SMART FIRE SAFETY IN AUTOMOBILE

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Abstract— During recent times we have read articles of cars are getting fired up due to heat or any other reason. Similarly, after accident, possibilities are strong and chances are high that a car may set on hazardous fire causing death or injuries if in case explosions may occur.

Thus we may understand that now a day, one of the serious problems in automobile is engine fire. There is no equivalent mechanism as if now to avoid such problem. Fire suppression system deals with sensing of smoke in engine compartment (bonnet). Therefore, actuating dry co2 inside the engine compartment through electronics and T valve; thus, suppressing the fire that has taken place.

Many incidents of fire ignition in vehicles have occurred since the very invention of locomotive body was introduced. And as per records and survey of BBC and local media, India contributes highest car accidents due to fire all over the world. For which no precautions and safety measures have implemented which are highly necessary rather than any person's opinion. Countries that are located near or on equator face the rage with high temperature is also a major factor for fire ignition in car and India is a one those countries which is located on high temperatures areas, where issues of heat production in vehicle leads to fire generation in vehicle

Keyword: Automatic extinguishing system, fire detection, fire protection, fire protection form store container

I. INTRODUCTION (FIRE SAFETY IN VEHICLE BONNET)

As the role of the engineer he emerged, many have become responsible for the engineering of safety of a automobile they design. It is also their duty to be knowledgeable about the applicable fire safeguard system types, design methods, relevant accept codes, insurance regulatory requirements, and general installation approach. The two main purposes for fire protection systems within an automobile's environments are life safety and property protection. Equal deliberation must be given to attempt to contain a fire while a car sets on fire and thus till all passengers are depute out, the fire must not lead to any explosions. Unconditional safety from fire is not attainable, but means must be provided to minimize the potential for fire and the casualty done by fire. The systems and methods used today are constantly changing and improving to meet the requirements of project variations and challenges. This project provides a basic outline for establishing the needed criteria to ensure fire safety via fire suppression within a passenger and engine. For understanding concept of fire suppression we must first understand the types of fire that are classified by engineers

II. COMPONENTS

Fire Extinguisher Gas Cylinder:--- A fire extinguisher is an active fire protection equipment used to smooth out or restrict small fires, often in emergency situations. It is not calculated for use in an out-of-control fire, such as one which has hits the roof, endangers the user (i.e., no escape route, smoke, explosion hazard, etc.), or otherwise requires the expert of a fire department. Typically, a fire extinguisher subsists of a hand-held cylindrical pressure vessel containing an handler which can be discharged to extinguish a fire. Fire extinguishers are manufactured with a non-cylindrical pressure vessel which also exist, but are less common. In the United States, fire extinguishers in all apartments other than buildings are generally obligatory to be maintained/healed and inspected by a fire protection service company at least annually. Some jurisdictions need more frequent service for fire extinguishers. The servicer places a service tag on the extinguisher to indicate and identify the type of service performed (annual inspection, recharge, new fire extinguisher).

Pneumatic Actuation System:--- Pneumatics is a branch of engineering that makes use of gas or pressurized air. Pneumatic systems used in industry are commonly mechanized by compressed air or compressed inert gases. A half-way located and electrically sourced compressor powers cylinders, air motors, and other pneumatic devices. A pneumatic system are controlled over a manual or a automatic solenoid valves which is preferred when it provides a lower amount, a more flexible, or a safer alternative to electric motors and actuators.

Pneumatics also has a operation in dentistry, infrastructure, mining, automotive service stations and other operations Pneumatic systems in hooked/established installations, such as factories, use compressed air because a sustainable supply can be made by compressing atmospheric air. The air commonly has moisture removed, and a small quantity of oil is supplemented at the compressor to prevent deterioration and lubricate mechanical components.

Pneumatic cylinder is utilized to develop required amount of force/impact to open extinguisher pin. Standard procedure to construct the pneumatic cylinder for force requirement is to prefer any one cylinder from standard catalog and check its output force. When the output force is

greater than the required force, then the design is safe and secure.

Specifications of the Pneumatic cylinder

Cylinder bore diameter – 25 mm

Stroke length – 100 mm

Cylinder rod diameter – 12 mm

Operating pressure – 0 – 12 bar

Taking operating pressure = 4 bar

Force developed by cylinder = pressure * area

F = 5*100000*3.1416*0.025*0.025*0.25= 245.44 N

So the force is sufficient to operate fire extinguisher.

Smoke Detecting Sensor :--- A smoke detector is a device that senses/detect smoke, commonly as an gauge to detect a fire. Across the counter. security applicant issue a signal to a fire alarm control panel as part of a fire alarm system, while household smoke detectors, also known as smoke alarms, generally concern a local audible or ocular alarm from the detector itself.

Smoke detectors consists of a plastic enclosures, typically embody like a disk about 150 millimetres (6 in) in diameter and 25 millimetres (1 in) thick, but shape and size may differ. Smoke can be encountered either poetical (photoelectric) or by physical process (ionization), detectors may use either, or both, manner. Sensitive alarms can be used to detect fire, and thus deter, smoking in areas where it is banned.

Smoke detectors are used in large commercial, industrial, and residential buildings are usually powered by a central fire alarm system, which is powered by the building power with a battery backup. Smoke detectors spectrum from individual battery-powered units, to several interlinked mains-powered units with battery backup; with these interlaced units, if any unit disclose smoke, all trigger even if household power has gone out.

Nozzle :- A nozzle is a device constructed to control the direction or aspect of a fluid flow (especially to boost the velocity) as it exits (or enters) an confined chamber or pipe.

A nozzle is generally a pipe or tube of changeable cross sectional area, and it can be used to direct or adapt the flow of a fluid (liquid or gas). Nozzles are generally used to regulate the rate of flow, speed, direction, mass, shape, and/or the pressure of the stream that appears from them. In a nozzle, the velocity of fluid boosts up at the expense of its pressure energy.

Control Unit :- The control unit (CU) is a component of a computer's central processing unit (CPU) that controls the action of the processor. It inform the computer's memory, arithmetic/logic unit and input and output devices on how to communicate to a program's instructions. It instructs the operation of the other units by providing timing and control signals. Most computer resources are handled by the CU. It controls the flow of data between the CPU and the other devices.

In modern computer plans, the control unit is typically an internal part of the CPU with its overall role and operation unaffected since its introduction.

Hoses and Pipes:- A hose is a flexible hollow tube constructed to carry fluids from one location to another. Hoses are also frequently called pipes (the word pipe commonly refers to a rigid tube, whereas a hose is generally a flexible one), or more commonly tubing. The shape of a hose is usually cylindrical (having a circular cross section).

Hose design is based on a consolidation of utilisation and act. Common factors are size, pressure rating, weight, length, straight hose or coil hose, and chemical unity.

Hoses are made from one or a sequence of many contrasting materials. Applications mostly use nylon, polyurethane, polyethylene, PVC, or synthetic or natural rubbers, based on the environment and pressure rating needed. In recent years, hoses can also be manufactured from special grades, of polyethylene (LDPE and especially LLDPE). Other hose materials including PTFE (Teflon), stainless steel and other metals.

Position of Equipment:- Fire Extinguisher: Location of fire extinguisher fitted, because space is convenient as per dimensions we required, so our 2 kg cylinder has properly fitted in this space.

Nozzle 1: Position of nozzle 1 is assigned at this place because it covers a 20% area of bonnet from this position and it is at the end of the bonnet towards the vehicle.

Nozzle is fitted at the end of bonnet towards the left of the bonnet and it covers 25% area of the bonnet.

Nozzle 3: It was fitted at the front side of the bonnet towards the left side and it cover the 30% area of the bonnet and fire will spread numerously fast

Nozzle 4: This nozzle will have fitted at the front side towards the right side of the bonnet and this covers the 25% area will extinguish fire.

Fire sensor: It was fitted at the centre of the bonnet for covering total area of bonnet.

Fabrication of the System:--- Metal fabrication is the building of metal structures by cutting, bending, and assembling processes.

It is a value-added action that comprise the formation of machines, parts, and structures from various raw materials. A fabrication emporium will bid on a job, usually established on the engineering drawings, and if awarded the contract will build the product. Large fab shops employ a multitude of value-added processes in one plant or competence along with welding, cutting, forming and machining. These large fab shops offer further value to their customers by reducing the need for acquiring personnel to locate different vendors for different services. Metal fabrication jobs usually start with shop drawings counting precise measurements, then move to the fabrication stage and finally to the accession of the final project. thus, the prototype we have proposed has been working successfully in a very minimum cost and after using one of the best products and brands in market.

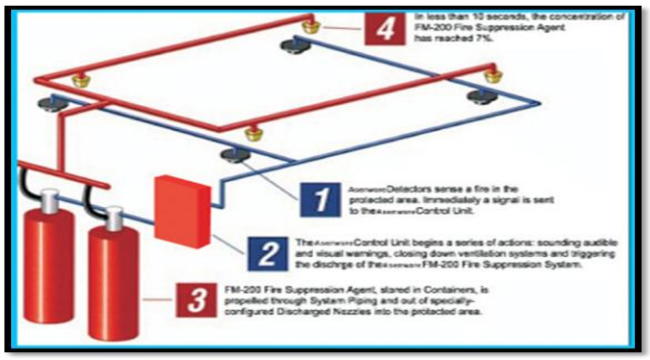
III. WORKING OF THE SYSTEM

Working of the System:--- Fire Suppression System in case of automobile to supress the electric heat and fire due to leakage of fuel in the system. An automatic system to detect smoke under the bonnet and subsequent actuation of the Fire Extinguisher using a pneumatic cylinder. The Fire extinguisher is a ABC type for supressing electrical as well as gasoline fires. The nozzle is split into two to subdue fires from all directions.

As smoke sensor detects high temperature it gives signal to control relay circuit, then control system actuates pneumatic cylinder through the control of T solenoid valve. With full stroke of the cylinder, extinguisher knob gets pressed and releases compressed CO2 through hoses. After that CO2 get sprayed through nozzle and occupies entire volume to suppress fire. Finally, we get result of blaze cut and result is achieved.

IV. SCHEMATIC WITH WORKING PRINCIPLE OF THE PROJECT

The corresponding figure shows actual setup of the components of the project and arrangement also ensures working flow.



Conclusions

In this study, a system that automatically extinguishes fires in commercial automobiles was proposed. The structure and the operational method of the automatic extinguishing were proposed considering the characteristics of commercial vehicles. Lab scale simulation of the proposed method was employed to determine its performance; the following conclusions were obtained.

Through the process of proposing and evaluating the method of fire detection and extinguishing for a car fire, the commercial viability of the proposed fire extinguishing system was verified. In particular, through the 3 methods of fire detection, it was determined that an effective response to a car fire was possible.

The developed automatic extinguishing system can rapidly extinguish a car fire, minimizing material damage and loss of life. The need for such an automatic extinguishing system is especially high for commercial vehicles with large passenger capacity.

However, the performance of the automatic extinguishing system proposed in this study was assessed only in a lab environment. Thus, research on product testing and a mass production design process for commercialization is necessary. Furthermore, study on a fire extinguishing medium or extinguishing method that does not affect the engine parts is necessary in order to resolve the issue of completely replacing automobile engine parts damaged by a car fire.

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