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Mass Launching Z-bombs

Figure 1: Perforated and grooved launch board.

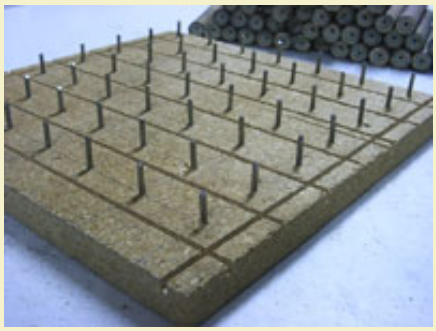

Figure 2: 1-1/2" roofing nails with points cut off.

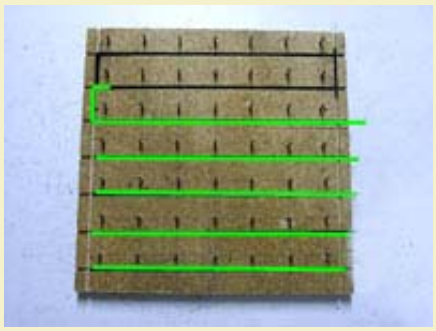

Figure 3: Main body visco path (green) and black match finale path (black).

Introduction:
This multi-shot Z-bomb launching device is a bit exotic and certainly a lot of work to make, but readers may find the techniques used for timing the shots applicable to other cake type items. Indeed, the most difficult part about making bottom fused cake items is getting the timing right.

Efforts that utilize unprotected black match as the fusing mechanism will almost always have accidental side ignition problems, caused when stray sparks propagate between the tubes and prematurely ignite other tubes out of sequence. Even the use of cardboard barriers between tubes does not prevent the problem.

The use of visco, the only ignition material protected from side ignition that is readily available to hobbyists, suffers from a slow burn rate. The Chinese have solved this problem through the creation of a faster burning visco type fuse, but this requires complex machinery to manufacture and is beyond the realm of what hobbyists can make themselves. Until this type of fuse is readily available on the pyro-hobby market, it is not an option for most of us.

In developing this multi-shot method, I tried several alternatives to visco. All of them involved a wooden base with 1/4" deep slots cut in rows as shown in Figure 1. This is easily done with a standard 1/8" wide blade in a radial arm saw set 1/2" above the table. Two side channels are used to intersect the parallel channels at both ends, which are used to route fire from one row to the next.

It is worth noting what didn't work before describing the final working method, in case any readers want to pursue these other methods further than I did.

Method #1:
The channels were filled with hot glue, into which a stick of black match was immediately pressed, then covered with hot glue again on top. This method resulted in inconsistent burn rates, skipping and quick-match like eruptions that fired down the entire row at once. Causes were likely to be gaps at the corners of the square channels that allowed gasses to shoot forward, as well as air pockets where the glue did not fully settle around the black match.

Method #2:
The channels were filled with a meal slurry level with the top of the board, then allowed to dry. Both hot glue and foil tape were tested for protecting the top of the powder channels, and both failed in the same way as method #1. Again, air gaps at the bottom corners of the square channels were suspected as the source of the problem.

Figure 4: Locking in the 1/16" mini visco with 1/8" visco.

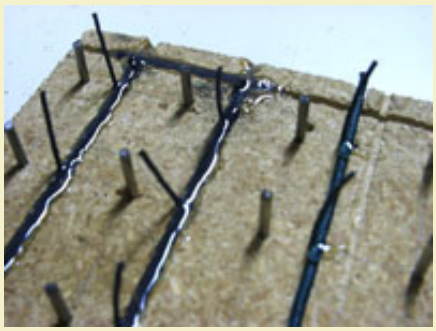

Figure 5: Hot glue applied over black match paths to protect from accidental ignition.

Figure 6: Launch board is fused up and ready for Z-bomb installation.

Method #3:
A special molding blade that cuts round bottom channels was used to eliminate the corners where air gaps form. Meal slurry was again spackled into all the channels and allowed to dry. Foil tape seemed to work the best at sealing over the tops of the filled channels. The skipping was not as bad as method #1 and #2, but still bad enough to prevent this method from producing reliable results.

While making black powder circuit boards seemed like a neat idea, it proved unworkable. The final solution was to use plain old visco laid into the channels, then ignite several rows at once such that each one was out of phase. In the 7x7 grid shown here, the first five rows burn in parallel but with staggered ignition times. The result is a rapid fire succession of Z-bombs leading up to a finale chain of two full rows fired at once.

Preparing the Base Board:
A 11" square piece of particle board was prepared with seven 1/8" wide channels cut 1/4" deep. This can be done with a table saw, radial arm, router or even a skill saw. The spacing between the channels was 1-1/2", with a margin of 1" at the top and bottom. Two more channels are cut 3/4" from each end to connect all the rows.

A 1/8" dia. hole must now be drilled in a 1-1/2" grid for the launch nails to be inserted into. The tips of these nails need to be cut off so that the Z-bombs do not wobble when loaded. Figure 2 shows the finished base loaded with nails.

Fusing the Channels:
Two types of visco fuse are required for this operation. The first type is the green variety of 1/8" diameter visco fuse. It is said that the green variety burns out the side more than the red variety does, although I have not verified this. Visco with plenty of side spit versus end spit is desired for this method.

The second type of visco is a very small 1/16" diameter type that is less common but still available if you search hard enough. I got mine at an FPAG 4F vending tent, so you might look for it at PGI as well.

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Figure 7: Inserting mini-visco into Z-bomb holes.

Figure 8: Securing fuse with a patch of foil tape.

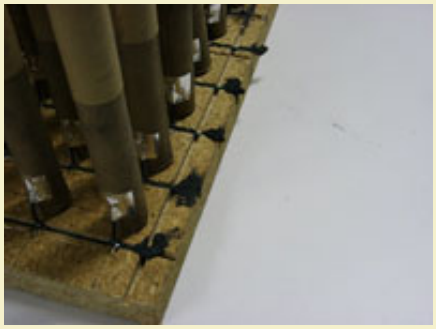

Figure 9: Slurry priming ends of visco chains.

First you will need to cut all your long 1/8" visco pieces that run down the channels. Figure 3 shows the pattern I used for this project. Note that all five pieces will be burning at the same time, so they are cut at slightly different lengths to stagger the ignition times. The longest piece loops around to the finale chain, where sticks of black match have been pushed into the channel.

Figure 4 shows how the thin visco is laid under the larger visco as it is pushed into the channel with a screwdriver. This firmly locks the fuse in place so that it can not be pulled out. It may be necessary to slightly widen the channel at the fuse points by drilling with a 3/16" bit. The lengths of the small visco will need to be determined by installing a Z-bomb and cutting the fuse such that it reaches the powder core while also allowing the Z-bomb to rest on the base. The bottom part of the thin visco should loop under the thick visco, but not stick up out of the channel. Once the proper length has been determined, go ahead and cut all 49 pieces. This is a perfect application for the anvil cutter length gauge.

Once all the thin visco ignition points have been pressed in place, a dab of hot glue is placed at the base of each one to protect the exposed black powder at the end of the thin fuse where it hooks around. Hot glue is also applied over all the exposed black match in the finale chain, as shown in Figure 5. It is important to seal down between the grooves at the ends of the channels and anywhere where a spark could sneak in and ignite the fuse chain out of sequence. Figure 6 shows the entire board fused and ready for loading.

Loading the Z-bombs:
Start installing the Z-bombs from the back row first. The fuse is first inserted into either one of the two Z-bomb vents, then the device is seated on the pin. Figure 7 shows a row of installed Z-bombs. Once a full row has been installed, small pieces of foil tape are placed over the fuse entry point to secure it from dropping out once the bottom of the fuse burns away prior to ignition. While Figure 8 shows only a small square of tape, subsequent testing proves that a full strip of foil tape that protects the entire length of the fuse is required to prevent accidental side ignition during launch.

Lastly you will need to prime the ends of all the visco chains to insure ignition. I like to cut the ends at a 45 degree angle to expose more powder core prior to applying the prime. Once the prime dries, a stick of black match is run across all the ignition points as seen in Figure 10. A final piece of visco is added to the end of the chain and a piece of foil tape is applied over the black match to protect it and create instantaneous ignition of all visco chains.

Figure 11 shows the completed 49 shot Z-bomb cake. Note the alternating use of salute and color headings. This chain fusing method can work equally well on multi-tube repeater designs, and adjusting the nail size will result in similar launch pad for stinger missiles.

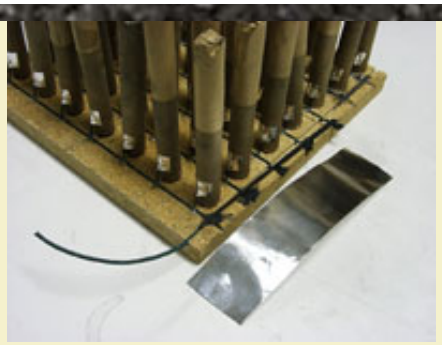

Figure 10: Stick of black match connecting all nodes together.

Figure 11: Foil tape used to seal and protect the black match ignition strip.

IMPORTANT NOTE:
Foiling the headers of each Z-bomb with foil tape is critical to insuring that the Z-bomb exhaust does not burn through the headings, blow the headers and ruin all your hard work. I omitted that step in the cake shown here and payed the price for it. Because the Z-bombs are so close to each other, all ignitable material must be as insulated from fire and sparks as possible.

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