Binocular Mount Construction Notes
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The inspiration for this mount came about when I purchased a pair of 11 x 70 Oberwerk binoculars recently. As expected, I am nowhere near steady enough to handhold these binoculars even though they are not very heavy. I knew quickly enough I needed a mount of some sort. A friend was also in need of a mount. He has a much heavier pair of Fuji 15 x 70's.

I saw a commercial example of a parallelogram mount in a camera store. In my opinion it is too expensive, and too shaky and vibration prone.

I tried adapting an old desk mount fluorescent light mount that uses a parallelogram. It was neither strong nor stable enough.

I built a wood prototype and tried to select materials to minimize shop time as much as possible. For the prototype I used the cheapest pine I could find. I also selected wood already cut to size where possible. The prototype cost about $26.00 to build. The binocular "L" bracket and an old light duty ball swivel mount were already on hand.

Even though I used only ½" pine for the main and short beams, the mount was remarkably useful. My 11 x 70's were held nicely and balanced with only 5 lbs of counter weight. I was amazed at how many more faint stars I could see because the binoculars were held steady. I thought I was steady enough to hand hold my old 7 x 50's but even those binoculars showed more stars when held securely.

We tried the prototype with my friend's 15 x 70 Fuji's and found the mount acceptable but a little shaky. More counterweight was needed as well. Additionally, the old ball swivel I had on hand was too small for the Fuji's.

The second version was made out of ¾" oak and once again precut lumber was purchased as much as possible. I also purchased another ball swivel. The new swivel, made by ProMaster, is much larger and heavier than my original ball screw but held all the binoculars securely. However, the added weight of both the wood and the ball swivel required more counter weight.

Version two is very satisfactory. All the binoculars I tried are held securely and comfortably enough to permit hands free viewing <u>directly overhead</u>.

The only thing that probably should be changed is the height of the main vertical post. I left the main post long intentionally because I was unsure of what length is necessary to work with various tripods. I felt I could always shorten it if necessary.

I have a fairly heavy medium duty photographic tripod. My friend has two much lighter and shorter tripods. The mount worked well with the shorter tripods without raising the

center posts too much. There was some sway in the mount due to the long post and some flexure in the small tripods. My heavier tripod is pretty stiff and will allow me to shorten the post and hopefully reduce the sway even more.
The cost for all the wood and hardware for version two was about $35. The ProMaster ball swivel was an additional $30.

I have included four drawings that detail the individual parts and how they fit together as an assembly. I'm sure Mr. Allen, my old drafting teacher would not approve of the lack of detail but I tried to convey as much detail as necessary to build the mount and not confuse the drawing with all the hidden lines and dimensioning that should be there. I drew the mount full scale but had to reduce the drawings to fit on 8-1/2" x 11" paper. I felt I had to reduce the detail with that much reduction. I apologize in advance for the unusual reductions (1/3 and 1/5 scale) but there should be enough detail to construct this mount without too much skull sweat.

The construction may be altered to accommodate materials already on hand. Just remember that if thinner or thicker wood is used, the lengths of the bolts will need to change. If the lengths of the main and short beams are altered, realize that the amount of counterweight required will also change. Shorter beams, will require more weight. In general, the counterweights provide a torque opposite to the torque generated by the weight of the binoculars and ball swivel. To balance, the weight of the binoculars and ball swivel multiplied by the distance from the center of mass of the binoculars and ball swivel to the center of the main post should equal the weight of the counterweight multiplied by the distance from the center of the main post to the center of the counterweights. Slightly more weight will probably be required than this simple calculation would indicate because the weight of the wood distributed along the length of the beams also comes into play. As long as the counter weight is neither to heavy nor too light, balance can be achieved by simply sliding the weights for and aft.

The only dimensions that should be considered critical are the dimensions between the pivot bolts. I used 5" vertical spacing and 16-1/2" horizontal spacing. The dimensions can be anything within reason as long as all vertical dimensions are the same and all horizontal dimensions are the same. For instance, if a 5" hole spacing is used on the main post and 5-1/8" spacing is used on the short vertical post, some binding will probably occur and prevent the parallelogram from opening and closing to the fullest extent possible. The same can be said for the horizontal hole spacing on the beams. Consistency is more of a concern than accuracy here.

The following notes refer to the four drawings provided.

Drawing one is a side and top view of the mount and also contains a minimal parts list. The circled numbers refer to the items number in the parts list. Where there are two circled numbers, one of each item is required at that position.

Construction

Start by cutting the lumber to the correct lengths. The main post, item 1, the short vertical post, item 4, and the short horizontal post, item 5, are cut from the same piece of 1-1/2" x 36" long ¾" oak square stock. As purchased, the post was about 36-1/4" long allowing two 8" pieces to be cut from it forming the two short posts and one 20" long post.

The two 36" long beams are cut from one piece of 6' long ¾" oak stock.
The two 18" beams were cut from two pieces of 24" long ¾" oak stock.

Tripod mount bolt.
The worst task. Refer to pages one and two. Drill a 13/64" diameter hole at least 5/8" deep into the head of the 3/8" x 6" lag screw, item 10. The hole must be straight. I used a succession of three taps. All were ¼-20 but each had a different taper at the end of the tap. I started with a ¼-20 tapered tap. This tap has the longest taper and will produce the shallowest threads but will be the easiest to hand tap so deeply. Next I switched to a plug tap. The taper is shorter, the threads will be deeper and farther down the hole. Finally, I switched to a bottoming tap. This tap has the shortest taper of all and produces the deepest thread all the way to the bottom of the hole. I was lucky in that I had all three taps. Most taps sold in sets are of the plug tap variety. They will certainly work by themselves but care must be exercised so that the tap does not break off in the hole. Always use cutting oil when tapping. Twist the tap no more than 1/8 turn then back off to break the chips. Remove the tap and blow out the chips frequently. Use cutting oil liberally.

Once the thread is in the head of the lag screw, take the 3/8" fender washer, item 13, and place it on the lag screw. Measure the combined thickness of the screw head AND the washer. 11/32" in my case.

Drill a 1/16" pilot hole about 1" deep in the exact center of the bottom of the main post, item 1. Then, use a spade bit or Forstner bit to drill a flat-bottomed hole 11/32" deep (or your measurement) centered on the pilot hole. The idea is to make the hole just deep enough so that the head of the bolt, when tightened, is absolutely flush with the bottom of the post. Done carefully, this will maximize the contact area that will mate to the tripod head. The pilot hole really isn't necessary but it makes the next task a lot easier.

Next, drill a ¼" diameter hole using the 1/16" pilot hole as a guide. Make this hole the depth of the lag screw- 6" as shown in the drawing.

Clamp the post in a vice and tighten the lag screw and fender washer, items 10 and 13, into the hole.

Use your imagination here. If drilling and tapping the bolt head as described is not practical, improvise. This isn't the only way to mount the post to the tripod but for me, it was the fastest way to do it and it works well.

Main Post, item 1 and short vertical post, item 4.
Refer to drawings one, two and four. Layout and drill the ¼" diameter pivot holes in the short vertical post, item 4 first. Be sure to drill the holes straight. If the holes are not perfectly perpendicular to the surface of the post, the pivot bolts will not fit through the holes in the side beams properly. Binding will occur when the mount is raised and lowered.

In order to help with consistency use the short vertical post as a drilling template. Clamp the short post to the main vertical post making sure that the two posts are oriented properly for drilling. The hole ¾" from the end of the short post should be clamped to the top of the main post so that the top hole in the main post will be ¾" from the top edge. Drill through both the short and main posts.

Next, drill a 1/8" diameter pilot hole centered on the top of the short vertical post, item 4. This pilot hole will accept the lag screw and washer, items 7 and 11, required to bolt the short horizontal arm to the top of the short vertical post.

The main post and short vertical post are now complete.

Short horizontal post, item 5.
Nothing trick here. Layout and drill two ¼" through holes ¾" from each end of the 8" long post.

Short and long beams, items 2 and 3.
Refer to drawing three. Consistency is important once again. Start with one short beam. Layout and drill two ¼" diameter through holes ¾" from each end of one short beam. Be sure to drill perpendicular to the surface of the beam. As shown, this produced two holes 16-1/2" apart. Use this short beam as a drilling template to drill all the remaining holes in the remaining beams.

Clamp the short beam to the other blank short beam and drill through.

Clamp the 1st short beam to one end of one of the long beams and drill through. Repeat the process for the remaining long beam.

As shown in the drawings I radiused the ends of all of the beams. This is cosmetic only, not really necessary.

Assembly

Not much to say here. Assemble the mount and check it out before applying some kind of finish to the wood. Refer to the assembly drawing, page 1, and go to it.

Start by bolting the short horizontal post, item 5, to the top of the short vertical post, item 4, using a ¼" x 3" lag screw and a ¼" fender washer items 7 and 11.

Loosely bolt the two long beams, item 2, to the bottom of the short vertical post, item 4, using ¼ - 20 x 3-1/2" hex head bolts, washers and knobs or wing nuts- items 8, 11 and 14.

Loosely bolt the two short beams, item 3, to the top of the short vertical post, item 4, and the top of the main post, item 1, using ¼ - 20 x 3-1/2" hex head bolts, washers and knobs or wing nuts- items 8, 11 and 14.

Mount your choice of ball swivel to the end of the short horizontal post using bolt and washer, items 6 and 11.

The remaining setup and initial trial should be done in daylight to become familiar with setup and teardown.

Mount some counterweights as shown using items 9, 12 and 15. Because of the added weight of the thicker oak and the heavier ball swivel, my 11 x 70 binoculars required 10 lbs. of counter weight. I used bar bell weights.

Carefully thread the mount to a tripod. Tightening the tripod bolt securely will be easier with better quality tripods. Be sure everything is secure and stable before mounting the binoculars.

Mount an L bracket to the ball swivel and mount the binoculars to the L bracket.

Adjust the knobs so the mount will move up and down freely. Carefully adjust the mount so the horizontal beams are horizontal. Slide the counter weight for and aft until the binoculars will balance at all elevations.

In use, the knobs can be tightened or loosened to the operators liking.

If all is well, disassemble the mount, sand the wood and apply the finish of your choice.

Final thoughts and some improvements.

If the wood is to be finished- either painted or stained and varnished, eventually the rotating motion of the beams at the pivot points will wear the finish.

- To protect the finish, I installed eight extra ¼" fender washers IN BETWEEN the posts and the beams where the rubbing occurs. This required longer pivot bolts. The additional washers indeed separate the beams from the posts preventing rubbing of the finish. However, with the extra fender washers, there is less contact area at the pivot points and the knobs or wing nuts need more force to tighten properly. With my 11 x 70 binoculars this is no problem. Users with heavier, (read MORE EXPENSIVE) binoculars might not want to install these washers. Instead, larger thin Teflon or plastic squares might be a better choice to achieve some separation and still maintain a large contact area.

- I also took the time to install short Oilight bronze bushings inside all of the pivot holes in the beams and the posts. The bushings I found are 5/16" outside diameter and ¼" inside diameter and are available in ½" and 1" lengths at a local hardware store. These bushings are available in brass and Oilight bronze. The brass bushings cost about $2 each. The bronze bushings cost about $0.50 each.

  I had to drill the ¼" diameter pivot holes out to 5/16". I pressed ½" bushings into the beam pivot holes and 1" long bushings into the post pivot holes.

  The addition of these bushings resulted in smoother operation but, in my opinion, not that much smoother.

  Neither the bushings nor the extra fender washers are shown on the drawings.

- My friend decided he didn't like the ball swivel I used so he improvised on his own and removed a tripod head from an unused tripod and bolted that to the mount in place of a ball swivel. It works well with his 15 x 70 Fuji's and is a lot cheaper if you already have an unused tripod laying around.

- An inside corner brace might be a useful addition where the short vertical post and horizontal posts are bolted together.

- The main post is too long in my opinion. I left it long to minimize waste and to try it with a variety of binoculars and tripods and with users of varying height. My friend has to be over 6' tall. He can use this mount to look at zenith with a fairly short light duty tripod!

  Although it works well when built as shown, a shorter main post will provide more stability and less possibility of damage if a severe blow is applied to the top of the mount. Things do go bump in the night. Adjust the height of the main post to suit yourself and your tripod. A sturdy, moderately tall tripod will allow a much shorter post.

Enjoy.