Head Restraint Adjustment Reminder System

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Abstract – The recent technological advancements in the new generation cars have made it possible for us to achieve high speed with great performance, which today’s generation craves for. But if we see the flip side of the coin, with high speed and great performance, there emerges the requirement of more excellent occupant’s safety systems like Seat belt Reminder System (SBR), which should cater to the demands of all people with different anatomy. This is when Head Restraint Reminder system comes into the picture. Head Restraint Reminder system can be used as a very effective tool in realizing the ultimate goal of achieving maximum human safety. In this paper the use of Head Restraints (HR) positioning reminder for occupant to avoid whiplash injury is proposed. The Head Restraints Reminder system includes a wave emitter and sensors provided on the front portion of adjustable head restraint producing and emitting waves frontward in a predetermined distance. The reflected wave (detected pulse) gives the distance between the occupants head and the head restraint. If adjustable head restraint position is not proper, the reminder system in the vehicle triggers a red warning light and/or an audible chime (especially for driver seat) reminding occupants to avoid whiplash injury.

Keywords – Whiplash, Seat, Torso, Automotive Safety, SBR, Head Restraints (HR), Sensor, Wave emitter.

I. INTRODUCTION

The beginning of 20th century heralded the advent of the motor vehicle era, then the mid-century was an era of performance cars where the ultimate goal was to achieve power and speed and then, more power and speed. Now, at the turn of 21st century, with performance of cars at their peaks, the very elementary need of cars is safety.

Now a day’s evolution of vehicles is more towards safety. Many rules and regulations are coming into the picture for occupants or pedestrian’s safety. A lot of research in the automotive sector is going to make vehicles safer than in the past. Because of increasing accident and more safety awareness among people, insurance companies are also paying attention towards safety research.

For example, as per study data from Industrial and Commercial Bank of China (ICBC) — including its 2002 estimate that whiplash claims ate up $135 from every annual car insurance payment in British Columbia (B.C.) — researcher calculated that whiplash injuries cost British Columbians more than $464 million a year in disability, lost work and medical bills.

The effect on the individual health is another big concern. Whiplash injuries are often serious problems that persist for years. Few of these symptoms are Headaches, neck pain, low back pain and travel anxieties. Around 25 to 40 percent of whiplash injury victims never fully recover. Using Head restraint reminder is a good solution to avoid such injuries.

II. HEAD RESTRAINT REMINDER SYSTEM

Today numbers of accident are so high and uncertain. Accidents occur frequently and cause worst damage, serious injury or even death. There are an around 2,72,088 whiplash injuries per year occurring in reported and even more with unreported rear impact car crashes.

Whiplash is nothing but the movement of the head and neck relative to the torso. If we reduce the gap between the occupant’s head and the restraint to reduce the movement of the head relative to the torso, the result will be lower whiplash rates.

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Head Restraint (HR) is an automotive safety feature in seat to limit this movement of the adult occupant’s head, in case of rear collision — to prevent or mitigate whiplash. According to study research, around 40% people don’t adjust their car’s Head Restraints properly, resulting in whiplash injury. Our idea is to have head restraint positioning reminder for occupant to avoid this problem.

A. Working of Head Restraint Reminder System

The working of HR reminder system is very simple and similar to Seat Belt Reminder (SBR) system. Head restraint reminder system consists of visual signal (a blinking icon or text display) or an acoustic signal of varying pitch.

Majorly for the driver seat head restraint, a combination of both signal i.e. visual and acoustic types are used, whereas only a visual signal is generally used for the all other and rear occupants.

The system produces and emits waves from HR to frontward in a predetermined distance. The reflected waves give the distance between the occupant’s head and HR. If position of HR is not proper or if the occupant is far from the HR for longer time, the reminder system in the vehicle triggers a warning light and/or an audible sound. The warning light or signal switches off when the HR is well positioned or the distance between head and HR within a safe permissible range.

B. Seat Belt Reminder System

This idea of ‘Head Restraint Reminder System’ has basically originated from ‘Seat Belt Reminder (SBR) system’. When occupant seats in car and do not use a seat belt, he gets indicator to lock seat belt.

The Seat Belt Reminder sensor mat detects occupants in passenger and rear seats. This system indicates a warning light and/or an audible sound reminding unbuckled seat occupants to fasten their seat belts.

In the event of a crash, safety belts reduce the risk of fatal injury to front seat occupants by 45% in cars and by 60% in light trucks. Considering 80% of unbuckled occupants fasten their seat belts, an SBR is one of the most effective safety way for preventing death or injury in a car crash. Below picture shows how SBR indicates signals.

C. Current situation

When we purchase a vehicle, we get user guide manual from the manufacturer. In that how one should use HR is mentioned. It says, every time occupant occupies a seat in the vehicle, should position HR as per height requirement. Some pictograms are also available for good or correct position of HR. In some countries, labelling is done on head restraint.

Requirement is Label should be clearly visible by an occupant when entering in the vehicle, although it is not accepted by all countries.

After 1st January 1969, Head restraints were mandatory by U.S. National Highway Traffic Safety Administration in all new cars sold in the U.S.

There are mainly two types of head restraints in car,

- Integral or Fix Head Restraints.
- Adjustable Head Restraints.
We can reduce injury percent in adjustable head restraints by reminding occupant to position or adjust head restraint in the same manner like Seat Belt Reminder.

III. DETAILS OF HEAD RERAINT REMINDER SYSTEM

Generally all the vehicles are equipped with head restraints on their driver seat, followed by passenger seat i.e. for all available seats excluding middle seat in rare rows.

In this system, moments when occupant enters in car and occupies seat but forget to adjust HR, sensors in HR will indicate red signal. System indicates Green signal when HR is adjusted or well positioned. In this system visual and audio indicator or warning systems are used, which will also warn when occupants are moved from his ideal seat position more than predefined time. This system also has provision to detect occupants in driver, passenger and rear seats which are indicated by faint pink colour.

In general all the indicators are located on dashboard of vehicle. In Head Restraints reminder system, indicators are defined on dashboard with a variety of colour as per working situation. So it is easy and convenient for a rider to get all information from dashboard at a glance.

IV. POSITIONING HR

In order to adjust a head restraint in correct position you should,

- Maintain the top of the head restraint is as high as the top of your head
Locate the head restraint as close to the rear of your head as possible
Have a locking head restraint, as it is very important. A head restraint that cannot be locked in position may move during an accident.

At the time of buying second hand vehicles, it is important to ensure that the head restraint can be properly adjusted so that it rests behind your head.

The following pictures show difference between properly and poorly adjusted head restraints, and also give ideal condition for occupants with respect to HR.

V. BENEFITS OF HEAD RESTRAINTS REMINDER SYSTEM

Whiplash injury affects over one million people in year and is the most common injury resulting from car accidents. Although you usually have no control over whether someone will strike your car from rear side, by just adjusting your car seat head restraint within a short period, you can dramatically reduce the amount of pain and suffering you might experience if someone does collide with you. So just check the ideal positioning of your Head Restraint each and every time when you get in the vehicle easily with help of head restraints reminder system.

Head restraints Reminder System offers some more benefits listed below,

a) As head restraint is important safety car gear, user will be safer.
b) Head restraints – both fix and adjustable types have more significantly reduced whiplash injuries in rear impact crashes.
c) As they have been performing as intended in highway crashes, this system is very effective: they support the head and neck and prevent hyperextension.
d) Result of adjustable type head restraints will get improved like fix type head restraints.
e) Whiplash injuries cost will be less.
f) It will be best practice for users or occupants.

VI. CONCLUSION

The head restraint reminder system is majorly aimed at reducing the whiplash injury resulting from car accident. A head restraint reminder reminds car user or occupants to adjust their head restraints. This system is basically originated from Seat Belt Reminder System. It will eventually reduce the chronic injury problems and will also make the occupants indirectly habitual for safety practices. The systems with a continuing and persistent acoustic signal are the most effective.

REFERENCES