A Mini Project Report On

TITLE:

Vehicle Operating on Compressed Air by Coupling Rod Locomotive and Inversion of Slider Crank Mechanism

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Guide

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Vehicle Operating on Compressed Air by Coupling Rod Locomotive and Inversion of Slider Crank Mechanism

ABSTRACT: *This paper describes the working of a vehicle which works on pneumatic power. A pneumatic vehicle uses compressed air as a source of energy for locomotion. In this system a double acting pneumatic cylinder is operated as a slider crank mechanism with the help of coupling rod locomotive which converts the linear reciprocation of the cylinder piston rod into oscillatory motion of the driver crank.*

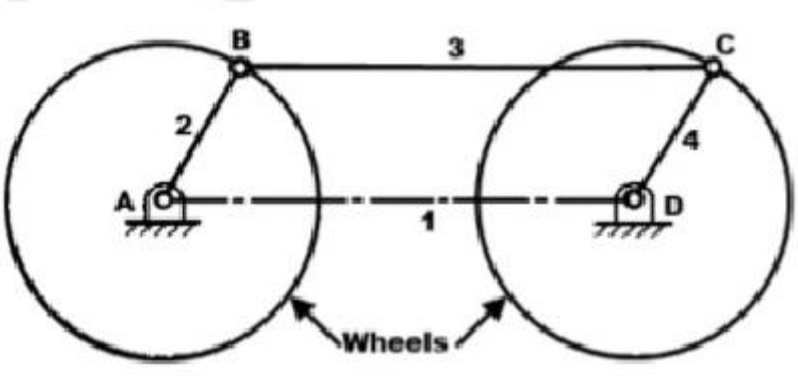
I. INTRODUCTION

A **coupling rod** or **side rod** connects the driving wheels of a locomotive. Steam locomotives usually have them, but some diesel and electric locomotives, especially older ones and shunters, also have them. The coupling rods transfer the power of drive to all wheels.

A **slider-crank linkage** is a four-link mechanism with three revolute joints and one prismatic, or sliding, joint. **Slider-crank mechanism** is an arrangement of mechanical parts designed to convert straight-line motion to rotary motion, as in a reciprocating piston engine, or to convert rotary motion to straight-line motion, as in a reciprocating piston pump.

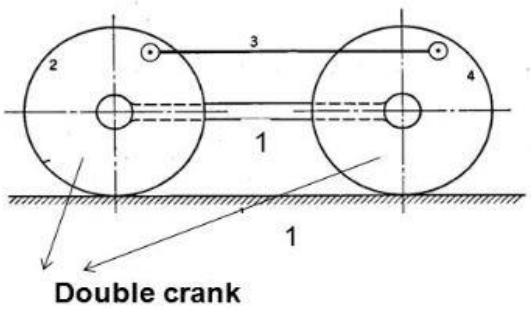
In a pneumatic system, the working fluid is a gas (mostly air) which is compressed above atmospheric pressure to impart pressure energy to the molecules. This stored pressure potential is converted to a suitable mechanical work in an appropriate controlled sequence using control valves and relay module controlled by a microcontroller. In this work a sincere effort is made to develop Vehicle operating on compressed air by **by Coupling Rod Locomotive and Inversion of Slider Crank Mechanism**

II. Coupling Rod Locomotive:



Links -links AD frame (Fixed), link AB (Crank), link BC (Coupling Rod), link CD (Crank)
Pairs -Turning Pair = AD (Frame) & AD (Crank),Turning Pair = AD (Frame) & CD (Crank),Turning Pair = AB (Crank) & BC (Connecting Rod), Turning Pair = CD (Crank) & BC (Connecting Rod)

Inversions of four bar chain
Double crank mechanism
Coupled wheels of locomotives

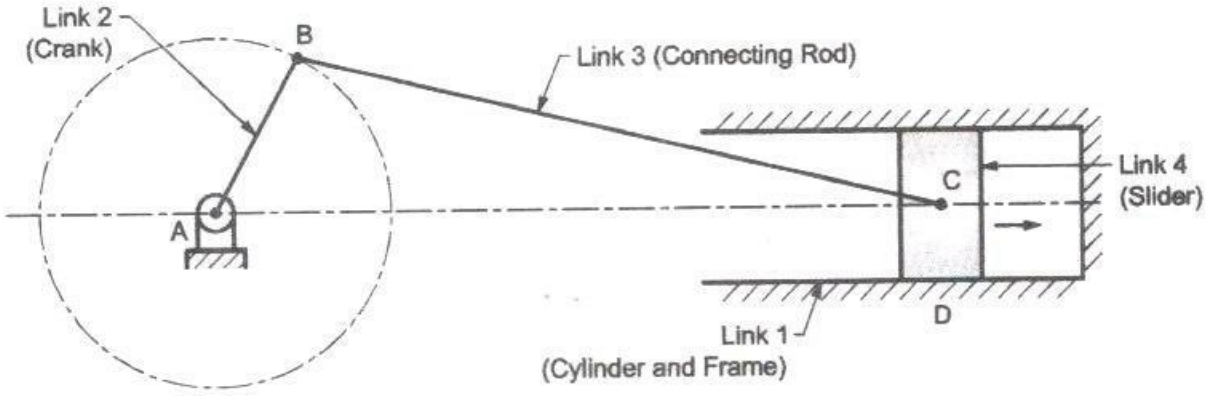


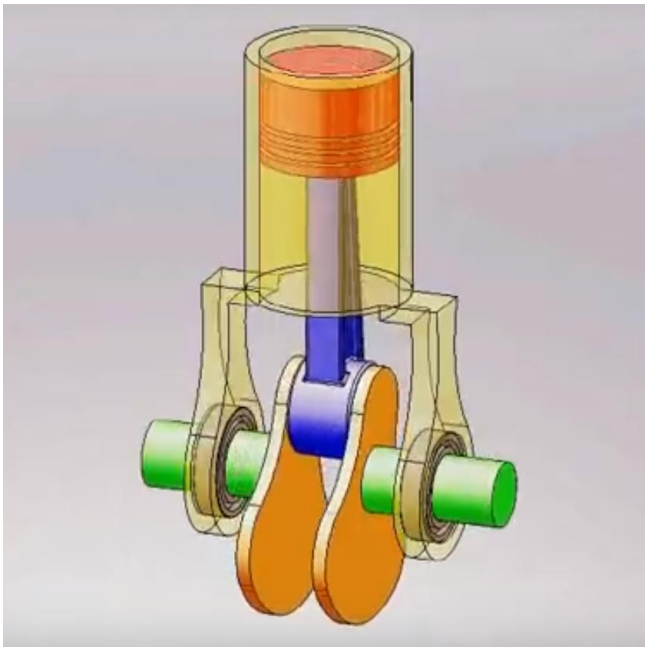
- Consists of four links.
- Link 1 fixed
- Link 2 and 4 are of equal lengths are called as Crank **(Rotating)**.
- Link 3 acts as a coupling rod for the two crank (or wheels).
- Rotary motion from one wheel is transferred to other wheel.
- Converts rotary motion from of one crank (or wheel) to rotary motion of other crank (or wheel).
- Egs: Coupled wheels of the locomotives.

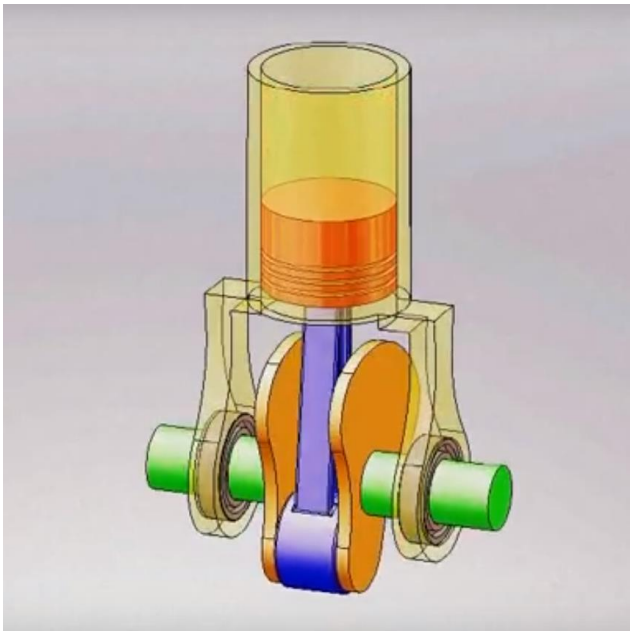
Construction: This mechanism is an inversion four bar kinematic chain. This has four turning pairs. It is consists of frame AD which is fixed, on which two cranks AC & BD are fitted on it. The cranks are free to rotate about points A and D. Both the cranks have same lengths. Two cranks are connected to each other by means of coupling rod, Connecting the other ends B and C of both cranks. At the connections B and C there is turning pair.

Working: When link AB starts rotating about fixed point A. The rotary motion of wheel is transmitted to next wheel by means of coupling rod BC. As a result, the other wheel also starts rotating in same direction and same speed, because both cranks have same radius of rotation.

III. Inversion of Slider Crank Mechanism:







Slider-crank chain inversion arises when the connecting rod, or coupler, of a -crank linkage becomes the ground link, so the slider is connected directly to the crank

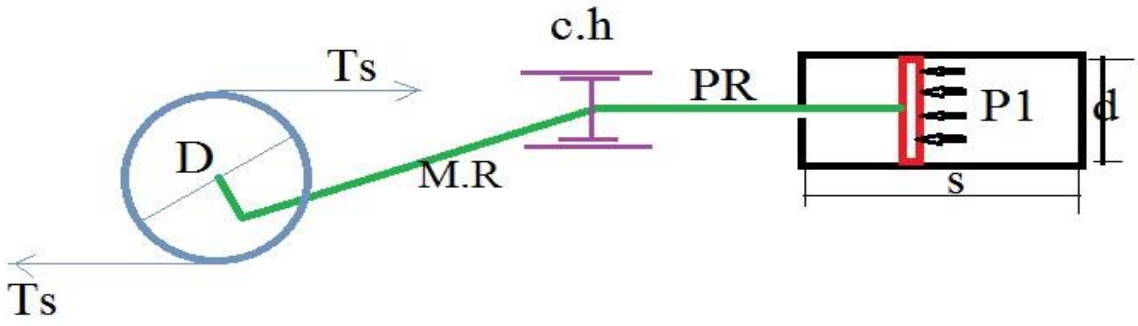
Different mechanism by fixing different link of slider crank chain are as follows:

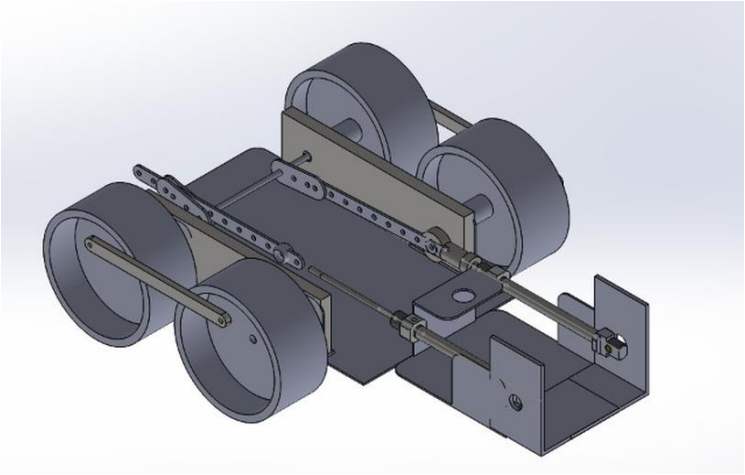
First inversion:

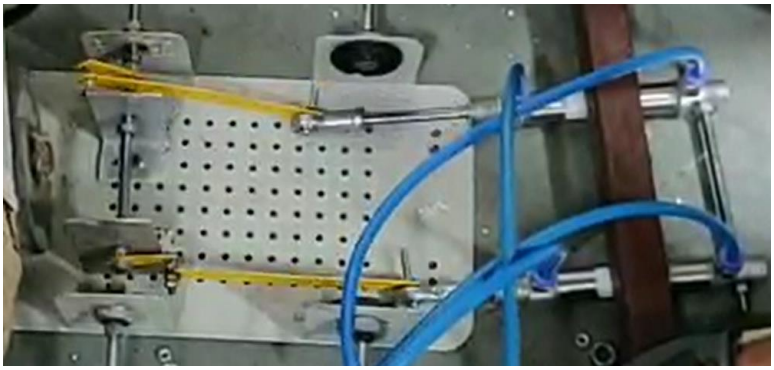
This inversion is obtained when link 1 (ground body) is fixed.
Application- Reciprocating engine, Reciprocating compressor

IV: Working and Prototyping of Model

The wheel is connected to the rod by a crank. The rod is connected to the piston rod of the steam cylinder., thereby converting the reciprocating motion of the piston rod generated by steam power into wheel rotation







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- MATERIALS USED IN CONSTRUCTION OF THE MODEL

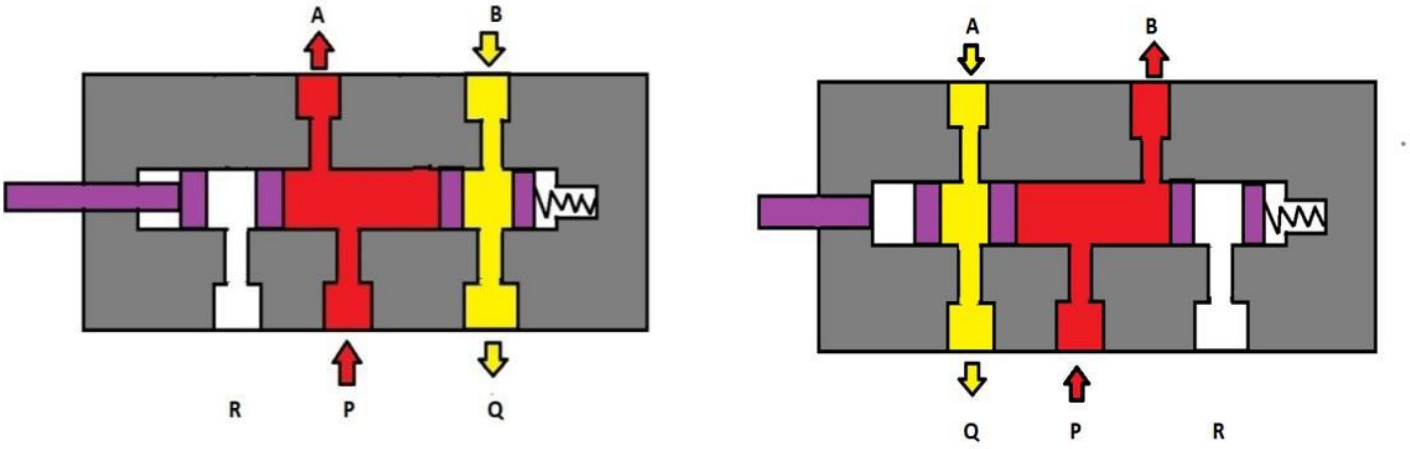
- LONG LINKS	X4
- SHORT LINKS	X4
- SHAFT DIA 13	X3
- BALL BEARINGS	X4
- PNEUMATIC PISTON	X2

4.1. WORKING OF DOUBLE ACTING PNEUMATIC CYLINDER

Pneumatic cylinders or air cylinders are mechanical devices which use the power of compressed air to produce a force in a reciprocating linear motion or cylinders which converts pneumatic power into mechanical power. Compressed air forces the piston to move in the desired direction.

4.2 5/2 DIRECTIONAL CONTROL VALVE

To control the to and fro motion of a pneumatic cylinder, the air energy has to be regulated, controlled, and reversed with a predetermined sequence in a pneumatic system. Similarly, one has to control the quantity of pressure and flow rate to generate desired level of force and speed of actuation.



4.3 Two Channel Relay Module

This 2 Road/Channel Relay Module (with light coupling) 12V module meet the safety standard as control areas and load area have the isolation groove. Optical coupling isolation module.

Meaning of High level and Low-level:

High-level trigger refers to using the anode voltage at the VCC connection way of a trigger and triggers the end when the trigger side has the positive voltage or to trigger voltage when the relay is off.

Low-level trigger refers to using the negative voltage at the GND connection way of a trigger and triggers the end when the trigger side has 0 v low voltage or voltage to can trigger, the relay is off.

4.4 Arduino UNO

The Arduino UNO is an open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino.cc.[2][3] The board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits.[1] The board has 14 Digital pins, 6 Analog pins, and programmable with the Arduino IDE (Integrated Development Environment) via a type B USB cable.

V. CONCLUSION

The technology of compressed air vehicles is not new. In fact, it has been around for years. Compressed air technology allows engines that are both non-polluting and economical.