

Final Operation and Assembly Manual

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Introduction

The aim of this project is to create a kinetic sculpture that illustrates several principles of mechanical engineering combined with an artistic methods. Kinetic sculptures are forms of art used to exhibit motion that would improve attractiveness of the object. This artistic object utilizes engineering concepts such as energy and transferring it to express fascination. The blending of engineering and art has been displayed in various kinetic sculptures. In this assessment, the major interest is on a kinetic sculpture made of different types of materials. In addition, the project is developed to provide a deeper understanding of the physical nature of engineering. In this manual: the project objectives, description of kinetic sculpture, and its principles are evaluated.

Manufacturing

This section covers the correct procedures to help manufacture the device separating the machine box into two halves and two parts of the bird.



Item Number:	Materials:	Quantity:
1	Bevel Gears	2
2	Rods	2
3	Timing pulley	3
4	Crankshaft	1
5	Camshaft	1
6	Rubber V-belt	1
7	Hardy board	2
8	Foam sheet	1
9	Felt	6 ft x 6ft
10	Melamine Board	6
11	Screws	20
12	Bolts	4
13	Bearings	5
14	Dense Styrofoam	2, 4ft x 4 ft
15	Wood	1

Figure 1&2: Machine Box 1 & 2

Assembly:

First Half of the machine box:

1. Start by placing the entire base wooden board from figure 1 part number 10 as a base.
2. From their start attaching the two white wooden boards as figure 1 part number 10 oriented as squares acting like a stand.
3. Add the two bearings as figure 7 and 8 on top of the square shaped wooden boards for stabilizing.
4. Add two bolts on both ends of the bearing as figure 9.
5. Attach four screws as figure 28 in the bottom of each square board to stabilize them totaling eight screws.
6. Attach the red bevel gear to the shaft as shown in figures 20 and 21.
7. Attach the shaft connecting the two white wooden boards and bearings.
8. Attached the first end of the shaft with the crank using silicon glue.
9. On the opposite end of the shaft attach the 1st timing pulley as shown in figure 23 and 24.
10. Attach another rectangular shaped wooden board making a right angle with both squared boards attached in the beginning
11. Attach the double roller bearing as illustrated in figure 26 and 27 into the blue bevel gear using silicon glue.
12. Attach the double roller bearing attached to the blue bevel gear into the hole of the rectangular shaped whiteboard as shown in figure 29 creating a 90 degrees angle for both gear making a bevel gear placement.
13. Attach the eccentric timing pulley behind the back of the hardy board from figure 29 to the back of the blue bevel gear using silicon glue then attach the wooden shaft.
14. Assemble the hardy board as shown in figure 29 with the two rods from figure 14 and 15 inside the circular cuts of figure 29.
15. The eccentric timing pulley is then placed into the rectangular hole of the hardy board.

Second Half of the machine box

1. Attach two rectangular shaped wooden boards as shown in figure 2.
2. Add two double roller bearing as illustrated in figure 26 and 27 on both holes of the two rectangular board.
3. Attach the shaft as illustrated in figure 2 on both sides of the bearings.
4. Add the cam shaped part from figure 2 item #5 made from styrofoam creating a camshaft.
5. At the end of the shaft add the 2nd timing pulley as shown figure 5. Than attach the belt creating the V-belt system.
6. Add two screws on both rectangular wooden boards totaling four screws.

Glass

1. Add the plexi glass on all the mechanisms with rectangular and square shapes as shown in the figures 21,22 and 23.

Bird

1. Five parts creating the bird were shaped from styrofoam as shown in figures 10,11,12 and 13.
2. cover the five parts with felt material as shown in figures 3 and 4.
3. The movable items in the bird items are the wings, body and tail.

Wings:

- a. Start by attaching the two wings together.
- b. Slide the wing along the metal rod shown in figure 16.
- c. Then attach the pipes to the wings as shown in figures 10, 11, 14 and 15.

Tail:

- d. Slide the tail into the gap created in the bird's body as shown in figure 12.
- e. Align the groove at the bottom of the tail with the cam shaft as shown in figure 30.

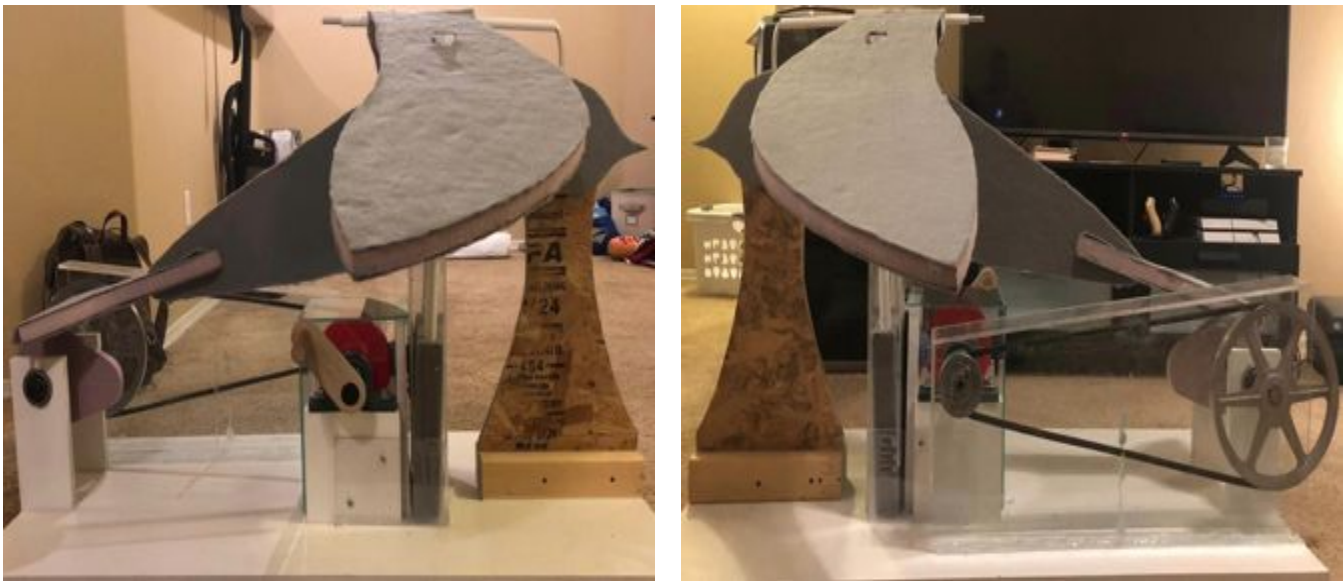


Figure 3 & 4: Bird and Glass

Working Procedures

1. Starting by a human force into cranking the crankshaft on a clockwise rotation to have it start moving.
2. Then the bearings will reduce the friction working as one principle of mechanical engineering.

3. From there the bevel gears starts rotating on a clockwise rotation rotating the timing pulley on the back of the blue bevel gear.
4. Then the timing pulley starts rotating the same directions as the shaft and the red bevel gear moving the V-Belt.
5. On the opposite side of the pulley the big timing pulley rotates on same rotation as both pulleys and timing gears.
6. The big timing pulley moves the camshaft and the two other bearings reduces the friction as well.
7. Then the camshaft starts moving the tail vertically.

Appendix:



Figure 5: Big timing pulley item #3



Figure 6: V-Belt system



Figure 7: Pillow Block bearing 1 item #13

Figure 8: Pillow Block bearing 2 item #13



Figure 9: Bolt for bearing part number #12



Figure 10: Wing 1 right side of the bird **Figure 11:** Wing 2 left side of the bird



Figure 12: Tail of the bird



Figure 13: Bird's body from the left side



Figure 14: Right plastic PEX rod part #2



Figure 15: Left plastic PEX rod part #2



Figure 16: Wings hanger metal piece



Figure 17: Bird's head right side



Figure 18: Bird's head left side



Figure 19: Blue Bevel Gear part #1



Figure 20: Red Bevel Gear part #1

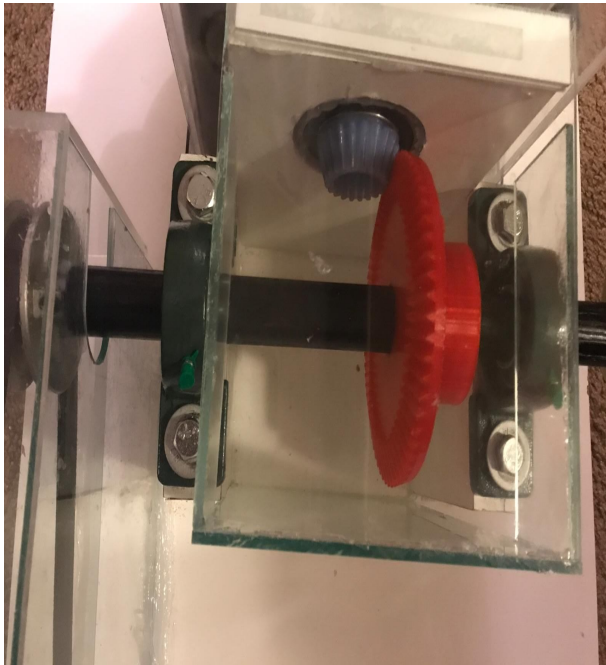


Figure 21: First machine box glass



Figure 22: First machine box glass left side



Figure 23: Second Machine box glass



Figure 24: Small timing Pulley part #3



Figure 25: Crank for the crankshaft part #4



Figure 26 & 27: Melamine board and double roller bearing



Figure 28: screws part #11

Figure 29: Hardy board and foam sheet part #8 & #7



Figure 30:Camshaft Groove