

Making Graduated Collars *by Mike Burdick P.E.*

It seems I'm always making something that needs a graduated collar to index – whether it is a replacement dial for a machine tool, a thread dial, a degree marker, or graduations for a special grinding fixture. Nowadays with CNC mills, creating the graduations and numbering is easy, but those machines weren't available to me 20 years ago and for most of us home shop types they still aren't. So, if you want to make nice looking dials using the basic tools available in most home shops, this article is for you.



Fig. 1

Stamp Holder Face

I have several lathes but the one I like to use for making graduated collars is my South Bend Model C lathe. It is small and easy to work with and it has plain bearings so my 'gentle' tapping with my mallet when using the number stamps doesn't harm it. It really doesn't matter what lathe you use as these 'techniques' can be adapted it suit your needs.

To mark the divisions, one can use a dividing head set up so that it can be attached to be back of the lathe's spindle or one can mark a piece of paper with the proper divisions using a CAD drawing program such that it fits the circumference of the lathe's chuck exactly - then tape it to it. Also, tape a note card on the lathe headstock somewhere for use as a witness mark.

To stamp the numbers I made the following numeral stamp holder – for perspective the holder is 8 inch long with a ¾ inch shaft and a 1-¼ inch shaft (see fig. 1 and fig. 2). The holder has two slots cut into it at 90°. If you do not want to make a holder, use a boring bar that is made for square HSS bits. The slots: One is cut the exact width of the stamp and the other is cut larger for stamping a number with two digits. On the second, remember not to cut it double width, as the digits will be too far apart.



Fig. 2

Stamp Holder Profile

To use it just install it on the compound with a boring bar holder and set it to the same angle as the plane of your collar. For stamping the double digit (see fig. 3), hold the stamp body against one side of the holder and for the other digit; lift the stamp to the other side, and use that as a guide. Since the holder or boring bar is on centerline the numeral will automatically be centered and correctly spaced. For single digits just rotate the holder 90° and use that guide.

Over the past 20 years I've made hundreds of graduated collars and this is the only holder I ever needed. Remember the entire collar can be made and stamped in the lathe so think about your setup and order of machining. The last steps should be sanding down the upset metal left by the numeral stamps and then removing the finished collar from the chuck.

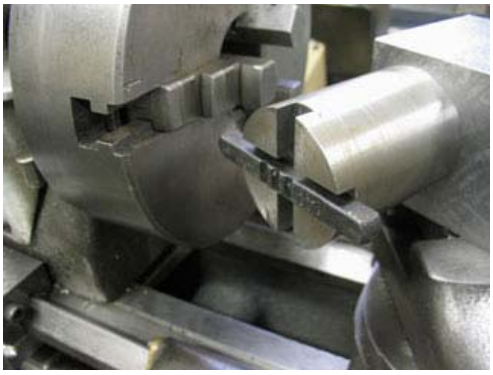


Fig. 3

Stamp In Double Digit Slot

To cut the graduations: I use a boring bar with a very sharp 'V' and a small amount of back rake (see fig. 4). When setting this up, extend the boring bar as far away from the compound holder as possible (see fig. 5). This is very helpful as it allows for some 'spring' that will force the cutting bit into the metal. Always cut lines by PULLING the compound toward the open end of the collar – never 'push' the line, as this will result in a very deep and unsightly mark. In addition, cut the mark using the compound with the carriage locked. This way you can measure the length of each mark exactly.



Fig. 4

HSS Graduation Cutter Bit

An example:

Setup: Pull back the cross-slide so that the cutting bit will clear the work. Run the compound to where the graduated mark will begin and set it to zero. Push the cross-slide up so it just touches the collar and then push it in another 20 or 30 thousands depending on your desired cut depth (that's where the spring of the boring bar comes in) and set the cross-slide's collar to zero.

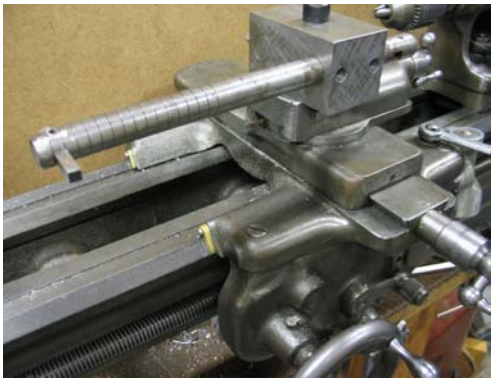


Fig. 5

Boring Bar Overhang

Marking: Pull the compound so the mark will be made - pull back the cross-slide – put compound back to it's zero mark - push the cross-slide to it's zero mark - pull compound back to make another cut - rotate work – repeat.

A couple of reminders:

When stamping the number just hit it once with a hammer. Multiple hits cause 'double' marking that will ruin the work! As for how hard to hit it – you'll learn, but remember the numeral '1' doesn't need to be hit as hard as the other digits because it is much smaller! Practice is a good idea here!

If making thin collars (rings) put the markings and numerals on **before** machining out the inside. This is necessary so that the thin ring doesn't misshape from the hammer blows.

If you have any questions please feel free to contact me at mikeburdickutah@yahoo.com .

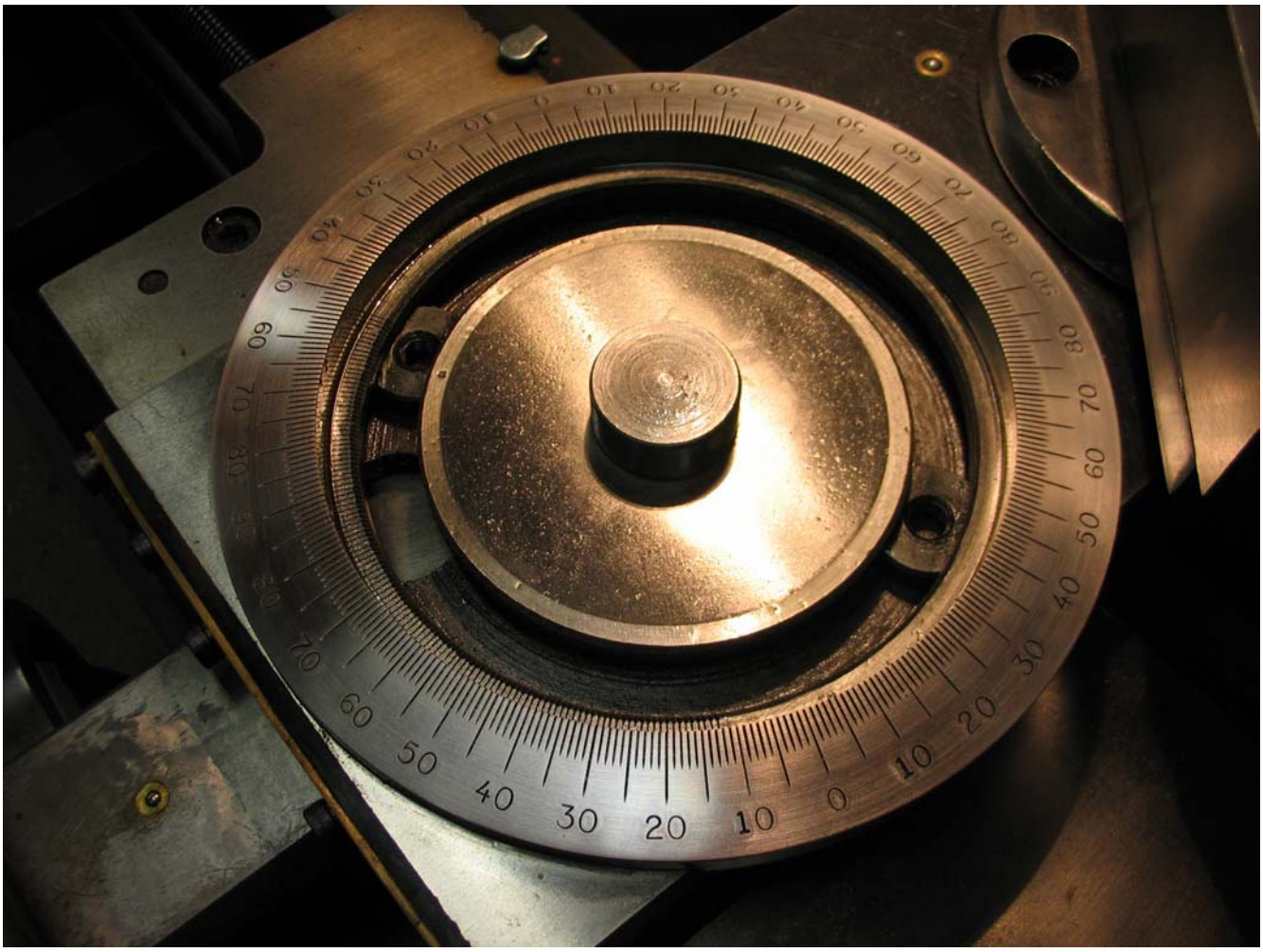
Here are some examples made with the above setup:



Graduated Collar for a Lead Screw



Thread Dial Face



360 – Degree Graduated Collar