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Development of speed breaker device for generation of compressed air on highways in remote areas

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***Abstract* - Roads and highways in India are provided with speed breaker to control the speed of traffic in congested areas. This energy loss on speed breakers can be utilized for useful purposes. This paper describes the potential of such type of energy available on roads and its utilization for useful work. The stages of development of a speed breaker device are described and the mechanism to generate and store compressed air that can be further used for desired purpose is elaborated.**

***Keywords* – Speed breaker, air compressor, pressurized air generation, traffic.**

I. INTRODUCTION

According to statistics provided by the Ministry of Road Transport & Highways, Government of India, in 2002, 58.8 million and in 2004, 72.7 million vehicles were playing on Indian roads. The annual rate of growth of motor vehicle population in India has been almost 10 percent during the last decade. There is tremendous vehicular growth in India year by year [1-3]. On Road these vehicles waste a tremendous amount of energy on speed breakers, where there is a necessity to provided speed breaker to control the speed of the vehicles. The increasing traffic and number speed breakers on roads motivate to manufacture an innovative device which can channelize the energy of vehicles that is wasted on speed breakers to some useful work. In this paper practical manufacturing processes and steps of speed breaker device for generation of compressed are described which can be used to generate compresses air on highways in remote areas. The reciprocating air compressors are used for pressurized air generation taking advantage of design simplicity and also these are the most common type of compressors found in industrial applications [4, 5].

II. CONSTRUCTIONAL DETAILS OF THE DEVICE

In the speed breaker system the speed breaker is made up of mild steel strips (8mm thick). The dome is made of mild steel sheets of 6 mm thickness. Dome of speed breaker is welded with the frame which is rectangular in shape and made of 3 mm angle iron. In middle of that, angle iron of 3 mm thick is welded to provide stiffness and also distribute load on the iron strip of frame. This frame is welded with the 228.6 mm long steel road of 25.4 mm diameter at the four corners of rectangular. These steel rods of strip frame construction are inserted in the hollow pipe of the mild steel of 6 mm thick and internal diameter is 25.4 mm. Between the section of frame construction and hollow pipe, the helical spring is inserted. Spring is inserted in the outside of the hollow pipe with four round roads inside the hollow section. Hollow section is welded to the base which is 6 mm thick mild steel plate. The welding is used in fabricating the device is shielded metal arc welding by using the flux coated electrode. Another part welded on the bottom of the mild steel plate and in the middle of the plate. It is welded to give support and

adjusts the reciprocating air compressor head. The compressor head is adjusted in the side where crank shaft and piston mechanism can be connected with the strip attached with the dome frame structure via welded elongated portion. The connecting rod is connected through the bush and screw. Screw used is of 19.05 mm. Fig.1 (a) & 1(b) show two different views of the internal parts of the speed breaker device. This whole mechanism is covered by 4 mm thick wooden ply-board. The complete process of manufacturing is shown in the table 1 (given at the end of the article).

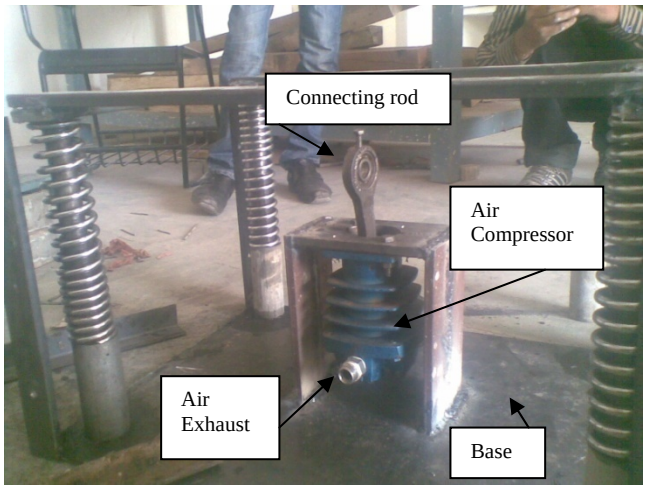

Fig. 1(a) Internal view of speed breaker device

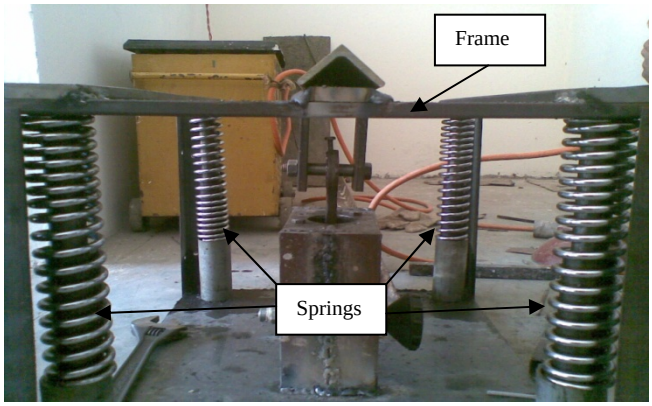

Fig. 1(b) Internal view of speed breaker device from another angle

This assembly is fitted in the highway and only curved shape dome of mild steel plate is outside of the road which acts as speed breaker. The air-tank is considered as a reservoir and is connected to the compressor out let. This air tank stores the generated air for its further use.

When the vehicle (load) passes over the curved shape metal sheet i.e. dome, it goes down due to the load of vehicle. This assembly pushes down to the spring. This curved dome is connected with the piston via connecting rod. This quick action (movement of piston downward) compresses air in the compressor cylinder which escapes out (exhaust stroke) from the delivery valve and stored in the air cylinder (tank). When the vehicle goes away from the speed breaker, the dome along with piston moves up quickly due to the action of spring allows air intake into the compressor cylinder (suction stroke). These steps are repeated with the successive passing of vehicles. The frequent up and down movement of air compressor piston (attached with speed breaker dome) complete the intake and exhaust strokes of the air compressor repeatedly. These repeated cycles will be possible with busy roads will store a good amount of pressurized air in the air cylinder that can be further utilized for useful purposes.

III.TESTING OF DEVICE

The block diagram as shown in Fig. 2 depicts the complete process of application of speed breaker device for generation of compressed air. The device was installed in the road as shown in Fig. 3 and vehicles (motor cycles and cars) were allowed to pass over the device. The weight of vehicles presses the dome of speed breaker which presses piston of reciprocating air compressor quickly, the air is generated as a result is stored in the air cylinder. The air stored in the air cylinder can be utilized for many purposes e.g. repair of punctured tubes.

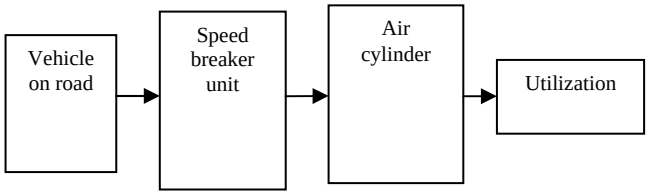

Fig.2 Block diagram representing generation and utilization of compressed air

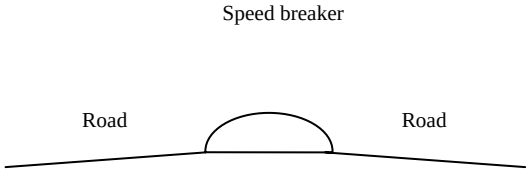

Fig. 3 Schematic diagram of use of speed breaker Device on road

IV.CONCLUSION

This speed breaker device is proved to be very useful in utilization of energy of vehicles lost on speed breakers. The manufacturing steps of this device are very simple and very specific manufacturing facilities are not needed. As tests show frequent movement of vehicles over it generates enough air (80 cc of atmospheric air is pushed up into the air tank connected with the device, per cycle of suction and exhaust strokes) for commercial utilization. This compressed atmospheric air finds applications where pressurized air is required e.g. repairing puncture of the tube of tyre, cleaning of machines with steam of pressurized air. Frequent passing of vehicles is ensured by increasing traffic on highways. It is further suggested that use of multiple air compressors attached with the same speed breaker would lead to improvement in the efficiency of the device.

V. ACKNOWLEDGMENT

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TABLE I

STAGES OF MANUFACTURING OF DEVICE

Part	Material	Picture
Frame [Strip in rectangular shape(8 mm thick1.5 inch width); 4 circular road (25.4 mm dia; 228.6 mm length);angle (3mm thick, 2×3)]	Mild Steel	
Base [Metal sheet 6 mm thick, 1.5 feet long 4 hollow pipes, 25.4 mm internal dia.]	Mild Steel	
Dome [2×2 feet, 6 mm thick metal sheet]	Mild Steel	

Compressor head [cylinder with piston and crank shaft]	Cast Iron	
Connecting arrangement [Connecting road of piston, connected strip, bush, crew]	Forged Steel