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PROTECTION DEVICE OF TRANSFORMER FROM FIRE AND EXPLOSION

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ABSTRACT

The article examines the device for protection against short circuits, fires and explosions caused by overcrowding of high-power transformer substations used in power transmission systems. The device that starts the electric motor in the event of an emergency of the transformer consists of an electrical contact device connected via a thermorelay, which is attached to the body of the transformer.Let's look at the operation of a transformer fire and explosion protection device.

KEYWORDS: *Thermal Relay; Thermo-Sensor; Cooling Radiator; Radiator Freonrunning Pipes; Freon Storage Volume (Barrel); Dielectric Oil Storage Barrel.*

INTRODUCTION

In recent years, our country has undergone radical changes aimed at developing the economy and improving the living standards of the population. At present, it is impossible to imagine all sectors of the economy and our life without electricity. Such rapid growth rates in all sectors of society and the economy is leading to an increase in the demand for electricity in the first place.

Particular attention is paid to the development of energy in the country, the stable supply of electricity to consumers. It is known that in power distribution networks, high-voltage energy

(550 kW; 110 kW; 10 kW; 6 kW) is converted to a voltage of 0.4 kW through step-down transformer substations [1].

In these processes, many failures are observed as a result of overloading of step-down transformer substations. Depending on the failure status of the transformers, overloading can cause the transformer oil to overheat and cause a short circuit. As a result of the inability of existing automated protection devices and systems to fully and reliably protect expensive high-voltage transformers, there are interruptions in the uninterrupted power supply to consumers. In this regard, it is necessary to use methods and devices based on new technologies that protect high-voltage transformers from short circuits in emergencies. It is known that one of the most pressing problems of current uninterruptible power transmission is to ensure the uninterrupted operation of the transformer, as well as its long operation at high power, by continuously controlling and preventing the overheating of the dielectric cooling oil of high-voltage transformers. Analyzing the research and engineering work carried out in this area, for example, a method and device for preventing the explosion of a transformer, developed by Indian scientists, and then preventing fire, have been proposed. The device consists of a housing filled with coolant and pressure sensors placed inside it, which activate the valves and emit inert gases inside the vacuole. The pressure rise as well as the pressure generating agent are not shown here [2,3]. A device that protects the automatic connection network from transformer explosion and high-pressure ignition is also known, which includes a gas relay, a sensitive electrical relay, a special relay, a dielectric cooling tank, a control unit, and a generated nitrogen gas leak. Dielectric oil emits nitrogen gas during cooling of the boiler, with the release of nitrogen gas, the gas relay and the sensitive electric relay are activated and send a signal to the control unit [4,5,6].The method and tool used in this device cannot fully meet the current need. Also, this device does not have a system for automatic disconnection and reconnection of the transformer in the event of a short circuit in the high and low voltage lines. The protection of these proposed devices does not meet current requirements. As the demand for power supply increases, the protection devices of transformer devices have not changed significantly. Given the shortcomings of the above devices, it is necessary to introduce means to ensure continuous, high power and long-term operation of the transformer by continuously monitoring the temperature of the dielectric coolant and preventing overheating to increase the efficiency and uninterrupted operation of transformer devices. To achieve this task, we present the block diagram of the device that protects and ensures the uninterrupted operation of the following transformer devices, as well as the device that protects the transformer from fire and explosion (Figure 1).The proposed transformer fire and explosion protection device includes a radiator, thermo relays and sensors made of coolant-filled tubes housed inside its housing, as well as a pump for circulating the coolant in the radiator and a ventilator for additional cooling of the radiator from the outside of the transformer housing.

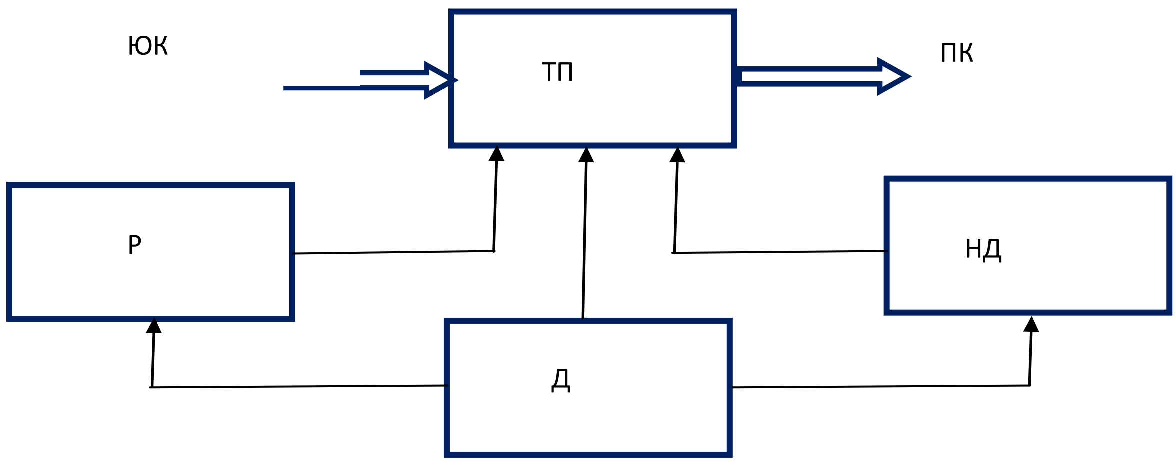

Figure 1. Block diagram of the transformer fire and explosion protection device.

This means that the fire and explosion protection device of the transformer consists mainly of four parts, namely, T-transformer, D-sensor, N-pump, which carries out the circulation of cooling oil; R- radiator and fan.The design of the proposed transformer fire and explosion protection device is connected to the data sensor and fastened to the housing by means of a switch. The cooling radiator is also attached to the housing by means of a tube that measures the transformer housing. The electric motor of the freon propulsion pump is attached to the Freon storage barrel through a tube. The high voltage and low voltage insulators of the transformer and the neutral wire of the transformer is connected to the ground from the housing. The device that starts the electric motor in the event of an emergency of the transformer consists of an electrical contact device connected via a thermorelay, which is attached to the body of the transformer.Let's look at the operation of a transformer fire and explosion protection device. It is known that when a transformer substation is operated at full power for a long time, the primary and secondary windings start to heat up, respectively. At the same time, the dielectric oils inside the transformer housing also begin to heat up. The heating of the dielectric oil often reaches the level of the combustion temperature, and this process can lead to an explosion. In the proposed device, a temperature control device is placed inside the transformer housing. The control device-sensor transmits the message to the thermocouple when the temperature of the oil reaches 80oC. Thermorele 1 will start 2 electric motors 12 and 15, respectively. The first electric motor15 turns the main blade 8 and the radiator 15 starts to cool the freon. The second electric motor12esa starts the gear pump11. The gear pump creates a large pressure and forces the freon 6 in barrel 13 to circulate inside the transformer housing and provides circulation through the freon tubes and the cooling device inside the transformer 19 starts to cool the transformer coil 20 and the dielectric oil. The sensor, immersed in transformer oil, extends the chain of the cooling system24 through a thermorelay with dielectric oil, primary and secondary coil temperatures of 60oC. At the same time, the operation of the transformer is prolonged and will last for many years.The wiring diagram of the transformer fire and explosion protection device is shown in Figure 2 and its structural design is shown in Figure 3.This protection device was used in the transformer 63/10, which supplies electricity to the small processing company "Nur", which operates in the town of Yazyovan, Yazyovan district, Fergana region.The transformer fire and explosion protection device used a pump of model MDW-07 (or MDW-15MDW-15S with a capacity of 1.1 kW) with a power of 0.5 kW and a speed of 2760 rpm, as well as a device RJ-6511 as a cooling system. This device has a motor that rotates the blade of the radiator and the fan attached to it.By extending the service life of transformers in the power transmission system, it is possible to reduce economic costs by up to 60%, prevent interruptions in the system and ensure uninterrupted power supply to consumers.

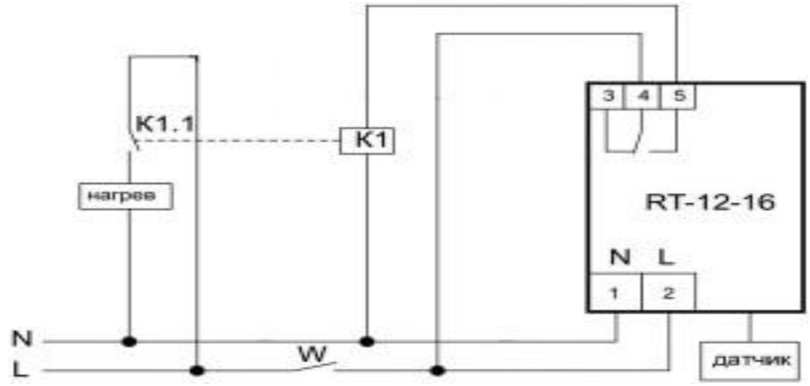

Figure 2. Electrical circuit of the transformer fire and explosion protection device.

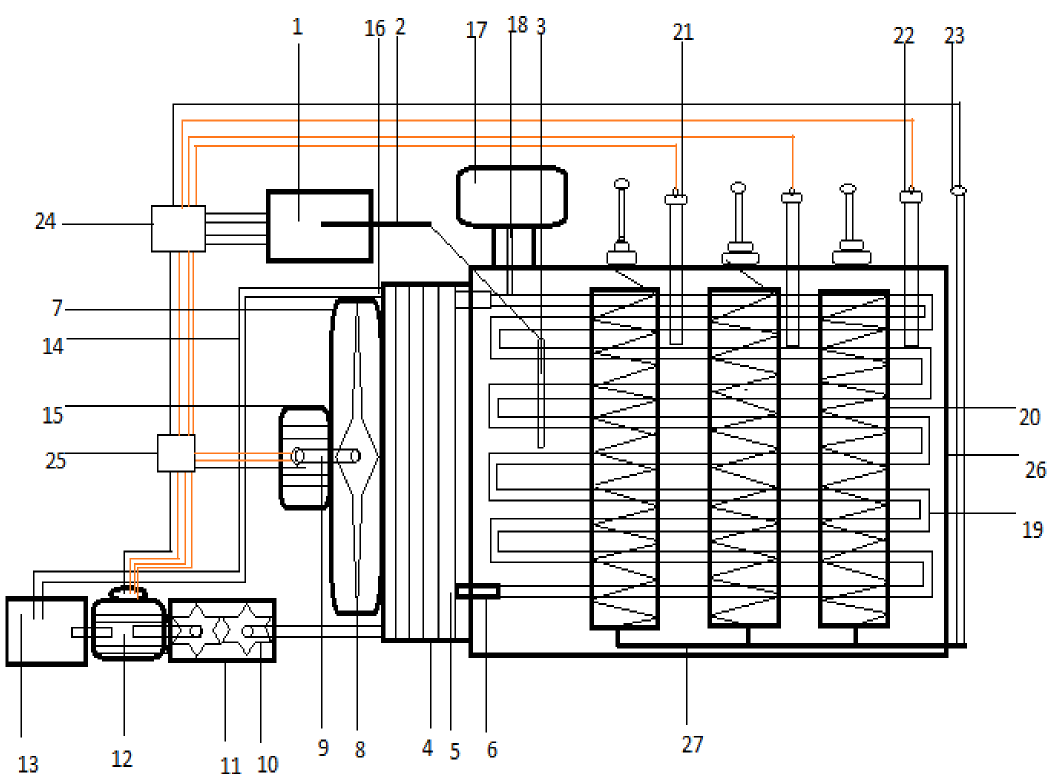

Figure 3. Structural drawing of the device for fire and explosion protection of the transformer.

Here: 1 thermorele; 2-cable to connect the sensor to the thermorelay; 3-thermodotor; 4-cooling radiator; 5-freon running pipes to the radiator; 6-inlet pipe connecting the transformer body to the radiator; 7-fan body; 8-fan blade; 9-motor shaft ; 10-pump (rotor); 11-pump housing; 12-gear pump electric motor; 13-freon storage volume (barrel); 14-pipe connecting the freon barrel with the radiator; 15-main engine that rotates the blade of the main fan; 16-freonnibochka-carrying pipe; 17-dielectric grease barrel; 18-transformer housing oil pipe; 19-freon rotating pipe inside the transformer housing; 20-primary and secondary winding of the transformer; 21-high-voltage insulator; 22-low-voltage insulator; 23-grounding of the transformer and neutral wire; device; 25-emergency start-up device; 26-transformer steel body; 27-zero cable connecting high and low voltage coils.

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