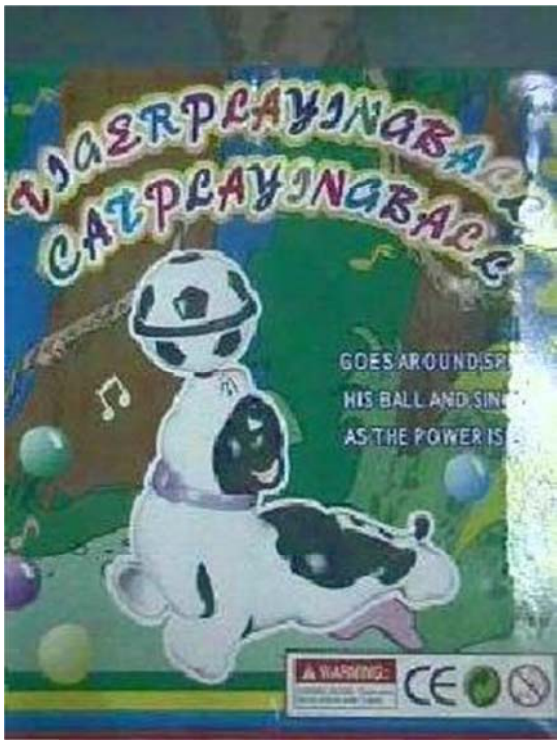
HANDS ON LAB ME 371

Introduction

We are going to demonstrate the working of an interesting toy. It is basically a cat playing with a ball.

FIGURE

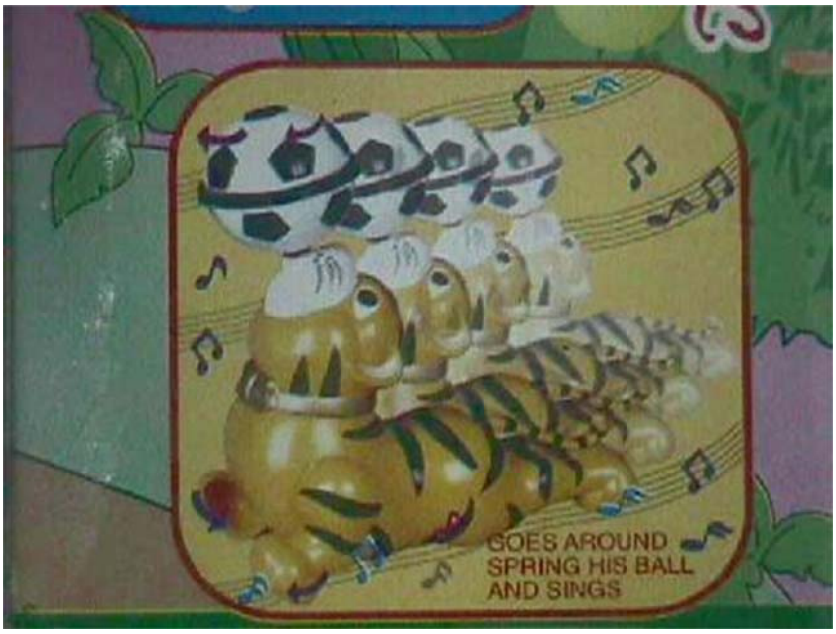


It dances and spins the ball as it moves along its path. It is a simple device in which the motion is transferred through gears and the motion of primary shaft is powered by a dc motor run by two 1.5 volts batteries.

Motion :

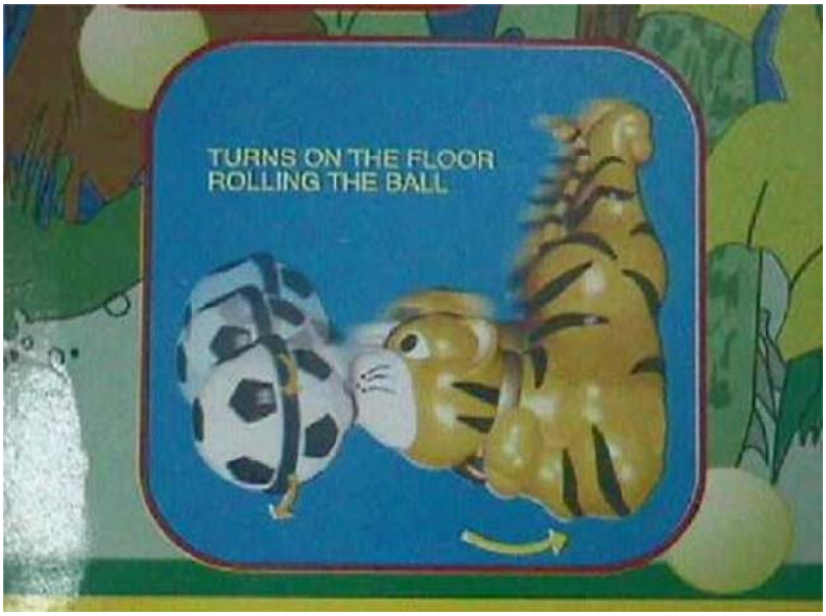
The toy walks on the floor by the reciprocating motion of its feet with the ball spinning on its mouth.

FIGURE



After moving in the forward direction for a while the Toy bows in the forward direction and touches the floor with the ball on its mouth. There on it moves in a circular path.

FIGURE



After executing an angular rotation , it lifts itself up supported on its feet and starts walking again. During its forward motion , it makes a knocking sound as well.

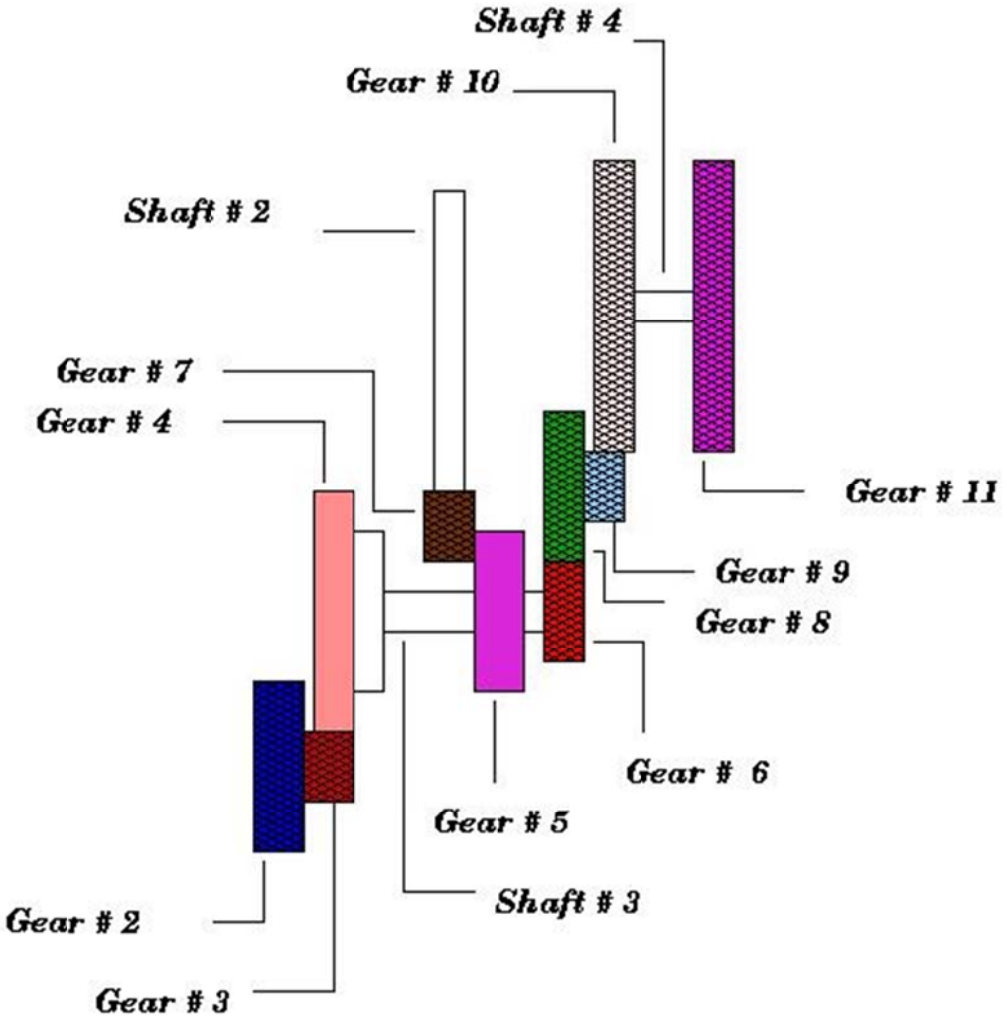
Mechanism

The shaft of the motor is mounted with a spiral gear (gear # 1). This spiral gear engages an assembly of a pair of spur gears (gear # 2,3)connected to a common shaft. The spiral gear is engaged to the larger of the two gears (gear # 2)of the assembly.

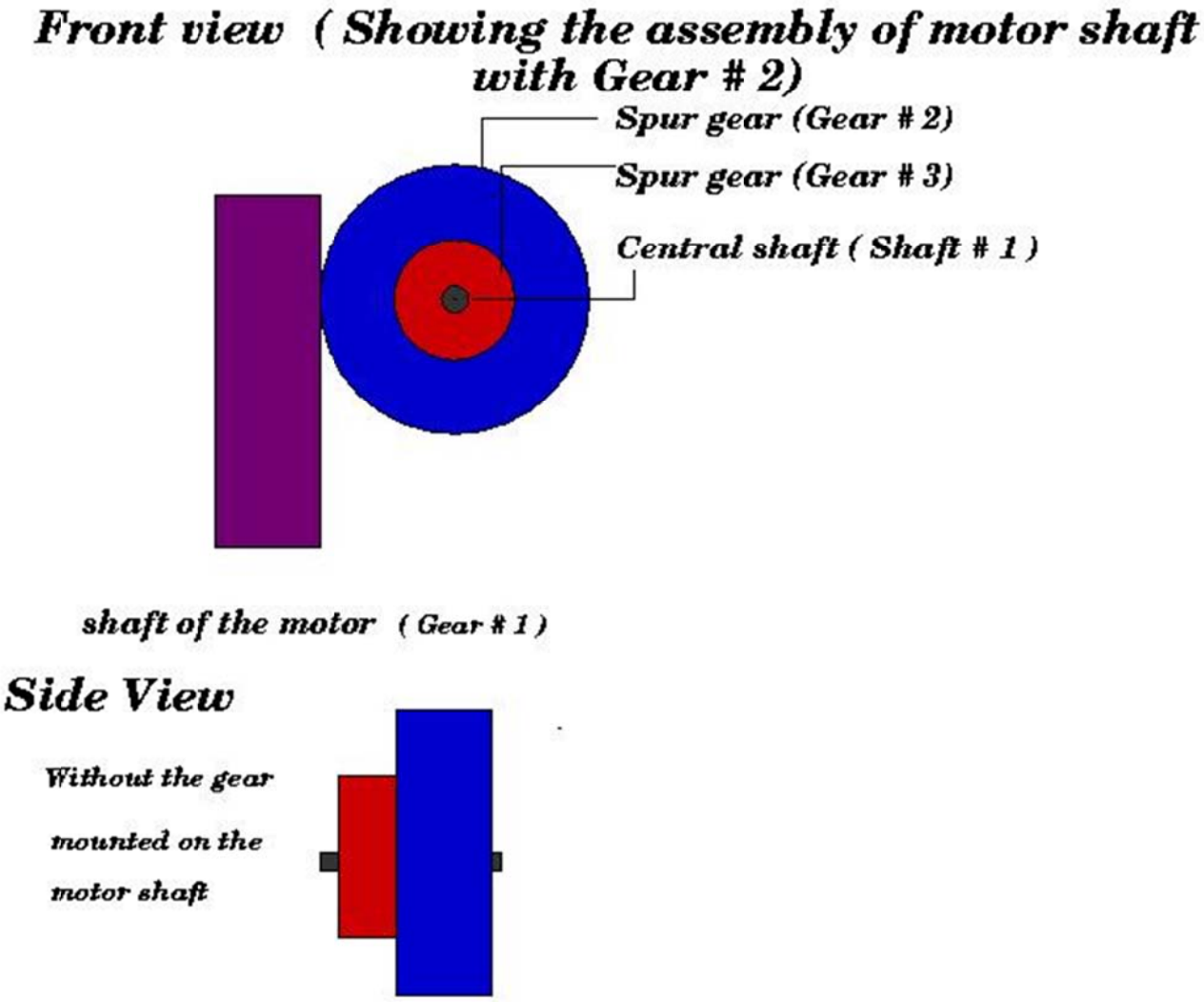
FIGURE

This gear train converts the rotatary motion parallel to motor shaft to rotatory motion perpendicular to the motor shaft.

Assembly drawing (Side view)



The drawing doesnot include the gear of the motor shaft.



The gear # 3 rotates a shaft (Shaft # 3) having three different types of gears. (gears # 4 ,5,6) The first gear (Gear # 4) is engaged to the smaller spur gear (gear # 3) of the shaft # 1.

FIGURE

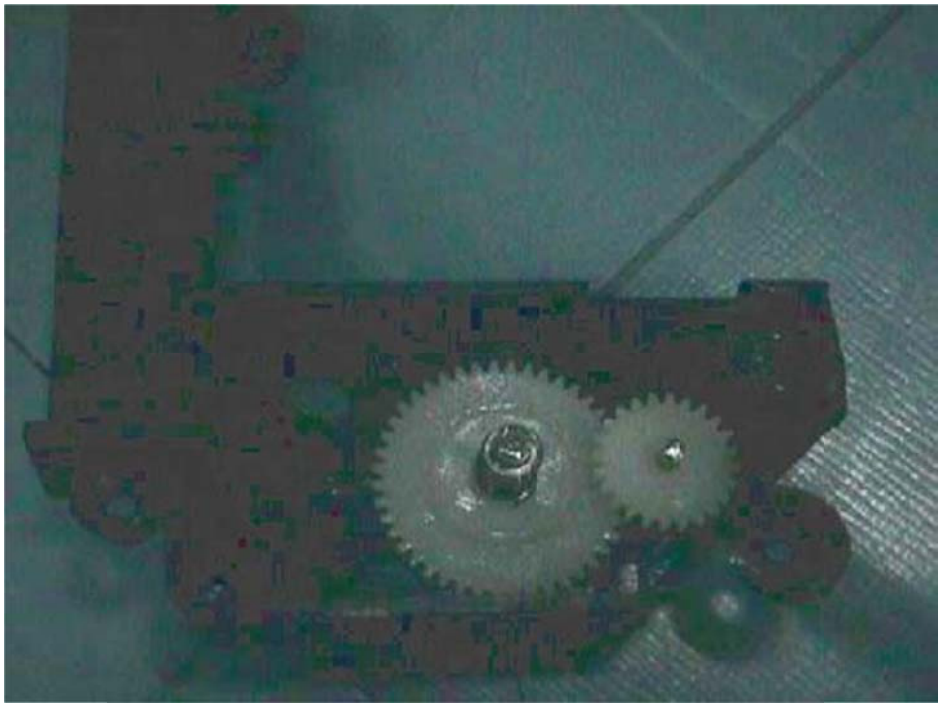
The second type of gear (Gear # 5) engages the gear (Gear # 7) mounted on the shaft carried by the ball (Shaft # 2).

FIGURE

Gear # 6 engages a shaft carrying two gears (Gears # 8 ,9). Gear # 6 is meshed with gear # 8. Another gear connected to this shaft i.e, gear # 9 meshes with a shaft (Shaft # 4) carrying two gears (Gears # 10 , 11). The motion is transferred in this way to the gear # 11.

Gear # 10 FIGURE

Gear # 8 , 9 , 10(Gear # 9 not visible) FIGURE



Gear # 11 FIGURE

Gear # 11 is a special type of gear which has two types of teeth fabricated on it. This gear is to engage with the gear on leg shaft which is connected to the legs.

FIGURE

Its motion provides the legs with reciprocating motion . When the widely spaced teeth comes in contact with the teeth of the gear

mounted on the leg shaft , the legs undergo oscillatory motion due to a spring fixed at the other end of the leg shaft.

FIGURE

The toy also makes sound as it moves because the spring makes the engagement jerky. The toy moves exactly 10 paces before encountering the other set of teeths. This is because the number of widely spaced teeths are ten. When the gear mounted on leg shaft encounters the region where there is no tooth on the gear # 11 , the legs lifts up due to the spring action.

FIGURE

Due to a small eccentricity in the center of mass ,the neck portion of the toy falls down and the toy makes a rotation with the spinning ball acting like the wheel. When the gear mounted on the leg shaft encounters the set of teeth which are closely spaced ,the legs once again touches the ground (by spring action once again) and it lifts the body.

FIGURE

Once again the gear of leg shaft engages with widely spaced teeths of gear # 11 , it begins to walk. So the motion goes on.

Materials Used and Design

The gears are made up of plastic. Though this is not strong enough strength wise , it will still serve our purpose as the contact stresses are not too large and the load transfer involved is also small. Besides this , the plastic gears have an advantage of being light weighted,and easy to fabricate.

The legs of the toy are specially designed so as to allow the toy a smooth lift , when the leg shaft gear engages the closely spaced teeths of gear # 11.

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