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DESCRIPTION OF HUNGARIAN "GANZ" SIX-CAR DIESEL-ELECTRIC TRAIN

Emil Deri

Under the Soviet-Hungarian trade agreement, the Ganz Factories this year began shipment of the Ganz six-car remote-controlled diesel-electric train to the USSR. The train forms a single closed unit, [redacted] and consists of two identical 5-axle motor cars and four 4-axle coaches, equipped with automatic couplers and buffers. The motor cars are equipped with controls at one end of the car [redacted] and one motor car is located at each end of the train. The 160-meter-long train is designed for long-distance travel, and has 190 sleeping berths, two baggage or postal compartments of approximately 5,000-kilograms capacity, an electric kitchen, a bar, and a diner [redacted]

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The built-in diesel engines produce a total of 1,640 horsepower, the weight at maximum load is approximately 380 tons, and the maximum speed on a level track in calm air is 125-130 kilometers per hour. Control of the train is by a power-output control arm, which is manipulated by the engineer, and automatic control equipment. In addition to the main power plants, the motor cars have independent auxiliary diesel-generator units which generate electricity for auxiliary circuits, air conditioning, air compressors, etc.

The main power plant in each motor car consists of a 16-cylinder diesel engine, developing 600 horsepower at 1,100 rpm built into one unit with a single-bearing, compensating-wound, 550-kilowatt shunt generator employing mixed excitation [redacted] The direct current produced by the generator is fed through the main contact-type rheostat and a converter to drive series-wound traction motors with forced ventilation. Considering the constant load of the train, the two traction motors are connected permanently in parallel for the sake of simplicity. The traction motors are located on the two axles of the 3-axle truck which are closest to the center of the motor car. The main generator is driven by a Ganz-Jendrassik vertical V-type, four-stroke, forward-chamber, high-speed 16-cylinder diesel engine. Fuel is fed by the usual spring-type injectors.

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The engine is provided with a centrifugal governor which regulates operation at three speeds and a safety device which stops fuel injection if lubricating oil pressure falls below a certain point (because of a melted bearing, break in the oil line, etc.). The three speeds of revolution are for the following purposes: warming up the engine, 530 rpm; starting and basic operating speed, 850 rpm; and safety limit to preventing racing of the engine, 1,150 rpm. The engine is started by the main generator, which is specially wound for this purpose. Starting current is provided by the motor car's 50-volt 200-ampere-hour storage battery, which also supplies current for control purposes and for lighting.

The lead axles of the engine are adjustable, to permit the Ganz-Jendrassik starting procedure, and have triple-profile suction knobs, which are necessary for rotating the axle in starting when decompensation is provided for, and in operation. It may be noted that the main generator can easily turn over the engine under normal operating conditions, and that the decompensated, or starting, setting is necessary only when the oil has become very thick, i.e., when the engine is cold.

The remote-control system consists of a main control arm located at each of the two control stations, fuel regulators, automatic relays, the automatic starter and exciter boxes, control and exciter rheostats, and manifold control cables and connecting leads which run the length of the motor car. The remote-control system serves the following purposes:

1. Sets up the proper fuel feed and speed of the diesel engine, corresponding to the output setting adjusted by the engineer (higher speed for higher output, lower, for lower output).

2. Increases the speed of the train by providing for a constant starting tractive force (starting current) corresponding to the engineer's output setting until the product of the starting tractive force and the speed is equal to the output setting.

3. As the speed increases, gradually reduces the tractive force until the product of the speed and the tractive force necessary to overcome track and air resistance gives an output equal to the desired setting.

4. As track conditions vary, the tractive force and speed are regulated to maintain a constant product equal to the desired output setting.

5. If, because of some internal disturbance (cold engine, partial combustion, etc.), the diesel engine cannot develop the desired output, the remote-control system adjusts the electrical load of the diesel to conform to its reduced output level and protects the engine from partial overloading.

The remote-control system accomplishes the above by the following means: The relays associated with servomotors reproduce the setting of the main control arm and at the same time, through various resistances, regulate the starting current and the speed of the diesel engine. The rotor current of the servomotors passes through a "dynamic relay" and a carbon-pile /regulator/. This dynamic relay is a high-capacity voltmeter which, through a Wheatstone bridge circuit, balances the diesel flywheel setting with that of the relay equipment. If the two currents are not equal, the relay deviates in one direction on the other, bringing together two carbon discs. When contact is made, the resistance of the appropriate carbon-pile drops sufficiently to start a 50-volt retarding motor with permanent external exciter, which runs in the appropriate direction until the relay is returned to its rest position by the effect of the restoring resistance. Then the pressure on pile is again released.

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