal was primitive and not suitable for use.

The first relay system, which really functioned, was that invented in 1899 by Emile Guarini-Foresio (Fig. 1).

The brief history of radio relay systems and their antennas is presented below.

2. THEORY

Inventor Emilio Guarini-Foresio was born on October, 4th 1879 in the Italian commune of Fazano located in region Apulia, in a province of Brindisi.

It is remarkable that 2014 became anniversary for E. Guarini-Foresio as well: in October, 2014, 135 years went from his birth.

On the 27th of May, 1899 Belgian student E. Guarini-Foresio has submitted an application for patent of invention to the Belgian patent department, first having described a device of the radio relay repeater [2]. The patent confirms the E. Guarini priority and allows considering this date as the official birthday of radio relay communication.

A feature of the Guarini-Foresio invention consisted in a combination of receiving and transmitting devices in one repeater implementing signal receiving, demodulation in the coherer, and formation, by means of the relay, of the updated signals, reradiated through an undirected antenna. For electromagnetic compatibility, a receiving segment of the repeater was surrounded by a filter intended to protect the receiving circuit from powerful radiation of the transmitter.

Use of the undirected antenna, which did not allow effectively using the transmitter power, was an obvious limitation of E. Guarini-Foresio's automatic repeaters presented in his first publications [2, 3].

In December 1899, Guarini-Foresio patented in Switzerland (patent № 21413 [4]) designs of directional reflector-type antennas (Fig. 2), and also of spiral antennas of axial radiation, represented in the form of metal conductor stacked as a spiral in grooves of a metal reflector (Fig. 3). The requirements of such antennas were caused by the necessity to avoid message interceptions beyond a transmission line. Next updates of this idea were patented by E. Guarini-Foresio in [5].

Continuing improving the idea of automatic repeater, Guarini-Foresio jointly with Fernando Pontsele in 1901 carried out a series of experiments on an establishment of radio relay communication between Bruxelles and Antwerp [6]. The repeater was installed in Malines being the intermediate railway station between Bruxelles to Antwerp. Constructions with cylindrical antennas of 50cm in diameter were mounted on high architectural buildings (Fig. 4, 5).

Leaning from the got experience, in June, 1901 Guarini-Foresio began preparing to realization of experimental radio relay communication between Bruxelles and Paris at the distance of 275 km. It was planned to place repeaters on distances about 27 km from each other [6].

In December, 1901, Guarini-Foresio achieved the objective he had planned, successfully having carried out a communication session on the specified line of relaying between the capitals of Belgium and France, with the general time delay in delivering messages of



Fig. 1. Emile Guarini-Foresio (1879 - 1953)

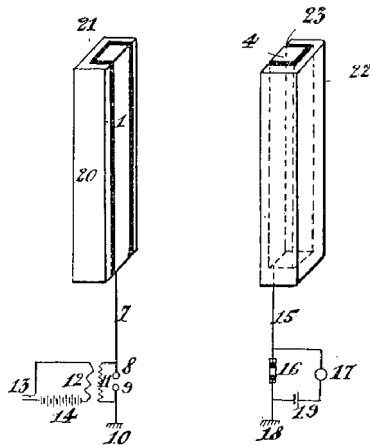


Fig. 2. Directional reflector antennas [4].

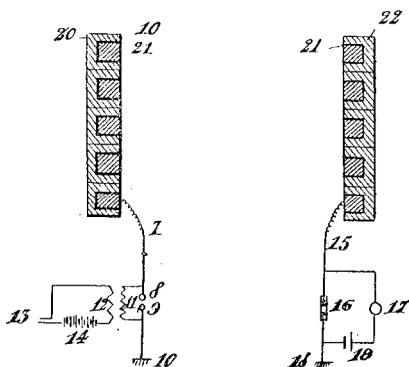


Fig. 3. The spiral aerials of axial radiation [4].

several seconds.

Considering that the repeaters opened new horizons for wireless cable communications, eliminating a problem of distances, Guarini-Foresio was extraoptimistic as for the cloudless future of the inventions. Because of the increase in the range of radio stations at the expense of the increase in capacity of generators of radiation, and also due to the further development of antenna and reception systems, demand for repeaters had essentially decreased. And only in the 1930-s, after the invention of electronic lamps and development of high-frequency ranges, the idea of radio relay communication became called-for again.

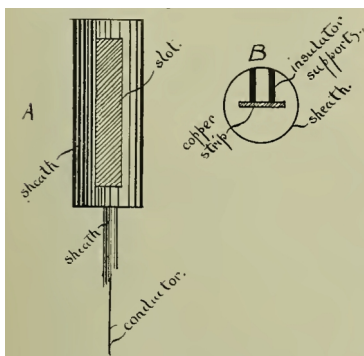


Fig. 4. The directed antenna of slot type [7]

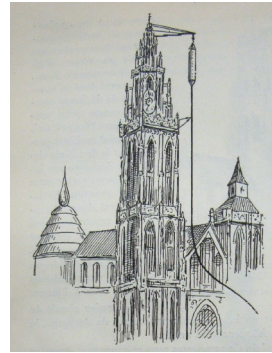


Fig. 5. Guarini's antenna in the Cathedral of Our Lady (Onze-Lieve-Vrouwetoren), Antwerp [6].

3. CONCLUSION

For numerous merits in development of techniques E. Guarini-Foresio became the gentleman of an award of the Crown of Italy. His biography still waits for the researchers. It is known that the life of Emile Guarini has broken on the 75th year in Bruxelles on November 13, 1953. Owing to the invention of the radio relay communication, the essential contribution to development of antenna technology and, in particular, designing of spiral and other types of antennas, his name is for ever entered in radio engineering history.

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