ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 4, April 2016

A Study on Vehicular Horn Noise Limiter

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ABSTRACT: The horn noise limiter is designed for areas or countries experiencing rising level of noise pollution due to over honking of vehicles. The world despite being alarmed of rising levels of harmful effects of noise pollution, there are many countries still experiencing the negative impacts of this menace. During peak traffic conditions and many a times even unnecessarily the drivers start honking increasing the noise levels and disrupting the peaceful atmosphere of the surrounding. High penalty and legal actions mostly is not sufficient to curb this tendency of the masses. This device aims at suppressing the environmental effects of noise pollution and acts as a solution without legal involvement to curb negative effects of vehicular noise pollution due to the tendency of over honking and unnecessary honking of the drivers. It lets out only that sound level as per the permissible decibel level of the zone as prescribed by the authorized body. It does not alter any inbuilt mechanisms of the vehicle and just acts as an additional system which can be incorporated into the vehicle and connected to the honking system. It uses a set of acoustic filters or a versatile acoustic filter capable of attenuating various frequencies of noise.

KEYWORDS: Noise pollution; vehicle, over honking, decibel limit, honk output, attenuation, acoustic filter

I.INTRODUCTION

The purpose of the horn is to alert other vehicles and warn bystanders of a vehicle's presence. Smaller vehicles have higher frequency horns than larger vehicles; which allows them to be identified by the sound of their horn as either a small vehicle or a large vehicle. The principle of electromagnetism is used to create noise in a vehicle horn which is an electromechanical device. A typical vehicle horn consists of a flexible metal diaphragm (made of spring steel), a coil of wire that forms an electromagnet, a switch and a housing that functions like a megaphone. The mechanism of the horn functions according to Hooke's law which states, The extension of a spring is directly proportional to the load applied, provided the limit of proportionality is not exceeded. This means that if a horn is designed properly as long as the current is applied, the flexible diaphragm will oscillate back and forth continuously. This will translate into the sound desired. Horns are constructed with a flexible electrical contact that is actuated by the flexible diaphragm. A central armature which is moved by a strong electromagnet is connected to the flexible metal diaphragm. When current is applied to the electromagnet the armature moves to its mechanical limit, disconnecting power at intervals of time. As it relaxes back to its starting point, electrical contact is again made and the armature starts its travel again. This mechanism helps in reducing the sustained noise which is more than 90 decibels this leads to a lot of energy consumption. This energy obtained is in the form of electrical current and in automobiles equipped with electromechanical horns the starter is the only accessory which is used the most. Headlights, power seats, etc., individually don't use as much current as the horns. The wiring and terminals which are associated with horns are large, so a relay is necessary to actuate the horns.

In normal operation, the horn button is pressed and at that moment the electrical contact allows current to flow to the relay, which in turn furnishes high current to the horn's electromagnet. This attracts the diaphragm, which flexes to its mechanical limit. This disrupts the contact, that is, stops current flow to the electromagnet. The diaphragm is released to travel back past neutral position closing the switch again, and thereby pulling the diaphragm back, setting up an even oscillation. Horns are availed in variety of notes or frequencies.

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The note or frequency of a horn is determined by

- The flexibility of the diaphragm.
- Its physical size.
- The power of the electromagnet
- The mass of the diaphragm.
- Mechanical arrangement of the switch contact.
- Size and shape of the horn's case and a number of other contributing factors.

In many countries a vehicle's specific horn frequency is mandated. The idea is that a high-pitched horn note should indicate a small vehicle and the lower the note the larger vehicle. That's the reason big trucks and locomotives have deep horn sounds. This is related to the size of the diaphragm used in these automobiles. The larger surface area of the diaphragm and power of the electromagnet is used to contribute to the frequency that the horn will produce. Many trucks are introduced with air powered horns, which work by forcing air from the compressor that's used with the brakes past a diaphragm which causes sound. Many states are mandated for auto manufacturers that require large trucks to have horns that are loud and low, to allow other vehicles to know that a large vehicle is approaching just by the sound of the horn. Smaller vehicles will have a higher pitched sound when the car horn is honked indicating that the vehicle is smaller in size. A good number of collector vehicles made prior to the 1970s use two horns one with a low note and the other a high note which allows the vehicle to produce its distinctive sound.

II.CIRCUIT DIAGRAM OF HORN

Typical horn circuit and its various components are assembled together to form a workng system:

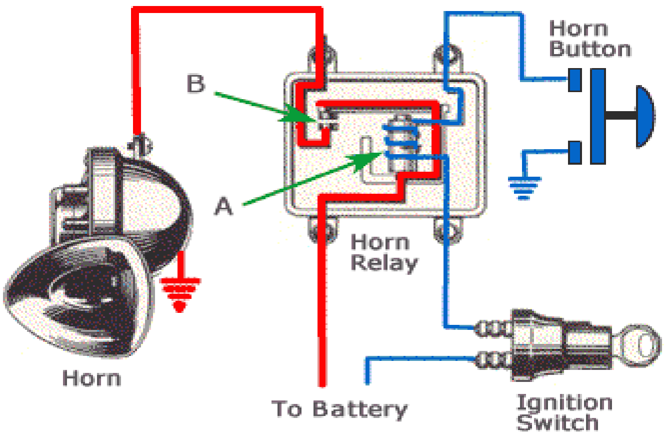

Fig 1. Horn Relay Diagram

The battery voltage travels through a high current wire (red) through the relay to the horn and also through a smaller wire (blue) through the ignition switch to the relay's low-current coil. When the ignition switch is turned on ,the horn circuit is always "hot" or "live" and requires a ground path. When the horn button is pushed in ; the specific path is completed and the ground connection is made energizing the relay's coil "A". The coil's iron core pulls down arm, connecting high-current contacts "B". High current then flows from the battery to the horn which is connected to ground as it's mounted to the chassis of the car. The high current wire from the battery goes through an appropriate fuse on the fuse panel or to the in line fuse near the horn.

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III.BLOCK DIAGRAM

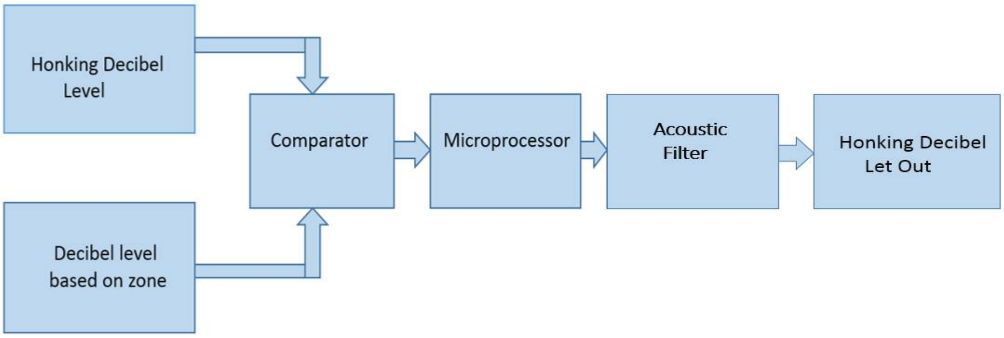

Fig 2. Block diagram of horn noise limiter

The honking decibel level indicates the normal sound output of the horn without this device fitted into the vehicle and is constant for a particular vehicle system. Another device detects the zone in which the car is currently present in and reads the decibel level permitted as per the zone from the list of decibel levels of areas saved in the memory of the device or which can be integrated to the GPS system of the car which mention the area and through that the decibel level. Whenever the horn is pressed,the constant sound output and the sound output reading obtained by the device is fed to a comparator. The comparator sends the signal to the microprocessor only when the honking decibel level exceeds the decibel level of the zone. The microprocessor then calculates the exceeding sound level value by subtracting the zone based decibel level from the actual honked output. This value is given to the set of acoustic filters which draws the required filter to to the front of honk outlet speaker thus attenuating the additional noise and lets out only permissible decibel level of sound. Thus the final output never exceeds the decibel limit of the zone

IV.REQUIRED CALCULATIONS

1. Comparator:

Output = 1 (high) when C O > Z L
Output = 0 (low) when C O < Z L
Where,
C O = Constant sound output of the car system without the noise pollution limiter.
Z L = Sound output as per the zone in which the car is located in.

2.Microprocessor:

Only when output of comparator = 1 (high)
The sound level let out = C O – Z L
Where,
C O = Constant sound output of the car system without the noise pollution limiter.
Z L = Sound output as per the zone in which the car is located in.

V.ADVANTAGES

A. The noise level does not exceed despite driver’s tendency to over honk.
B. It does not alter any inbuilt mechanism of vehicle.
C. It keeps the atmosphere calm and peaceful.
D. It reduces the negative impacts seen on health due to noise pollution.
E. Fauna of the area is saved from the exceeding noise levels
F. Use of acoustic absorptive filters make the device cost effective

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VI.APPLICATIONS

A. It reduces the noise pollution rising in an area due to over honking.
B. Keeps the decibel level within the prescribed limits of the zone.

VII.FUTURE SCOPE

A. With some modifications the horn noise limiter can be used for various other applications like huge machineries.
B. Use of advanced filters and sound absorbing materials would enhance the efficiency of the device.

VIII.CONCLUSION

The horn noise limiter is designed to attenuate the noise levels exceeding above the permissible decibel limit of a zone. This prevents the noise pollution impacts due to over honking of the vehicles and thus helps to keep the environment peaceful and reduces the negative health effects seen in livings beings around.

REFERENCES

1. Takafumi Shimizu, Toru Matsuda, Yosei Nishibe, Misake Tempo, Kimie Yoshitani and Yoichi Azumi;Noise barriers propagation of sound around different noise barrier models using a three-dimensional scan based sound visualization technique; Jasper Serraris Suppression of diffracted sounds by green walls.
2. Thu Lan Nguyen, Takashi Yano, Tsuyoshi Nishimura and Tetsumi Sato; Exposure–response relationships for road traffic and aircraft noise in Vietnam ;in journal on Noise Exposure
3. Julie Meline,Andrea Van Hulst,Frederique Thomas,Basile Chaix; Road,rail and air transportation noise in residential and workplace neighbourhoods and blood pressure ; Record study.
4. Viroj wiwantikit;Effect of noise on health of bus drivers,noise control engineering journal.

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