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A Method for Cutting Bottles, Light Bulbs, and
Fluorescent Tubes Technical Bulletin No. 36

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VITA

TECHNICAL BULLETIN 36

A Method For Bottle Cutting

This technical bulletin contains directions for cutting bottles and light-bulbs. The author developed these techniques as a means of producing low-cost science teaching equipment.

Allen R. Inversin, the author, is an International Voluntary Services (IVS) volunteer. He serves as the VITA field representative in Papua New Guinea and is also assisting in the establishment of the Appropriate Technology Development Unit at the University of Technology in Lae. Mr. Inversin is a graduate of the Massachusetts Institute of Technology and prior to his assignment in Papua New Guinea spent a number of years in Laos, where he specialized in making technologies appropriate to local needs and in facilitating technology transfer through well-presented materials.

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A METHOD FOR CUTTING BOTTLES, LIGHT BULBS, AND FLUORESCENT TUBES

INTRODUCTION

While teaching science for six years in Laos, I spent an increasing amount of time seeking ways of making science teaching equipment more accessible to the science teacher. It was during this time that I came across a technique for cutting bottles and bulbs to make glassware for use in experiments. Over the last several years I have cut hundreds of bottles of all sizes and in the process have refined the technique to the point where it should be fairly complete.

Cutting bottles is not new. Various gimmicks can be made or bought to perform the task. Also numerous simple techniques are claimed to cut bottles. Though I have tried a number of these, none has been as generally successful for me as the method described in this bulletin.

Occasionally uses can be made of cut incandescent light bulbs, as for example, beakers for boiling solutions in chemistry experiments, watch glasses, and glass chimneys for wick lamps. But cutting them requires another technique since, because of their shape, the bottle cutting technique does not work.

Should there be any concern regarding the safety of using the techniques described (as there should be), I and others have used the techniques innumerable times to cut bottles, fluorescent tubes, and light bulbs (with their reduced internal pressures), and never once did one shatter. I would still, of course, recommend the safety precautions advocated in the descriptions of these techniques.

CUTTING BOTTLES

The method described below has been used to cut a variety of bottles with *untapered sides* and wall thicknesses up to almost half a centimeter (quarter inch) though the usual thinner-walled bottles cut more easily. It can only be used on the part of those bottles where the opposite sides are *parallel*.

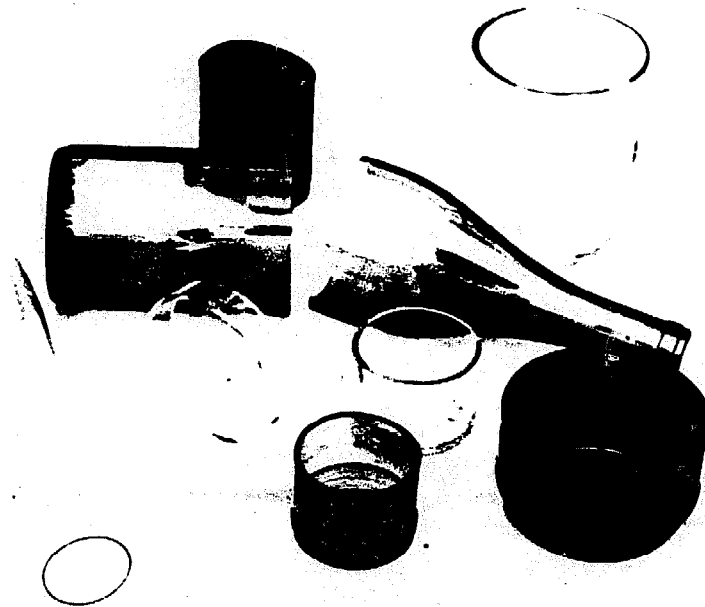
Can only cut bottles
anywhere in this area



All that is required for this technique are ...

- a metal file (or ordinary quartz pebble)
- a large sheet of newspaper
- a single-wick alcohol burner (such as can be made by placing a few lengths of string through the top of a metal film canister)
- a container of water
- a sheet of fine sandpaper or emery cloth

The heat from a candle or kerosene burner would usually be sufficient but the ensuing carbon black deposits on the bottle to be cut may interfere with the cutting and lead to disappointing results. The use of burning alcohol is therefore recommended.

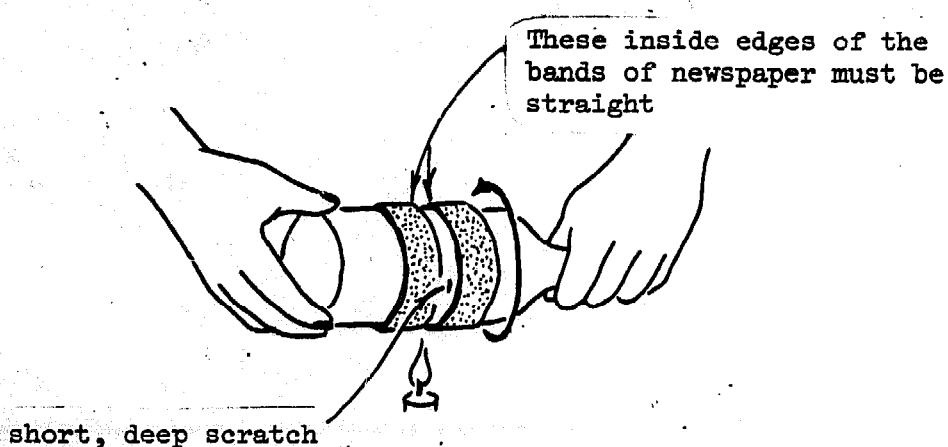


This technique must be used in a place FREE FROM ANY WIND OR BREEZES. Trying to cut a bottle over a flickering flame will probably only lead to frustration.

I and others have tried this technique around the world. On those occasions when someone claims that the method does not seem to work well, this has been found to be due to his not properly following the instructions. IF YOU WANT GOOD RESULTS, CAREFULLY FOLLOW EVERY INSTRUCTION. There are no short-cuts in using this method. Do not expect good results with half-hearted attempts.

Procedure

1. Using the *sharp* edge of a metal file (or freshly cracked quartz pebble), hold it *firmly* against the bottle at the level it is to be cut and make a *short, deep* scratch. Note that there is no need to scratch the bottle completely around its circumference as is necessary with some of the other methods. This is one advantage of this method.
2. Tear four long, *straight* strips of newspaper two or three centimeters (one inch) wide and soak these thoroughly in water. If thick-walled or larger diameter bottles are to be cut, a couple more strips are needed.
3. *Carefully* wrap half of these wet strips on each side of the scratch so that the strips on one side of the scratch are almost *one centimeter* ($3/8$ inch) away from the strips on the other side. Slip these bands over so that the scratch is *halfway* between them. Make sure that the strips are wrapped so that the edges nearest the scratch are straight and even. Once completed, each band should have no fewer than about six thicknesses of newspaper.
4. Slowly rotate the bottle a couple times so that the bared portion between the two bands of newspaper is heated just in the tip of the flame of the alcohol burner. Then rotate the scratched portion of the bottle back and forth above the flame tip until a slight cracking should be heard. Cracks will then have started on either side of the scratch and, if the still uncracked portion is then heated, the cracks will propagate around the bottle. When the two cracks nearly meet, gently pull the two halves of the bottle apart until they separate. This entire step should take two to three minutes.



With a little experience, one can make the cut edges surprisingly flat. AFTER CUTTING, DO NOT FORGET TO RUB THE INNER AND OUTER LIPS OF THE CUT EDGE WITH FINE SANDPAPER OR EMERY CLOTH TO REMOVE THE CUTTING EDGE. These edges are very sharp!



Trouble Shooting

If difficulties are encountered, these can easily be corrected. If the bottle does not crack by the time the strips of newspaper dry up, then either

- (a) the scratch is superficial and should be deeper (see step 1),
- (b) the strips of newspaper are too close together (see step 3),
- (c) initially too much time was spent in heating the entire circumference of the bottle (see the first sentence, step 4), or
- (d) the bottle walls are too thick.

If the final cut is not reasonably flat, then either

- (a) the strips of newspaper are a little too far apart (see step 3) or
- (b) the unscratched portion around the bottle between the strips of newspaper is too cool, probably because the bottle was not slowly rotated a couple times over the flame before heating only the scratched portion (see step 4).

CUTTING FLUORESCENT TUBES

The above method may also be used to cut sections from discarded fluorescent tubes. Because the walls of these tubes are thin and because a lower pressure exists within, it is a good idea to wrap a piece of cloth or a sheet of newspaper around the tube and to be careful not to bear down too hard when making the short scratch. Only one strip of wet newspaper is needed on either side of the scratch.

Once the previously described technique has led to a crack *completely* around the tube, the two portions of the tube will not come apart unless the pressure within has been relieved. If the two portions remain "stuck" to each other, **DO NOT TRY TO FORCE THEM APART.** Simply remove the paper strips and then heat just one point along the crack. This will force that part of the tube to expand slightly, letting air seep into the tube until the pressures inside and out are equalized. Then the two portions will easily fall apart.

The white coating on the inside of the tube can then easily be rubbed off. **BE CAREFUL IN REMOVING THIS COATING SINCE IT IS HARMFUL IF TAKEN INTERNALLY.**

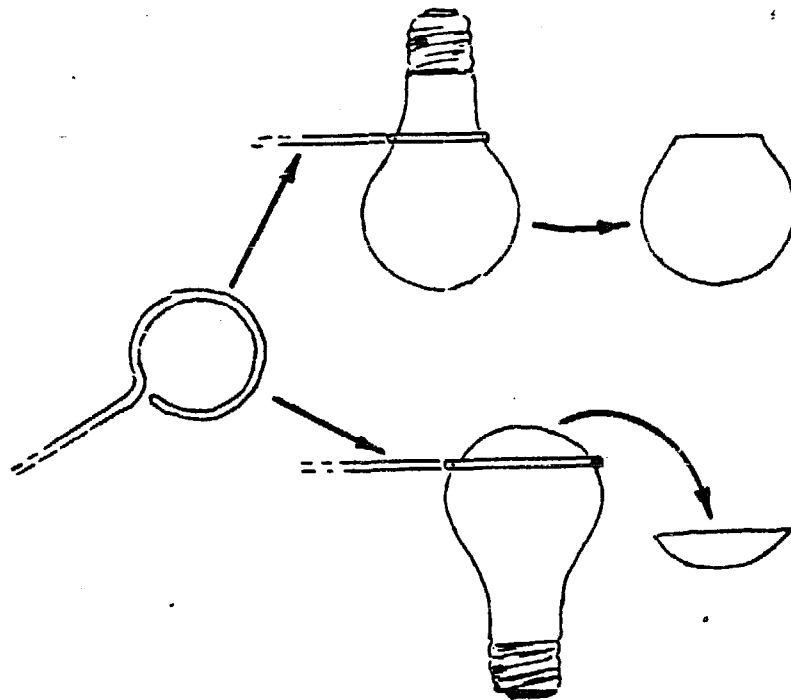
CUTTING LIGHT BULBS

This technique requires a metal rod 2-3 mm thick (a metal coat hanger works well), a sharp metal file, and a source of heat (a fire or gas range). Pliers facilitate the task of bending the rod.

First carefully bend one end of the rod in the shape of a circle of the desired diameter as shown in the figure on top of the following page. It will be nearly impossible to get the ring formed to fit perfectly around the bulb but this does not seem important. Get as close a fit as possible.

Then slip this metal ring over the bulb and note the level at which it rests horizontally on the vertically held bulb. Remove the ring and then holding the bulb in a piece of cloth, carefully make a short scratch in the glass at this level with the sharp edge of the file.

To cut the bulb, heat the ring in a flame until it starts getting red hot and then quickly place it over the bulb in the correct position. Holding the rod horizontally and the bulb vertically, rotate the bulb a little to ensure that most points around the glass bulb come in contact with the hot ring. In a few seconds, you should hear a cracking sound. In doing this, there is *no* need to press the ring hard against the bulb.



As with cutting fluorescent tubes, once the crack has gone completely around the bulb, it is possible that because of the reduced pressure in the bulb, both portions may not come apart. DO NOT PULL THE TWO PARTS APART. Rather remove the rod and hold any one point along the crack over a small flame for a few moments. This will cause that portion of the bulb to expand, permitting air to enter through the crack, equalizing the pressures inside and out. The two portions will then fall apart.

