Research Article

Mechatronic System Design of Feeding Mechanism in Shuttlecock Launcher by using Rotary to Linear Motion

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ABSTRACT

Taking advantage of one of the most common mechanical mechanism that we called it Rotary to Linear motion into one of the common popular gym interest apparatuses named shuttlecock launcher Machine to improve and promote their ability and keep it apart from complexity in a particular part has been addressed. This paper described and designed the Rotary to Linear motion into the Feeding Mechanism Unit one of the most important parts in the shuttlecock launcher that will push the shuttlecocks in the dispenser unit through the ejection unit.

Keywords*: Shuttlecock Launcher, Mechatronic System, Feeding Mechanism, Mechanical Design.*

1. INTRODUCTION

In the world of machine controls, linear motion is the name given to the process of moving some object in a straight line, usually with a programmed speed and to a defined position, in addition to the mechanical components, the linear-motion control system may include control electronics to process movement commands into motor-control commands and sensors to provide position feedback to the control system [1]. Most industries using technical and twist processes and create mechatronic systems and to produce superfluous quantities and save more time and cost at the same time. This obviously, human life becomes more rapidly and optimizing when taking advantage of the mechatronic systems. These technologies advances are highly supported by the development of mechatronic, the miniaturization and the drastic cost reduction of smart sensors and actuators, and of course the increased processing capacity [2]. Briefly, the feeding mechanism one of the common systems which led to process optimizing in systems such as training with shuttlecocks in badminton gym. A wide variety of ball throwing machines employing counter rotating wheels have been used in the past for activities such as tennis, ping pong, baseball, and volleyball practice [3]. Gym industrials one of the common that automation machines have been advancing during past decades, like badminton gym facilities. it is difficult to practice badminton without the assistance of another skilled player and coaches [4]. Shuttlecock launcher is a machine that will help the badminton trainer with assistance, and it is highly accepted. However, this kind of feeding mechanism will be used by ping pong ball machines for feeding purposes or any other fields that call for feeding mechanism purposes. Shuttlecock launcher includes three major units, Ejection Unit, Feeding Mechanism Unit, and Dispenser Unit. In this paper, we will describe and map the new kind of feeding mechanism out that we called FMU.

2. MECHANISM PERFORMANCE IDENTIFICATION

Different feeding mechanisms have been designed in the shuttlecock launcher machine, includes gripper mechanisms or railing mechanisms, that pushing a shuttlecock with complexity and cost. However, I have addressed this kind of mechanism in a specific and simple design. We can use this kind of mechanism for different purposes through different parts. The shuttlecock launcher machine includes a dispenser unit, a feeding mechanism unit, and an ejection unit. As I mentioned, in this paper, I am going to map the Feeding mechanism unit out. The feeding mechanism

Unit (FMU) transmits and pushing the shuttlecocks from the dispenser unit into the ejection unit, and the ejection unit has a main role in order to eject and proper the shuttlecocks.

As I mentioned, guide and push the shuttlecocks from the dispenser unit through the ejection unit will be done by FMU, which plays a key role in the machine performances. So basically, to push the shuttlecocks out it calls for the design of a mechanical mechanism that can cope with this mission, and for this reason, I have chosen a kind of Rotary to Linear motion mechanism and going to use it in the FMU structure. In continuity, the purpose of this article will be in touch and focus on the FMU structure and design it.

3. FMU STRUCTURE & DESIGN

In order to design and setting the FMU efficient system, it is calls for investigating the FMU roles in the machine. As I mentioned, the shuttlecock launcher machines taking advantage of the FMU in order to push shuttlecocks into the ejection unit. Moreover, we need a mechanism that can carry or push shuttlecocks one by one through the dispenser unit, efficiently.

To do this approach, I have taken advantage of one of the most popular mechanisms that will convert the Rotary motion to Linear motion with simple assembly parts. Convert the Rotary motion to the Linear motion has been done by the specific components that we should recognize the components part by part. In order to do this design, DC- Gearbox Motor (4), Belt-Wheel (2), Thread-Shaft (1), have been used in the FMU structure.

DC-Gearbox Motor has been used for the FMU kinematic power with 200 RPM, Belt-Wheel for power transmit through Belt-Wheel, and then, a Thread-Shaft for the linear motion on behalf of kinematic power when transmit by Belt-Wheel. However, in this structure, we have more components like hard surfaces (3,5,6) to keep the parts touch. (Fig.1)

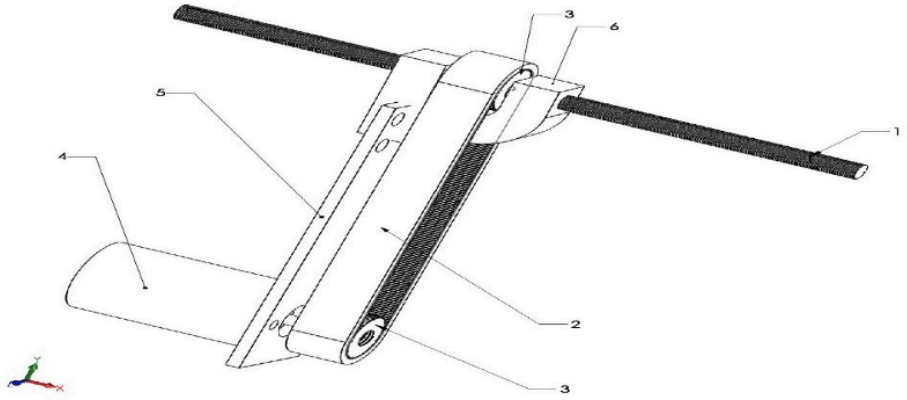

Figure 1. As I mentioned, the FMU has the main function of feeding the machine.

With DC-Gearbox Motor circulation, the whole of the system will run in a circle direction which led to Thread-Shaft circulate-reciprocal motions due to the thread that exists on the shaft surface. Besides, no matter what component scales will use in this kind of mechanism, we can use any scales to design this kind of mechanism. While the thread-shaft (1) movement due to the Belt-Wheel circulation, it will touch the shuttlecock surface (Fig2), and push or force one, and in continuity, all the rest shuttlecocks will be getting out one by one in dispenser unit (11) through ejection unit. (Fig.2)

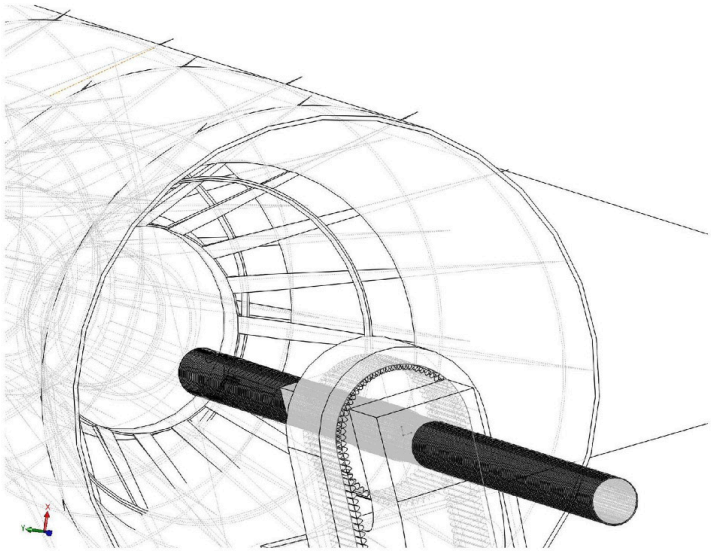

Figure 2. The Belt-Wheel circulation.

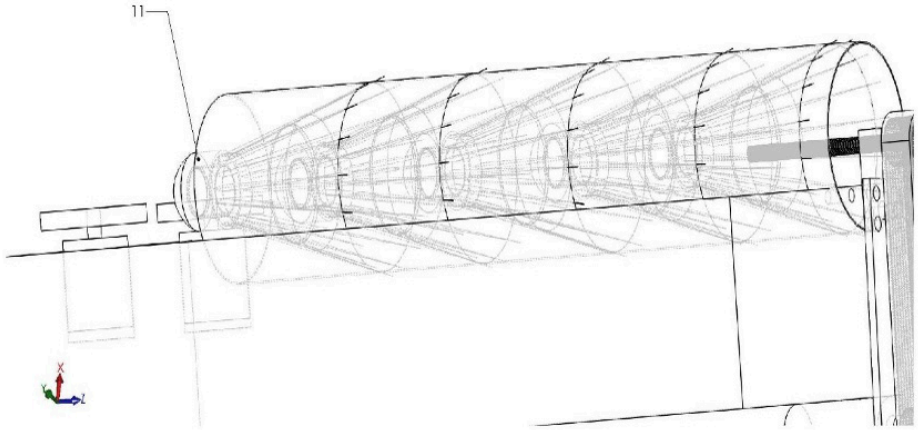

Figure 3. The dispenser depletion of shuttlecocks

Hence, the thread-shaft will push back by reverse motor circulation with the dispenser depletion of shuttlecocks. (Fig.3)

1. FMU REPAIR AND MAINTENANCE

The FMU has been innovated by very simple components and structural. basically, the more simples one mechanism is, the more can keep it running. As we know, we can take advantage of Lubrication and cleaning for maintenance.

2. CONCLUSION

As the result, we have developed and designed one of the most popular mechanical-Mechanism movements in a shuttlecock launcher machine with very simple components and assembly, that can push shuttlecocks efficiently and simply. Moreover, the unique of Rotary-to-Linear motion converter design proposed here can be applied to various engineering fields, instead of existing mechanical Rotary-to-Linear mechanisms, due to the advantages in a compact size and precise control.

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