March 2021

Newsletter

Volume 26 - Number 03

http://www.homemetalshopclub.org/

The Home Metal Shop Club has brought together metal workers from all over the Southeast Texas area since its founding by John Korman in 1996.

Our members' interests include Model Engineering, Casting, Blacksmithing, Gunsmithing, Sheet Metal Fabrication, Robotics, CNC, Welding, Metal Art, and others. Members enjoy getting together and talking about their craft and shops. Shops range from full machine shops to those limited to a bench vise and hacksaw.

If you like to make things, run metal working machines, or just talk about tools, this is your place. Meetings generally consist of ***general announcements***, an ***extended presentation*** with Q&A, a ***safety moment***, ***show and tell*** where attendees share their work and experiences, and ***problems and solutions*** where attendees can get answers to their questions or describe how they approached a problem. The meeting ends with ***free discussion*** and a ***novice group*** activity, where metal working techniques are demonstrated on a small lathe, grinders, and other metal shop equipment.

President *Brian Alley*	Vice President *Ray Thompson*	Secretary *Joe Sybille*	Treasurer *Gary Toll*	Librarian *Ray Thompson*
Webmaster/Editor *Dick Kostelnicek*	Photographer *Jan Rowland*	CNC SIG *Martin Kennedy*	Casting SIG *Tom Moore*	Novice SIG *John Cooper*

This newsletter is available as an electronic subscription from the front page of our website. We currently have over 1027 subscribers located all over the world.

About the Upcoming 10 April 2021 Meeting

The next general meeting will be held as a virtual meeting on 10 April 2021 at 1:00 P. M. on-line at Zoom.us. A week before the meeting invitees will receive from the webmaster the meeting ID and passcode to join the on-line meeting.

General Announcements

Videos of recent meetings can be viewed on the HMSC website.

The HMSC has a large library of metal shop related books and videos available for members to check out at each meeting. These books can be quite costly and are not usually available at local public libraries. Access to the library is one of the many benefits of club membership. The club has funds to purchase new books for the library. If you have suggestions, contact the Librarian *Ray Thompson*.

We need more articles for the monthly newsletter! If you would like to write an article, or would like to discuss writing an article, please contact the Webmaster Dick Kostelnicek. Think about your last project. Was it a success, with perhaps a few 'uh ohs' along the way? If so, others would like to read about it. And, as a reward for providing an article, you'll receive a free year's membership the next renewal cycle!

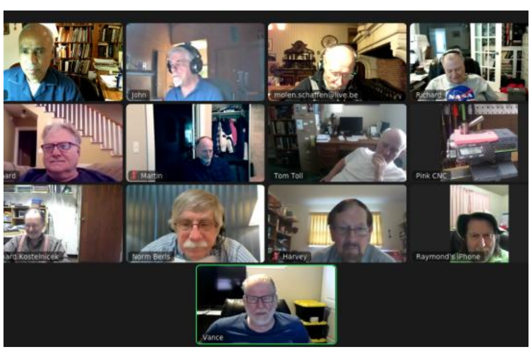
Ideas for programs at our monthly meeting are always welcomed. If you have an idea for a meeting topic, or if you know someone that could make a presentation, please contact Vice-President Ray Thompson.

Members are requested to submit to the club secretary the name, address, telephone number, and website address, if any, of any metal or other material stock supplier with whom the member has had any favorable dealings. A listing of the suppliers will appear on the homepage of the club website. Suppliers will be added from time to time as appropriate.

The club is looking for a member to serve as webmaster. After over ten years of service, our current webmaster would like to pass the webmaster torch to a successor.

Recap of the 13 March 2021 General Meeting

By *Joe Sybille*



Thirteen participants attended the 1:00 P.M. virtual meeting. There were two visitors, Molen Schaffen and PinkCNC. President-emeritus. Vance Burns, led the meeting (right photo).

Presentation

There was no formal presentation.

Safety Moment

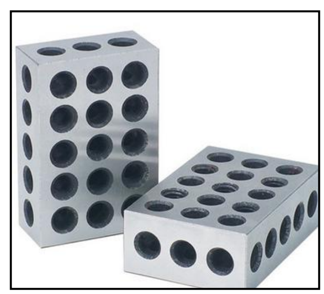
This past January, a member bumped his head on a shop tool and thought nothing of it until he noticed the occurrence of frequent headaches from sometime in January to early March. In March, he collapsed in his house, fracturing a lumbar vertebrae and sustaining a hair line fracture of his femur. Subsequent tests in hospital revealed the likely source of the headaches was a subdural hematoma caused by the bump to the head in January. The member is contemplating the wearing of a hardhat or bicycle helmet when working in the shop.

Two safety videos were shown. One depicted a lathe operator showing how the wearing of a scarf is an unsafe practice. Sometime in the past, he had done so and the scarf became entangled in a rotating part of the lathe. In so doing, the scarf caused the operator to sustain a permanent scar about his neck. The lesson learned is to avoid wearing anything that could become entangled in rotating machinery.

The second video depicted a lathe operator turning a wooden bowl. In the process of hollowing out the bowl, it fractured and disintegrated into many pieces. Fortunately for the operator, a face shield protected him from serious injury.

Problems and Solutions

A member requested suggestions on the use of an edge finder. In particular, he wanted to know why edge finder sizes are typically 3/8, and 1/2. Another member mentioned the existence of size 0.200.



Further, the first member requested suggestions on the best method to locate the center of an existing hole. This inquiry prompted a lively discussion on different methods. The use of a Blake Coaxial Indicator (www.blakemanufacturing.com) served as one method (left photo). Another was to place a 1-2-3 or gage block against a pin firmly located in the hole. Then, determine the block's face location in order to find the hole's extents (right photo).

Another suggestion was to use a combination edge finder to locate the center. Note the conical end of the edge finder (right photo). This end is placed in the hole to locate the center using a technique similar to that of locating a straight edge.

During the discussion on methods of finding the center of a hole, a participant commented about the difficulty of locating the center of a broken tap in an existing hole. Many times the tap does not break cleanly and to drill a starter hole with a carbide drill in the broken tap in an attempt to remove it often results in an exercise in frustration. One suggestion offered included milling the tap flat to drill the starter hole. Of course the broken tap must extend above the surface of the hole to do this. Another suggestion involved drilling out the tap from both the top and the bottom of the hole, if there is access to the bottom. According to another participant, some workers have had success using electrical discharge machining to remove broken taps. This process works by burning a hole in the tap and then using other tools to dislodge the remaining pieces of the tap. Lastly, another suggestion included using a product to chemically remove a broken tap. This technique works only when a steel tap breaks in an aluminum workpiece. Purportedly, the chemical product dissolves the ferrous steel tap and leaves unharmed the aluminum workpiece.

Another member requested help locating a source of dimensions for making broach bushings. No suggestions were offered.

Show and Tell

Richard Douglas showed a planer shaper gauge he acquired recently. Also shown was a set of adjustable squares. See photos at right.

Article

Bushings for Keyway Broaching

By *Dick Kostelnicek*

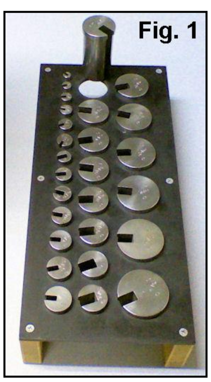


Fig. 1

Making push type keyway broach bushings (Fig. 1) is easy. However, the bushing manufactures seem to adumbrate the bushing's crucial dimensions by just calling them style A, B, C, D, etc. or equivalently I, II, III, IV, etc. For example, an A-type bushing supports all A-style broaches, regardless of the manufacture. This has become a de facto standard. So, why not publish the dimensions? You won't find them in Machinery's Handbook or on the internet.

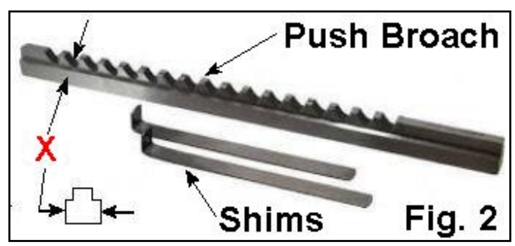


Fig. 2

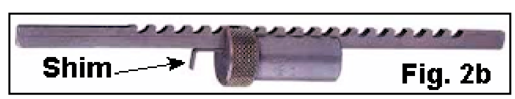


Fig. 2b

Now, you'll have to purchase push key broaches (Figs. 2) but the bushings can be easily made in the home shop. I won't discuss in detail how to use keyway broaches, as a YouTube search will lead to an adequate discussion.

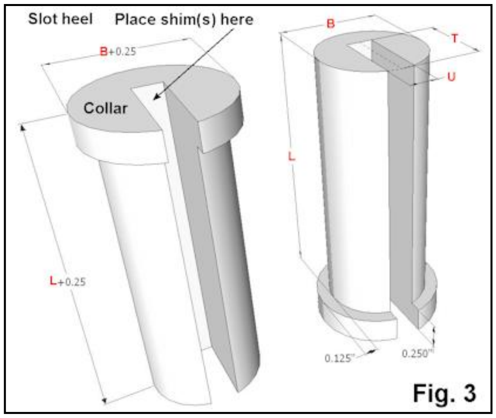


Fig. 3

A push keyway broach cuts a uniform depth slot with each pass by using teeth of progressively higher elevation along its length. For larger broach sizes, several passes are required. This reduces the broach's push force. Full slot depth results when shims are stacked between the broach's smooth or safe edge and the bushing's heeled slot (Figs. 2 and 3).

We can determine the bushing's crucial dimensions B, U, and T (Fig. 3) if we have in hand the broach along with its shims. Measure the thickness H (Fig. 5) using the tallest or last tooth on the broach and with all its shims in place (Fig. 4).

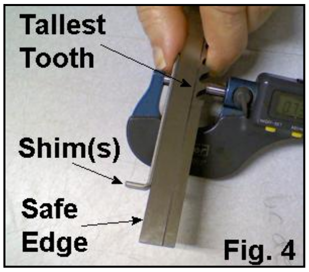


Fig. 4

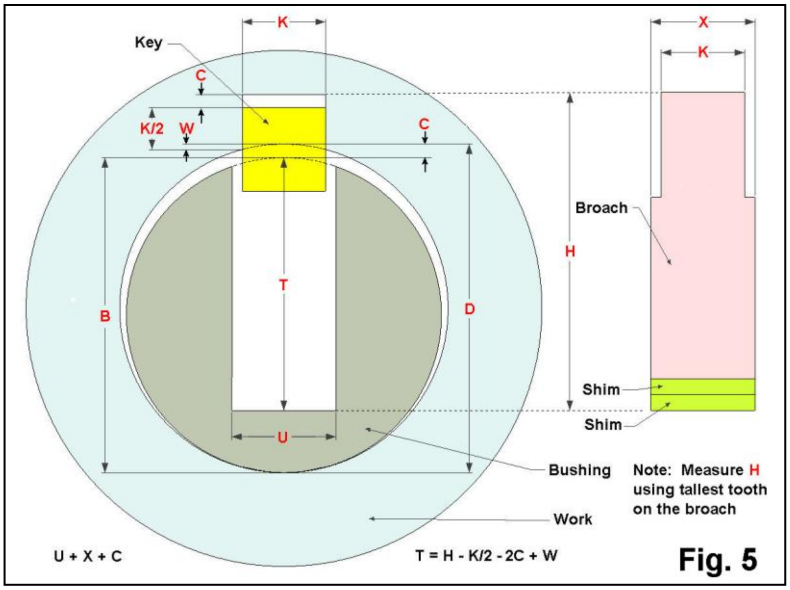


Fig. 5

The measured width **X** of the broach is shown in Fig. 2. The bushing's crucial dimensions are:

$$B = D - C \qquad U = X + C$$

$$T = H - \frac{K}{2} - 2C + W$$

The three clearances **C** (Fig. 5) are all the same and are taken as 2.4% of **K**, the square key size. You, however, may choose **C** to suit your preference. The chord thickness **W** (Fig. 5) is determined where the key's half height touches the shaft's outer surface. It is calculated as:

$$W = \frac{D - \sqrt{D^2 - K^2}}{2} \cong \frac{\frac{1}{4}K^2}{D}$$

The following table provides dimensions for making A, B, and C style collared broach bushings for imperial shaft diameters from ¼ through 1-1/2 - inches.

The broach length **L** and collar (Fig. 3) are sized to be the same as those used by most manufacturers.

Nominal Shaft Diameter	Decimal Shaft Dia.	Nominal Square Key Size	Decimal Square Key Size	Broach Bushing Style	Shaft Chord Thickness	Broach + Shim(s) Thichness	Broach Measured Width	Clearance Same 3-places	Bushing Diameter	Bushing Slot Width	Bushing Slot Depth	Bushing Under Collar
D	D	K	K		W	H	X	C	B	U	T	L
1/4	0.2500	1/16	0.0625	A	0.0040	0.2306	0.1278	0.0015	0.2485	0.1293	0.2003	1.125
5/16	0.3125	1/16	0.0625	A	0.0032	0.2306	0.1278	0.0015	0.3110	0.1293	0.1995	1.125
3/8	0.3750	3/32	0.0938	A	0.0060	0.2442	0.1286	0.0023	0.3728	0.1308	0.1987	1.125
7/16	0.4375	3/32	0.0938	A	0.0051	0.2442	0.1286	0.0023	0.4353	0.1308	0.1979	1.125
1/2	0.5000	1/8	0.1250	A	0.0079	0.2567	0.1283	0.0030	0.4970	0.1313	0.1961	1.125
1/2	0.5000	1/8	0.1250	B	0.0079	0.4563	0.1915	0.0030	0.4970	0.1945	0.3957	1.688
9/16	0.5625	1/8	0.1250	A	0.0070	0.2567	0.1283	0.0030	0.5595	0.1313	0.1952	1.125
9/16	0.5625	1/8	0.1250	B	0.0070	0.4563	0.1915	0.0030	0.5595	0.1945	0.3948	1.688
5/8	0.6250	3/16	0.1875	B	0.0144	0.4775	0.1913	0.0045	0.6205	0.1958	0.3891	1.688
11/16	0.6875	3/16	0.1875	B	0.0130	0.4775	0.1913	0.0045	0.6830	0.1958	0.3878	1.688
3/4	0.7500	3/16	0.1875	B	0.0119	0.4775	0.1913	0.0045	0.7455	0.1958	0.3867	1.688
13/16	0.8125	3/16	0.1875	B	0.0110	0.4775	0.1913	0.0045	0.8080	0.1958	0.3857	1.688
7/8	0.8750	3/16	0.1875	B	0.0102	0.4775	0.1913	0.0045	0.8705	0.1958	0.3849	1.688
15/16	0.9375	1/4	0.2500	C	0.0170	0.7202	0.3797	0.0060	0.9315	0.3857	0.6001	2.500
1	1.0000	1/4	0.2500	C	0.0159	0.7202	0.3797	0.0060	0.9940	0.3857	0.5990	2.500
1-1/16	1.0625	1/4	0.2500	C	0.0149	0.7202	0.3797	0.0060	1.0565	0.3857	0.5981	2.500
1-1/8	1.1250	1/4	0.2500	C	0.0141	0.7202	0.3797	0.0060	1.1190	0.3857	0.5972	2.500
1-3/16	1.1875	1/4	0.2500	C	0.0133	0.7202	0.3797	0.0060	1.1815	0.3857	0.5965	2.500
1-1/4	1.2500	1/4	0.2500	C	0.0126	0.7202	0.3797	0.0060	1.2440	0.3857	0.5958	2.500
1-5/16	1.3125	5/16	0.3125	C	0.0189	0.7396	0.3786	0.0075	1.3050	0.3861	0.5872	2.500
1-3/8	1.3750	5/16	0.3125	C	0.0180	0.7396	0.3786	0.0075	1.3675	0.3861	0.5863	2.500
1-7/16	1.4375	3/8	0.3750	C	0.0249	0.7545	0.3794	0.0090	1.4285	0.3884	0.5739	2.500
1-1/2	1.5000	3/8	0.3750	C	0.0238	0.7545	0.3794	0.0090	1.4910	0.3884	0.5728	2.500
1-9/16	1.5625	3/8	0.3750	C	0.0228	0.7545	0.3794	0.0090	1.5535	0.3884	0.5718	2.500
1-5/8	1.6250	3/8	0.3750	C	0.0219	0.7545	0.3794	0.0090	1.6160	0.3884	0.5709	2.500
1-11/16	1.6875	3/8	0.3750	C	0.0211	0.7545	0.3794	0.0090	1.6785	0.3884	0.5701	2.500
1-3/4	1.7500	3/8	0.3750	C	0.0203	0.7545	0.3794	0.0090	1.7410	0.3884	0.5693	2.500

Fig. 6

It's prudent to scribe a slot-centered witness mark on the bushing collar (Fig, 6). This helps align the broach to the work or index multiple keyways on a single shaft. You need not harden the bushings. So, stamp an ID on the face of the bushing's collar. For example: 3B13 for a 3/16" key, B style, and 13/16" shaft diameter. Stamp clear of the broach slot so displaced stamped metal will not cause slot distortion.