Design and development of Air Compressor using Whitworth Quick Return Mechanism

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Abstract— The objective of this experiment is to investigate the kinematics motion of a whitworth Quick Return mechanism. The investigation is to show that it is indeed a quick return mechanism and to evaluate the increase in efficiency that this would offer if applied to a machine tool. In this project we store compressed air in vessel by using Whitworth Quick Return mechanism which is driven by motor. The main aim of our project is to design and develop air compressor using Whitworth Quick Return mechanism, the 3D model is drawn. All the parts will be manufacture and then assemble together and then the testing of model will be carried out.

Keywords: Compressor, Air compressor, Whit worth quick return mechanism, Pneumatic cylinder etc.

I. INTRODUCTION

A quick return mechanism is a mechanism that converts rotary motion into reciprocating motion at different rate for its two strokes. When the time required for the working stroke is greater than that of the return stroke, it is a quick return mechanism. It yields a significant improvement in machining productivity. Currently, it is widely used in machine tools, for instance, shaping machines, power-driven saws, and other applications requiring a working stroke with intensive loading, and a return stroke with non-intensive loading. Several quick return mechanisms can be found in the literatures, including the offset crank-slider mechanism, the crank shaper mechanisms, the double crank mechanisms, and the Whitworth mechanism. All of them are linkages. A linkage has its strengths and weaknesses. It is inexpensive to make and easy to lubricate.

According to research papers instead of developing Air compressor by one cylinder it is required to make Air compressor by using two double acting cylinder

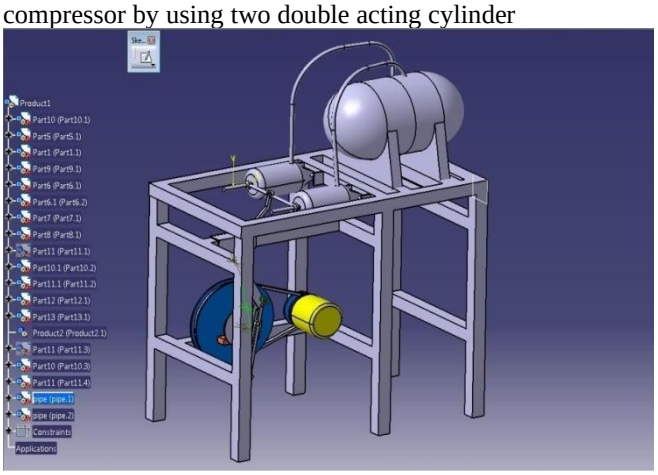

Fig. 1: Model for producing Air compressor using quick return mechanism

Practical use of two double acting cylinders is much better than one double acting cylinder, which results in more efficiency and less required cycle time to produce compressed air.

II. MOTIVATION

In order to save cycle time of air compression and to increase system efficiency we are going to use two pneumatic cylinders instead of one pneumatic cylinder. Our aim to produce an Air compressor as more output with less input. This project will help to increase productivity which results in organizational growth as this is work on more output with less input, and less cycle time of air compression. To use the reciprocating motion of the Whit worth quick return mechanism to produce an Air compressor.

III. OBJECTIVES

The objectives of the work carried out are:

- The objective of this project is to investigate the reciprocating motion of a Whit worth quick return mechanism. The investigation is to show that it is indeed a quick return mechanism and to evaluate the increase in efficiency that this would offer if applied to a machine tool.
- To use the reciprocating motion of the Whit worth quick return mechanism to produce an Air compressor.
- To get more efficiency by producing compressed air with using two double acting cylinders.

IV. SYSTEM DESIGN

1) Ball bearing selection

Principal dimensions (mm)			Basic load ratings (N)		Designation
D	D	B	C	Co	
20	52	15	15900	7800	6304

Table. 1: Ball bearing details (From table no 15.5 (design data book V. B. Bhandari))

2) Belt drive calculations

Dia of small pulley (driver) = 60mm
Dia of big pulley (driven) = 200mm
Length of Belt

$= 2*C.D+ (D+d/2)+(D-d)2/4*C.D = 1142$ mm

Speed of Belt $= \pi*D*N/60 = \pi*60*1200/60 = 3.76$ m/s

3) Design of Shaft

Selected Shaft Dia = 20 mm
Selected Shaft Length = 200 mm

V. SYSTEM REQUIREMENT

Sr. No.	Component Details	Photo of purchased product
1	DC Motor: 220-230 Volts, 3200 rpm, 50 watt	
2	Ball Bearing: D-52 d-20 B-15	
3	Belt & Pulley: Driver pulley- 60 mm Driven pulley- 200mm Belt Wp- 14mm, W- 17mm, T-11 mm	
4	Pneumatic cylinder: Bore dia-20mm Length-200mm	

Table. 2: Specifications of the components used

VI. CONCLUSION

With growing number of Industries in India it is important to give small efforts for growing industries. This will definitely help in organizations growth as this is work on more output with less input, and less cycle time of air compression. We worked on this project with lot of researches and produced an Air compressor with maximum system efficiency and less cycle time for air compression. Also system will give more output with less input.

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