



Real Time System Based Coupling of a Train by Using Magnetic Method

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ABSTRACT: Nowadays, lots of train accidents are occurred owing to fire accidents in train. This may lead to loss of many people's life and not able to avoid the spreading of fire in the train. Because the trains are coupled together with bolts, and it cannot remove the compartment when, it catches the fire. To overcome this problem the magnetic coupled method is implemented in the train. In which the train is coupled by using the electromagnetic coupling. In the magnetic coupled train the temperature sensor is used, to measure the fire and gives the information through the Zigbee to the base station. Then, the speed of the train is reduced by using the breaking system. From this system the fire accidents will be avoided and prevent many people's life.

KEYWORDS: Microcontroller, Temperature sensor, Relay, Magnetic coupler, Zigbee.

I. INTRODUCTION

Railway signalling is the baseline of safety system by controlling the movements of trains. It is safe for critical part of the (train) control function of the railway. Once instructed by a signaller or an automatic system, it is responsible for setting up non-conflicting and safe routes for trains, for defining (safe) limits of movement and for transmitting instructions or commands to train drivers. Magnetic couplings are generally transmit torque from one system to another, where the magnetic transmission is required to maintain a hermetic seal to prevent leakage and contamination. The couplings are synchronous and the output shaft speed is exactly equal to the input speed and these types of coupling can be designed with a maximum 100% efficiency. Magnetic couplings are widely used in pump systems to isolate the electrical motor from the liquid. This has the advantage of removing the dynamic seals which have a finite lifetime and are prone to leakage, which can cause failure of the machine and contamination of the working fluid. A membrane/seal wall is located in the magnetic gap between the rotors providing complete isolation between the wet and dry systems.

II. LITERATURE REVIEW

MAGNETICALLY COUPLED USED IN VEHICLE

High Temperature Superconducting (HTS) interaction shows a great potential in rotational bearing and linear Maglev technology. Besides the superconductor each application sets additional specific technical requirements. The challenges of use the various constructions and applications in the combination of the cold HTS material and the required technical periphery are discussed. ATZ's 0.5-ton HTS production per annum has enabled increased performance in a number of magnetic applications. Engineering properties, advanced magnetics excitation systems and thermal and mechanical stability of robust high-load YBCO bearings have been demonstrated. Effort is being made in the development of mobile HTS Maglev devices. We have designed and produced advanced 40-cm-long bulk cryostats, having 2-mm magnetic distance to the outside and operating more than one day without refilling. 24 vacuum cryostats have been manufactured for a magnetic train construction capable to transport up to 60-kN total vehicle and passenger weight and dedicated to operate on a 200-m-long track. The guide way consists of two parallel permanent magnetic tracks, whose concentrating magnetic field at 20 mm height above the surface. Superconductors are fixed on the bottom of a liquid nitrogen vessel and cooled by liquid nitrogen.



MAGNETICALLY COUPLED USING LEVITATION

After the levitation force relaxation was studied for different field-cooling height and working-levitation height, the high-temperature superconductor (HTS) bulk was horizontally moved in the lateral direction above the permanent magnet guide way. Both levitation and guidance force were collected by the measurement system at the same time. It was found that The decay of levitation force is dependent on both the maximum lateral displacement and the movement cycle times, while the guidance force hysteresis curve does not change after the first cycle. This work provided scientific analysis for the HTS maglev system design. The decay of levitation force is dependent on both the maximum lateral displacement and the movement cycle times. The guidance force hysteresis curve does not change after the first cycle. The contactless electrical energy transfer system (CEETS), by which electrical energy may be transmitted, without electrical connection or physical contact, through the large air gap. In this case energy is transmitted via coreless transformer. Coupling between the coils changes and depend on dimension of air gap. The efficiency of CEETS is mainly depended on the transmission frequency. Additionally large leakage inductances may be compensated also in resonance condition by adding capacitors to the coils. The article presents theoretical analyses and simulation results of transformer equivalent circuit with capacitors. Theoretical developments are compared with practical measurements from a prototype contactless system.

MAGNETICALLY COUPLED USING SINUSOIDAL GUIDEWAY

The vertical component of the Halbach array's magnetic field exhibits a sinusoid distribution because of the closed magnetic flux area between two neighboring poles, so this field can be regarded as the sinusoidal magnetic field. This article mainly discusses the influence of the closed flux region on the levitation performance of the bulk high-temperature superconductor (HTS). Moreover, the levitation performance is compared between the closed and diverging region of magnetic flux. The experimental results can be analyzed by the magnetic circuit theory and the frozen-image model. The analysis indicates that the closed region of magnetic flux can influence the levitation performance of bulk HTS obviously and provide an extra useful guidance force. These conclusions are helpful to optimize the HTS Maglev system. This mainly discusses the influence of the closed flux region on the levitation performance of the bulk high temperature superconductor. The levitation performance is compared between the closed and diverging region of magnetic flux. The design and analysis of a scale-model suspension test facility for MAGLEV is discussed. This work describes techniques for the design, construction, and testing of a prototype electrodynamic suspension (EDS) levitation system. The viability of future high-temperature superconducting magnet designs for MAGLEV has been investigated with regard to their application to active secondary suspensions. A set of approximate design tools and scaling laws have been developed in order to evaluate forces and critical velocities in the suspension.

GEOMETRIC COUPLED FOR MAGNETIC APPROACH

It is the geometric approach for the enhancement of the coupling coefficient between two magnetically coupled coils. Each of the two coils is assumed to be composed of concentric circular loops. It is the geometric approach for the enhancement of the coupling coefficient between two magnetically coupled coils. It is demonstrated that the coupling coefficient can be considerably enhanced, if the turns of the coils are not concentrated at the circumferences, but distributed across the diameters. For analysis, each of the two coils is assumed to be composed of concentric circular loops. The geometric approach for the enhancement of the coupling coefficient between two magnetically coupled coils. It is demonstrated that the coupling coefficient can be considerably enhanced, if the turns of the coils are not concentrated at the circumferences, but distributed across the diameters.

III. EXISTING METHOD

A Train can be coupled due to bolts for each compartment. In that, next bolts can be replaced and compartments able to connected through mechanically. In this connecting system, applied in many research studies. Even through, connected mechanically, we cannot avoid fire accident. For example, fire occur in particular compartment, let's say, third compartment. It spreads to other compartments also. This leads to serious death rate. Even, fire occurred information sent to base station. We can control fire at particular limit alone.

Drawbacks of the Existing System

It will consume more power to coupling two compartment of train. Power losses may be occur. This method economically high cost.

IV. PROPOSED SYSTEM

In the recent time, we have seen a lot of railway accidents and yet Indian Railways have not implemented any effective Anti-Collision System which can avoid such type of accidents. So, we come up with a project “Magnetically Coupled Train” which can avoid such type of railway accidents. In this project, we have used Microcontroller, Wireless Trans Receiver Unit (Zigbee) and power supply. We are going to couple the compartment of train by using electromagnet. When fire will occur, the temperature sensor senses the fire and gives the message to the base station and each compartment of train by using the Zigbee technology. The power supply will decouple the compartment on both sides. Then the breaking system will reduce the speed.

- ZIGBEE
- TEMPERATURE SENSOR
- TIME DELAY
- BREAKING SENSOR
- POWER SUPPLY

V. BLOCK DIAGRAM

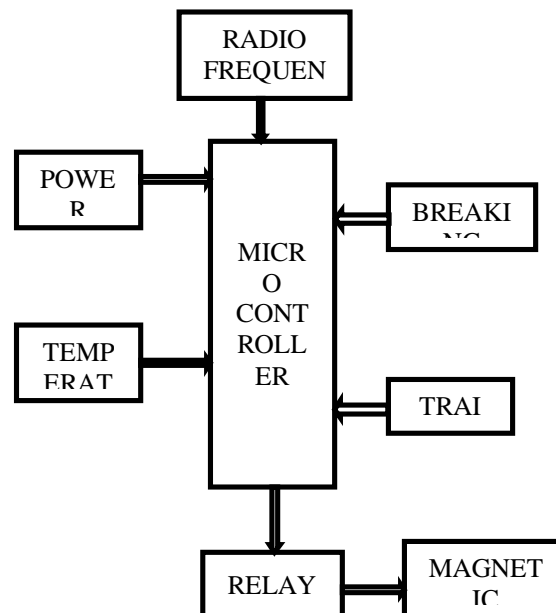


Fig 1: Block diagram for magnetically coupled train

VI. HARDWARE DESCRIPTION

Relay

A Relay is an electrically operated switch. Many relays use an electromagnet to operate a switching mechanism mechanically, but other operating principles are also used. Relays are used where it is necessary to control a circuit by a low-power signal (with complete electrical isolation between control and controlled circuits), or where several circuits



must be controlled by one signal. A machine tool relay is a type standardized for industrial control of machine tools, transfer machines, and other sequential control. They are characterized by a large number of contacts (sometimes extendable in the field) which are easily converted from normally-open to normally-closed status, easily replaceable coils, and a form factor that allows compactly installing many relays in a control panel. Although such relays once were the backbone of automation in such industries as automobile assembly, the programmable logic controller (PLC) mostly displaced the machine tool relay from sequential control applications. A contactor is a very heavy-duty relay used for switching electric motors and lighting loads, although contactors are not generally called relays. Continuous current ratings for common contactors range from 10 amps to several hundred amps. High-current contacts are made with alloys containing silver. The unavoidable arcing causes the contacts to oxidize; however, silver oxide is still a good conductor. Such devices are often used for motor starters. A type of relay that can handle the high power required to directly drive an electric motor is called a contactor. Solid-state relays control power circuits with no moving parts, instead using a semiconductor device to perform switching. Relays with calibrated operating characteristics and sometimes multiple operating coils are used to protect electrical circuits from overload or faults; in modern electric power systems these functions are performed by digital instruments still called protective relays. A simple electromagnetic relay consists of a coil of wire surrounding a soft iron core, an iron yoke which provides a low reluctance path for magnetic flux, a movable iron armature, and one or more sets of contacts (there are two in the relay pictured). The armature is hinged to the yoke and mechanically linked to one or more sets of moving contacts. It is held in place by a spring so that when the relay is de-energized there is an air gap in the magnetic circuit. In this condition, one of the two sets of contacts in the relay pictured is closed, and the other set is open. Other relays may have more or fewer sets of contacts depending on their function. The relay in the picture also has a wire connecting the armature to the yoke. This ensures continuity of the circuit between the moving contacts on the armature, and the circuit track on the printed circuit board (PCB) via the yoke, which is soldered to the PCB.

Transistor

A Transistor is a semiconductor device used to amplify and switch electronic signals. It is made of a solid piece of semiconductor material, with at least three terminals for connection to an external circuit. A voltage or current applied to one pair of the transistor's terminals changes the current flowing through another pair of terminals. Because the controlled (output) power can be much more than the controlling (input) power, the transistor provides amplification of a signal. Today, some transistors are packaged individually, but many more are found embedded in integrated circuits.

Temperature sensor

The LM35 series are precision integrated-circuit temperature sensors, whose output voltage is linearly proportional to the Celsius (Centigrade) temperature. The LM35 thus has an advantage over linear temperature sensors calibrated in ° Kelvin, as the user is not required to subtract a large constant voltage from its output to obtain convenient Centigrade scaling. The LM35 does not require any external calibration or trimming to provide typical accuracies of $\pm 1/4^\circ\text{C}$ at room temperature and $\pm 3/4^\circ\text{C}$ over a full -55 to $+150^\circ\text{C}$ temperature range. Low cost is assured by trimming and calibration at the wafer level. The LM35's low output impedance, linear output, and precise inherent calibration make interfacing to readout or control circuitry especially easy. It can be used with single power supplies, or with plus and minus supplies. As it draws only $60\ \mu\text{A}$ from its supply, it has very low self-heating, less than 0.1°C in still air. The LM35 is rated to operate over a -55° to $+150^\circ\text{C}$ temperature range, while the LM35C is rated for a -40° to $+110^\circ\text{C}$ range (-10° with improved accuracy). The LM35 series is available packaged in hermetic TO-46 transistor packages, while the LM35C, LM35CA, and LM35D are also available in the plastic TO-92 transistor package. The LM35D is also available in an 8-lead surface mount small outline package and a plastic TO-220 package.

Battery

An electrical **battery** is one or more electrochemical cells that convert stored chemical energy into electrical energy. Since the invention of the first battery (or "voltaic pile") in 1800 by Alessandro Volta and especially since the technically improved Daniel cell in 1836, batteries have become a common power source for many household and industrial applications. According to a 2005 estimate, the worldwide battery industry generates US\$48 billion in sales



each year. With 6% annual growth. There are two types of batteries: primary batteries (disposable batteries), which are designed to be used once and discarded, and secondary batteries (rechargeable batteries), which are designed to be recharged and used multiple times. Batteries come in many sizes; from miniature cells used to power hearing aids and wristwatches to battery banks the size of rooms that provide standby power for telephone exchanges and computer data centers.

VII. TECHNOLOGY USED

ZIGBEE

Zigbee is a specification for a suite of high level communication protocols using small, low-power digital radios based on an IEEE 802 standard for personal area networks. Applications include wireless light switches, electrical meters with in-home-displays, and other consumer and industrial equipment that require short-range wireless transfer of data at relatively low rates. The technology defined by the Zigbee specification is intended to be simpler and less expensive than other WPANs, such as Bluetooth. Zigbee is targeted at radio-frequency (RF) applications that require a low data rate, long battery life, and secure networking. Zigbee has a defined rate of 250 kbps best suited for periodic or intermittent data or a single signal transmission from a sensor or input device. The name refers to the waggle dance of honey bees after their return to the beehive. Zigbee is a low-cost, low-power, wireless mesh network standard. The low cost allows the technology to be widely deployed in wireless control and monitoring applications. The Zigbee network layer natively supports both star and tree typical networks, and generic mesh networks. Every network must have one coordinator device, tasked with its creation, the control of its parameters and basic maintenance. We are using Zigbee transceiver for wireless communication. Zigbee is the specification of a low-cost, low-power wireless communications solution, meant to be integrated as the main building block of ubiquitous networks. It is maintained by the Zigbee Alliance, which develops the specification and certifies its proper implementation. Zigbee builds upon the physical layer and medium access control defined in IEEE standard 802.15.4 for low-rate WPAN's. The specification goes on to complete the standard by adding four main components: network layer, application layer, Zigbee device objects (ZDO's) and manufacturer-defined application objects which allow for customization and favour total integration. These are responsible for a number of tasks, which include keeping of device roles, management of requests to join a network, device discovery and security. Its network layer natively supports three types of topologies: both star and tree typical networks and generic mesh networks. Every network must have one coordinator device, tasked with its creation, the control of its parameters and basic maintenance. Within star networks, the coordinator must be the central node. The main functions of the network layer are to enable the correct use of the MAC sub layer and provide a suitable interface for use by the next upper layer, namely the application layer. The routing protocol used by the Network layer is AODV. In order to find the destination device, it broadcasts out a route request to all of its neighbours. The neighbours then broadcast the request to their neighbours, etc. until the destination is reached. Once the destination is reached, it sends its route reply via unicast transmission following the lowest cost path back to the source. Once the source receives the reply, it will update its routing table for the destination address with the next hop in the path and the path cost.

VIII. APPLICATIONS

1. In Industrial applications, many automation systems are possible to produce fire due to heat or else other. At that time, we implement same concept in industries.
2. In nuclear power plant stations we use concept.

IX. FUTURE SCOPE

In future, the project will develop to save the compartment before the fire starts to destroy the compartments. By proposing this, send information to the all base stations and substation. From this the train arriving time can be measured easily. So that, There will be no disturbance to the passengers.



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