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Construction Plans for a Barn Door Type I Tracker for Astrophotography

What Is It?

A barn door in the simplest form is made of two boards hinged together, with the hinge pointing towards the polar axis. One board is kept fixed, and the camera is attached to the other. A screw is used to slowly push the boards open at just the right rate so that the camera will track objects in the sky as the Earth rotates. With this tracker you can now take longer exposure photographs with your 35mm camera without getting star trails. Typical exposures will be on the order of 5-10 minutes.

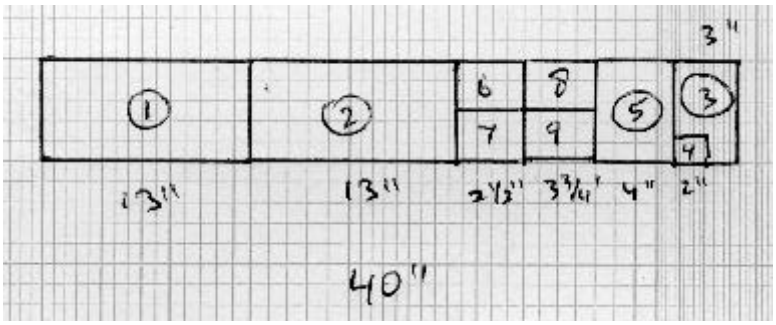
Cost:

The approximate cost of construction of the Type I is $20-30. There are other design types that are more accurate in tracking and allow for longer exposure times, but they are also more expensive. Once you have used this Type I model, you can look around and find a design you like and build a type II, III or IV.

Constructions Notes: All parts were sanded and coated with outdoor varathane (2 coats) to improve dew resistance. String is used so the camera weight does not cause the arms to flip apart and possibly break things.

Parts List:

1"x6"x4' wood (pine will do)(note that actual measurements of this wood is about 5.5" wide)



Wood Parts

1. Bottom Body 5.5"x13"
2. Top Body 5.5"x13"
3. Tracking Dial 3" circle
4. Lock mount 1.5"x2"
5. Camera Mount Dial 4" circle

6,7 Camera Mount Assembly 2.5"x2.5" each

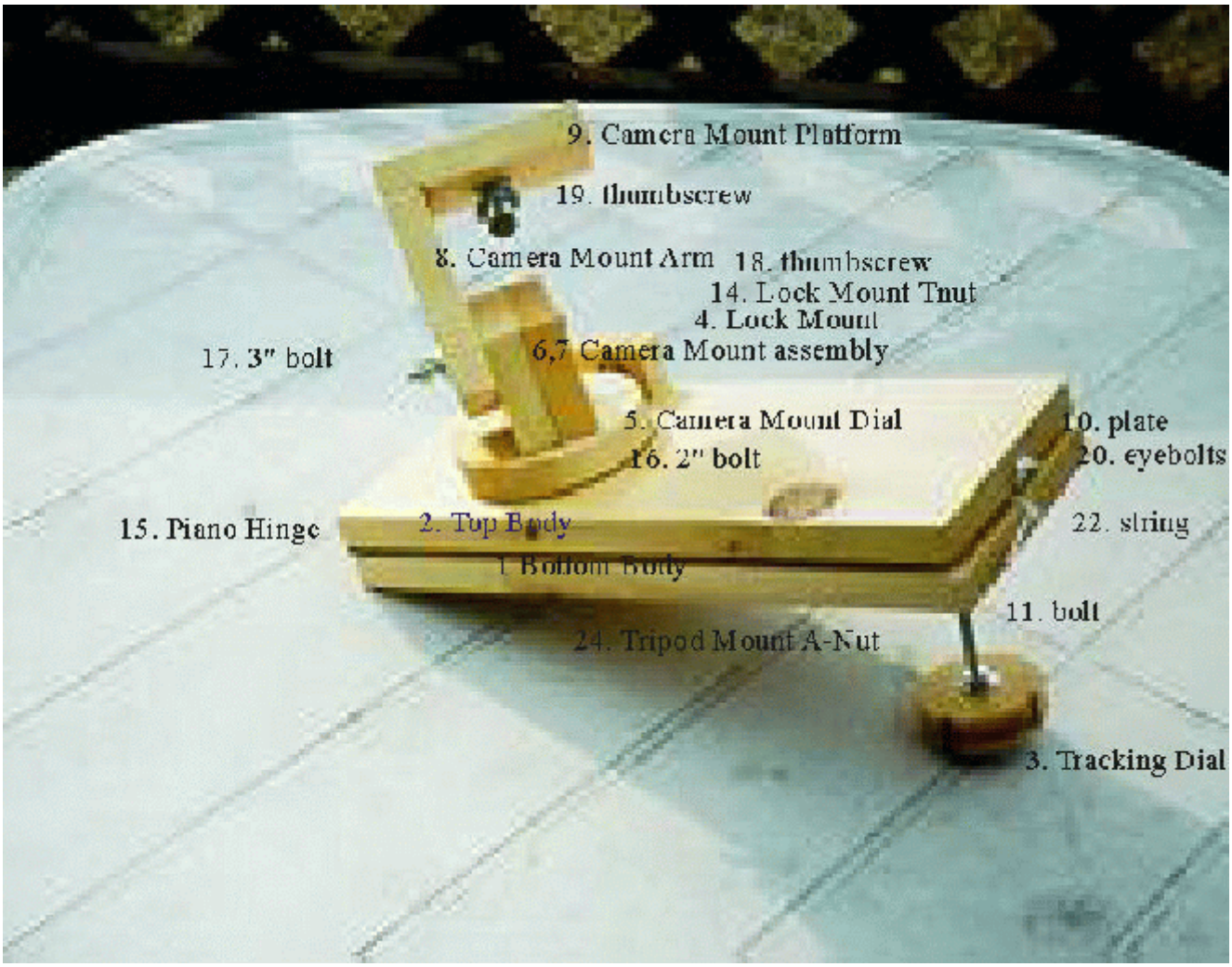
8. Camera Mount Arm 2.5"x3.75"
9. Camera Mount Platform 2.5"x3.75"

Metal parts

10. 0.5"x2" plate
11. Threaded Bolt 4 " or 5" 1/4x20 thread
12. 2 washers to fit 1/4x20 bolt
13. 2 nuts 1/4x20 thread
14. T-nut
15. Piano hinge 5.5" long, and 6 1/2" screws
16. 2" bolt, 2 washers, 1 nut, 1 locknut
17. 3" bolt, washer, wingnut
18. 2" thumbscrew, 2 washers, locknut
19. 2" thumbscrew, T-nut, locknut
20. 4 small eye bolts
21. Four 1/2" screws
22. String 8"

Other supplies:

Wood Glue
epoxy or other strong glue
sandpaper
varathane
23. rubber square 3"x4"
24. 1/4x20 A-Nut (uses a hex key to insert)



Assembly Instructions:

Cut out the wood pieces in the above diagram (parts 1-9). Sand and varathane (optional but a good idea)

Top Body (Part #2):
Drill a 5/16" hole in Top Body Part #2 along the centreline approx 4" from the piano hinge end. Countersink the bottom side the hole in the Top Body Part #2 to allow a nut to recess inside.
Cut out a notch for the Lock Mount part #4 (1.5" wide and 3/4" deep) 4" from the piano hinge end.
Glue and screw in the Lock Mount part #4 so the bottom is flush with the bottom of part #2.

Drill a 1/4" hole in the Lock Mount part #4 approx 3/8" above the top of part #2. On the "far side" insert a T-Nut (Part #14). Insert Part #18 (thumbscrew and washer on near side, washer and locknut on far side).

Camera Mount Assembly:
Drill a 1/4" hole through the centre of the Camera Mount Dial Part #5 and countersink enough for the bolthead to be flush. Insert the bolt (part #16) head up threads down and epoxy or glue it in place.

Glue together parts 6 and 7 to form a 2.5" x 2.5" x 1.5" thick block (round off the top corners). When dry drill a 1/4" hole through it.
Attach Parts 6/7 to part #5, centred on the dial, covering the bolthead and glue together. Use two screws from underneath part #5 as well.

Attach the camera Mount Assembly onto the Camera Mount Dial with a washer between the dial and the top body and underneath (inside the countersunk hole) add a washer and secure with a locknut so that it is freespinning.

Main Body Assembly:
Cut the piano hinge to the length (or slightly shorter) to 5.5"
Accurately align the top (part 1) and bottom (part 2) bodies and attach the piano hinge to both pieces of wood (hinge on the inside)

On the bottom body (part 1) drill a 1/4" hole exactly 11.43" (11 3/8") from one end, in the centre of the width on the **top surface**. This is a critical measurement and depends on the 1/4x20 thread on the main drive bolt. Countersink a slightly larger hole on the top surface and insert a T-Nut from the top. Insert the main drive bolt (temporarily) from the bottom and screw it in enough to mark the surface of the top bod and then remove it..

On the bottom of the top body (part #2) align screw on the metal plate where the mark was made. The top of the bolt should make contact with the centre of the plate. Be careful that the bolt does not touch the plate screws, giving it a bumpy ride.

Mount the Camera Mount Platform part 9 on the Camera Mount Arm Part 8 to form an "L" shape. (Again round off the bottom corners of the camera mount arm part 8 as shown above). Glue and use 2 wood screws. When dry, fit parts 8/9 with 6,7 and align so that 8/9 will move freely when part 8 has a 1/4" hole drilled through it. Drill the hole through all three pieces and attached with parts #17 (a 3" bolt, washer and wingnut). Wingnut goes on the outside of the arm.

Glue on the 3"x4" rubber grip part 23 on top of part #9. Trim edges off when dry. Trim 1/4" centre hole. Add in thumbscrew, washer and locknut. This is what holds your camera on the platform.

Tripod Mount:
On the bottom of part #1, drill a 1/4" hole on the centreline approx 5 " from the piano hinge end. and insert part 24, the A nut. This is the tripod mount and should be approximately at the centre of balance point.

Tracking Dial Assembly:
Take the tracking dial (part #3) and drill a 1/4" hole through the centre. Take the 4" bolt (part #11) and insert it into the hole on the bottom body (part#1) from the top side and screw it in all of the way (so the bolt head is up). Add a nut, a washer, the dial (part #3), a washer and a nut and tighten.

Misc:
Add 2 small eyebolts to the ends of parts 1 & 2 and tie off string so that the two arms do not fly apart more than the length of the bolt.

Add 2 small eyebolts on top of part 2 near the piano hinge to use as polar alignment aids (not very accurate but better than nothing)