

Quick Match Casing Former

By: Mark Merten



Introduction:

I wanted to create a tool that would be able to fold gummed tape around black match. The goal was to do this using simple building materials while creating a reliable end product. The finished quick match I made was produced using 1" wide 35 pound gummed paper tape. This will not be as strong as commercially made quick match. Nor will it be damp proof or water proof. However it does have a place for a hobbyist who will use it in a dry environment.

As with any hobbyist project, the driving forces for construction depend on what materials are available and what skills can be applied to accomplish the task. There is a lot of room for improvement in this project and I hope this paper will explain my idea to the benefit of both the hobbyist and someone who may have a commercial application for this idea. As for me, I will be using the quick match former, pictured above, much less. The reasons will be explained as you read further in the article.

Theory of Operation:

As the gummed paper tape is pulled through the tape dispenser, strands of black match are added. After being pulled through the round former, a mouse trap spring with paint sticks glued to it flattens the freshly formed tube to create the seal. From there the quick match goes under the black pulley. The small diameter of the pulley (really the bottom of the V-groove) is lower than the centerline of the round former and the jaws of the mouse trap. This was added to guide the quick match as it slides off the end of the board which further flattens the match; this allows the top jaw of the mouse trap spring to develop its full potential. As an added bonus, it helps the spooling at the end.

All this sounds easy, right? Well I discovered hidden problems which I will explain as we look at each part of the former.

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The Gummed Tape Dispenser:



We will start at the gummed paper tape dispenser. The picture above is a top view of the dispenser that came with my Widmann's Automatic Shell Paster (WASP) machine. So, as any good pyro would do, I used items that were handy. Kyle Kepley's Gummed Tape Dispenser article found on Passfire would be a good choice for this project as well. The only modification needed for my choice was to be sure that the gummed side of the paper tape is dispensed on the top side. I prefer it that way so that as the paper tape is pulled through this former I would be able to monitor the seam where the fold comes together. Making sure that the tape is sealed into an enclosed tube, when coming out of the round former, is of course high priority. When I made my match, I simply poured a little water onto the top side of the sponge. When the tape started becoming too dry, I simply added a bit more water to the sponge. I never filled the dispensing container with water.

I had 3 strands of black match laid alongside the roll of the gummed paper tape. To the left out of view in the photo above, I have a version of Kyle Kepley's black match drying frame. However, for my version of this frame, I made stanchions for legs. With the addition of the legs the drying rack can be disassembled and become portable. The drying frame can also spin on its own axle at the top of the legs thereby making removal of the black match easier. I would play out one revolution of black match, which amounted to about 10 feet at a time, from the frame and then process that much through the former.

I used three straws taped together to prevent the black match from becoming wet again as it passes over the sponge. I placed the resulting tube so that it would extend beyond the end of the sponge. With this arrangement, water is conserved for dampening of the gummed paper tape. If I had a small tube that was large enough to accommodate the number of strands I planned to use, I would certainly use it here. The addition of the straw-tube also helps to guide the black match strands to the center of the forming tube in the next phase of the forming process.

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The Former:



Looking at the path of the tape coming from the dispenser, notice that the dispenser is slightly higher than the copper pipe on the right. If it were lower than the copper pipe it would not work as well. At least that is what I found during my fiddling. The pipe is a 4¼" long piece of ½" copper. It was a piece that I had so I thought why cut it. I am sure that three to four inches would work. The lead end of the copper pipe could be flared outward some for better operation. On this prototype the tube was filed back with a round file to eliminate the square edge and then sanded smooth. The piece of 2X4 between the dispenser and the fixture is about seven to eight inches long. This allows for the strands of match to drop at a shallow angle.

To start the tape, a small dowel is placed through the copper pipe. I then taped the 1" wide gummed tape in a dog eared fashion to the dowel and pulled it through. Figure 1 illustrates the method.



Figure 1

Then I inserted the ferrule which is shown on the next page in figures 2 and 3.

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Figure 2



Figure 3

I can't say if these dimensions need to be exact, but I did measure them with a caliper because this is an important piece. Drill a fairly concentric hole through the middle of the ferrule. I actually free hand drilled that hole, so it can be done. The ferrule is $1\frac{3}{4}$ " long and has an outside diameter (OD) of .460"; the drilled hole being $17/64$ ". If using gummed paper tape wider than 1", the hole through the ferrule would need to be made larger.

Yes, the blue thing is a chopped up pen cap which I super glued to the dowel at one end. Now that you have seen the ferrule, I will be adding tape to hold it down, because the glue is failing after my initial use of the device. The strands of match would probably feed through just fine without the ferrule. The purpose of this piece is to guide the tape so that it will be curled up. The tape also needs to be kept at the inside bottom of the copper pipe.

It is important here to note that the tape should be fed under the ferrule and through the former in a straight line in all aspects, except for the little bit of angle coming down from the tape dispenser as shown in the picture at the top of page 3, the angle appears to be a degree or so. The OD of the ferrule

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is smaller than the ID of the copper tube. This results in a crescent shaped opening. This crescent shaped opening keeps the wet gummed paper tape from rolling inside the tube. Another way to describe this would be to take the letter "U" and keep it from turning over and looking like an "n".

Figure 4 is a look down the barrel of the former which transitions from the copper pipe to a round plastic slug. It is a little off center but still worked well. Should there be a problem for somebody, looking at this picture may help with troubleshooting.

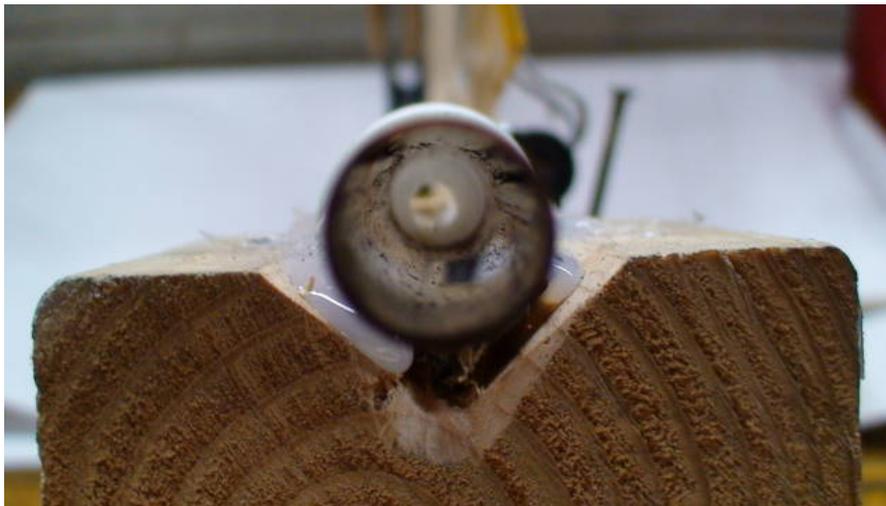


Figure 4

The last part of forming the tube is done using a white plastic round slug that is abutted to the copper pipe. It has an ID of $17/64$ ", which is the same as the ID of the ferrule. The OD is irrelevant because whatever the reader may use, or however the reader may assemble the parts that they use, I found that the ID's of the two pieces be somewhat concentric. Looking the picture in Figure 4, I would say that the $17/64$ " hole should be closer to the bottom of the copper pipe rather than centered.

When making this former I would have liked to have had one piece of material made out of Ultra High Density Molecular Weight (UHMW) plastic, nylon, or something with similar properties. You can use whatever is cheapest; however the goal here is to lower friction.



Figure 5

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Figure 5, on the previous page, shows what the dry tape looks like as it exits with 3 strands of match. Initially the 1" wide gummed paper tape was pulled through on its own. Then black match, that is stiff enough, can be pushed through the former inside of the formed paper tube; finally appearing out the exit end as shown. The amount of tape used for the overlap to make the finished seam can now be viewed. Figure 6 shows what the tube looks like flattened out with the 3 strands of black match inside.



Figure 6

At this point in the project, I had to admit, that this was looking good! But now, from a hobbyist point of view, I'd recommend that this version should be thrown away! Yes you read that correctly!

When I used the wind up wheel, it caused damage to the newly formed quick match. Because this was a one man operation, manipulation was much easier when I pulled the gummed paper tape through by hand and let the finished quick match fall into a large clean trash can.

The mouse trap spring mechanism did work, but not as well as I would have hoped. It was far simpler to pinch the tube between my forefinger and the thumb of my left hand while I pulled the gummed paper tape through with my right hand.

Because of the short distance of the entire device, as shown here, there was not enough time for adequate drying to take place. Use of a trash can did provide the few minutes of drying time which is all that is really needed. One could choose to wind the finished quick match into rolls at a convenient time, such as:

- When the trash can was full
- When finishing a rack of black match
- When changing out an empty roll of gummed paper tape

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The Finished Product:



This was the product of one drying frame with a deminsion of 30" wide and 5 feet tall. Half of the rolls shown have four strands and the remainder have three strands. Good commerical quick match is somewhat water proof; damp proof may be a better choice of words. Shown here is plain gummed paper tape and therefore is not remotely near damp proof. The cross section of quick match made using this former is less than that of commercial quick match. Therefore it does not perform well in tight bends and it will be very prone to breaking open and exposing the black match. A possible choice is to cut the finished quick match into predetermined lengths and storing the straight pieces in a cardboard or hand rolled paper tube. This is a thrifty way of making quick match for people who have a hard time obtaining such an item. This is a 1.3 designated product and does require proper magazine storage.

Suggestions for Improvement:

The mouse trap portion had a tape applied to the paint mixing sticks that I used to help lower friction. Materials with low friction qualities are best for this device. It appears, from my experience, that the gummed paper tape I used was also somewhat pressure sensitive. In a commercial manufacturing setting I would replace the mouse trap with a pair of soft rubber wheels. Both of these wheels could be driven, stacked vertically, have a speed control, and use an adjustable spring loading to apply a desired amount of pressure. This would duplicate the pinching of human fingers to help set up the seam. A distance of several feet following formation of the seam would permit adequate drying time, and should exist before attempting to wind the finished quick match on a reel or cutting it to length.

Here are links to a couple of YouTube videos I posted where you can watch me in action!

<http://www.youtube.com/watch?v=iLKzM46PHRM>

<http://www.youtube.com/watch?v=7Y3DsyH5TgM>