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Stabilization of Stretcher In An Emergency Ambulance

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Abstract - *It is an experimental project to determine the dynamic characteristics and reliability of a mechanical design for a solution to attenuate disruptive and harmful road-induced vibrations experienced in the patient-care compartment of an ambulance. Vibration data have to be collected experimentally from different tests on a different ambulance traveling over distinct road surfaces. The data to be processed and analyzed for correlations to safety and patient care. Additionally, the vibrations characterized through experimentation can be used to determine an appropriate mathematical modeling solution to attenuate the most harmful vibrations experienced in the ambulance patient compartment. The model have to be applied for discovering the ability of mechanical design that would support and protect patients*

1. INTRODUCTION

According to the National Ambulatory Model Care Survey (NAMCS) 2017, comfort of the person transmitting through the ambulance is very crucial. Ambulance service is to transport the patient from the accident site to the hospital as quickly as possible. It is not an easy procedure to comfortably transport patient in the ambulance. Since the patient is already injured and the difficulties to treat the patient in the moving ambulance, the role of improving the existing emergency medical services is crucial. The risks and injuries are generated from potentially dangerous shocks and vibrations transmitted through the ambulance as it transmit over the uneven road surface .The vibration produced in ambulance can lead to a secondary injury to the patient and discourage a parametric from providing emergency care.Now a days in a common procedure to strap the patient to the stretcher and transport in the ambulance. But it will not effectively reduce the vibrations that are transmitted. The aim of our project is to study about the vibrations experienced by a patient on the stretcher in a moving ambulance and to develop a new model on counter weight mechanism that would potentially reduce the most harmful vibrations transmitted through the current ambulance suspension system.

2. METHEDOLOGY

In our study we found that the vibrations experienced by the patient in an ambulance have to be resolved to provide a healthy environment to the patient. To solve this a new stabilization mechanism associated with the counter weight mechanism is introduced to provide a comfortable ambulance ride as well as better care for the patient while he is being transported.

A counter weight mechanism is defined by a weight that is by exerting an opposite weight to provide balance and stability for a mechanical system. Counter weight mechanism have often used in Elevators, cranes, vertical lift Bridge and camera stabilizer.

The working of handheld camera stabilizer is a best example for the vibration suppresser. It is used by the combination of counterweight mechanism and universal joint. Universal joint couplings that transmit rotary motion allow XYZ Axis with its freedom of movement to all planes.

3. COMPONENTS USED

Table -1: Components Used

Sl.No	Components	Specification	Quantity
1	Stretcher	72*24inch	1
2	Universal Joint	3/4inch	4
3	Counter Weight Plates	1kg	30
4	G.I Pipes	1inch	3
5	Weighing Machine	120kg	1

3.1 Universal joint

A universal joint (universal coupling, U joint) is a joint or coupling is connecting rigid rods whose axes, which are inclined to each other, and commonly used in shafts that transmit rotary motion. It is a pair of hinges located close together, oriented at 90° and is, connected by a cross shaft. The universal joint is not a constant-velocity joint.

Fig -1: Universal Joint

4. WORKING

4.1 Principle Of Working

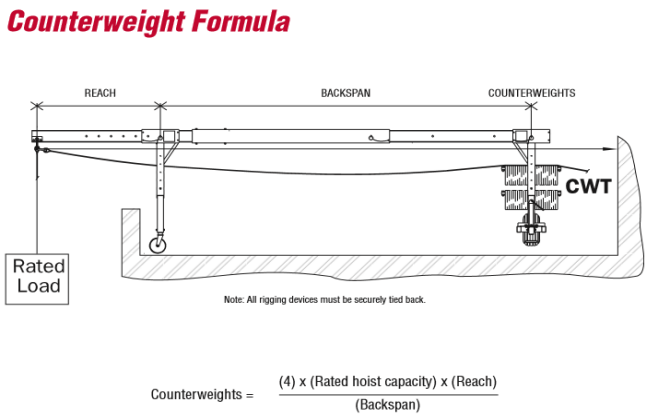

Fig -2: Counter weight formula

This is the basic principle we are using in our model. We also include a universal joint for the free axis movement and reduce the vibration. When we introduce this formula to our design it will be like.

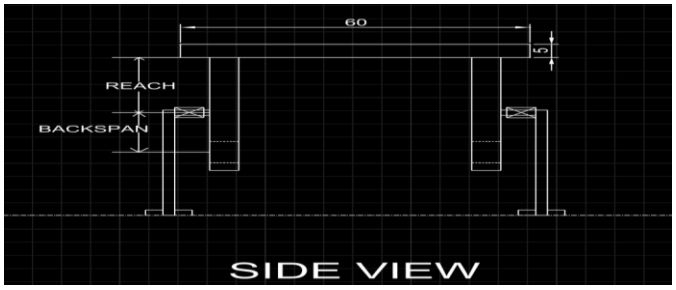

Fig -3: Cad Drawing

COUNTER WEIGHT = 4*LOAD*REACH
BACKSPAN

By taking all these effects into consideration we had designed our model in the design software SOLIDWORKS 2010 and it is like:-

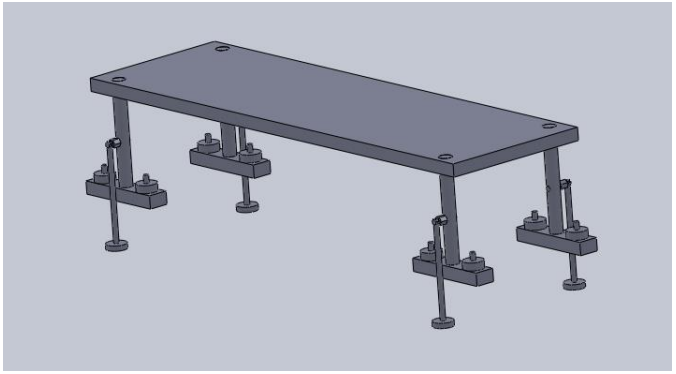

Fig -4: Solidworks Drawing

4.2 Working

When the stretcher with the patient is placed on the frame of stabilizing mechanism, the weighing machine connected to the mechanism will indicate the weight of patient along with the stretcher. The counter weight and backspan is adjusted according to the weight. Backspan is adjusted using telescopic extension road.

When the ambulance starts to move vibrations will be transmitted from the wheel to the leg of the structure through the floor. The basic suspension system of the vehicle alone cannot control all the vibrations, When this vibration reaches the point where universal joint is connected the counter weight mechanism starts to function. The universal joint will move in all possible axis according to the movement of the leg attached to the floor. The other end which is connected to the counter weight leg will not be affected by these vibrations and will stand still. And other movement of the structure caused by inertia is controlled by additional dampers connected in the sides of the frame.

5.ADVANTAGE

1. Avoid strapping of patient
2. Vibration less transportation for the patient
3. Avoid secondary Injury to the patient
4. Comfortable ride to the patients

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