Grooving V-Pulleys

By "Duplex"

THE endless V-belt is now widely used for driving machine tools because of its many advantages over other forms of transmission.

It is enough to say that these belts score heavily on the grounds of quiet running, effective grip, and easy and cheap replacement.

Included in the belt manufacturer's general instructions, as to the lay-out of a V-belt drive, is the question of correct pulley design, for on this largely depends the efficiency and trouble-free working of the installation.

Steel or cast-iron pulleys are superior to those made of aluminium or soft alloys, for the latter are not so resistant to wear and, when the pulley grooves become worn, the efficiency of the drive is lowered. This applies more particularly to pulleys of small diameter with only a small arc of belt contact; slip and belt creep then tend to wear the grooves out of shape and polish the contact surfaces. As a rule, there is no need to buy finished pulleys, for they can quite well be machined in the small workshop from castings or from scrap ends of material.

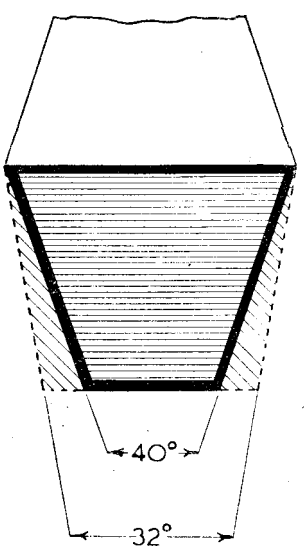


Fig. 1. *Showing the effect of bending a V-belt round a small pulley,*

However, judging from letters we receive, some beginners rather fight shy of machining the V-grooves in belt pulleys, but there is no real difficulty in this, provided one sets about the job in the right way. By using the following method, it has been found quite easy to machine the grooves in cast-iron pulleys up. to some 6 in. in diameter, even when using a light lathe of 39 in. centre height.

It is advisable to mount the pulley blank by its finished bore on an arbor, so that the tailstock can be used to support the work and thus relieve the load on the mandrel bearings. The pulley can be secured against rotation by means of an Allen screw engaging a flat formed on the arbor. In this way, the pulley can be faced and its rim turned to size, leaving only the V-groove to be machined.

The value of the included angle is now standardised for V-belts, as is also the angle of the groove for pulleys of all diameters. Where a V-belt is bent round a pulley of small diameter, its shape, seen in cross-section! is altered in the way represented in Fig. 1. As the outside layers of the belt become stretched and those on the inside compressed, the two sides of the belt will come to lie more nearly parallel and the included angle will thus be decreased. From this it follows that the smaller the pitch diameter of the pulley, the smaller must be the angle of the pulley groove if the belt grip is to be fully maintained.

The " M ." series of V-belts, 3/8in. in width is commonly used for drives from 1/4 h.p. electric motors, and for the motor pulley Messrs. Fenner recommend a groove angle of 32 deg. for a 1-1/2in. pulley and an angle of 38 deg. for pulleys above 3-1/2 in. in diameter.

Where jockey pulleys form part of the drive, it is usually necessary to fit a round leather or plastic belt.

Although old-time lathes, driven by a round, gut belt, had mandrel pulleys with grooves of some 60 deg. or more included angle, a wedging action, giving a better grip, is obtained by reducing this angle to some 30 deg. for the smallest driving pulleys.

Commercially, pulley grooves are usually turned by taking a plunging cut with a tool formed to the exact shape of the finished groove, but this is, perhaps, rather much to expect of a light lathe when machining a large pulley, and the work is, therefore, done in stages.

Accordingly, the top-slide is set over,. in either direction, to half the included angle of the groove, and the tool is then fed inwards at this angle in successive operations. It is always an advantage if the lathe top-slide can be rotated full-circle, but in some lathes this range of movement is not possible.

In a publication of Messrs. Percival Marshall, In *the Workshop,* Vol. III, descriptions are given of a number of additions to the Myford ML7 lathe, and included in these is a fitting that enables the top-slide to be set over to any required angle.

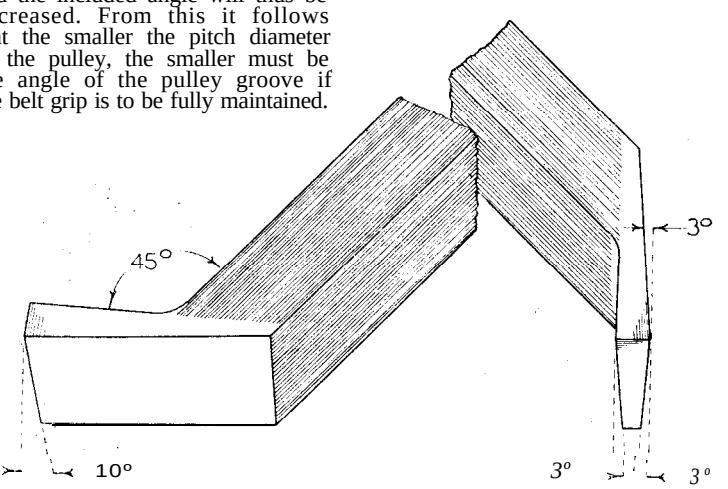


Fig. 2. A cranked tool for machining pulley grooves

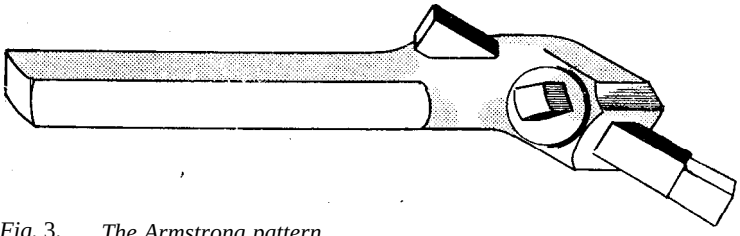
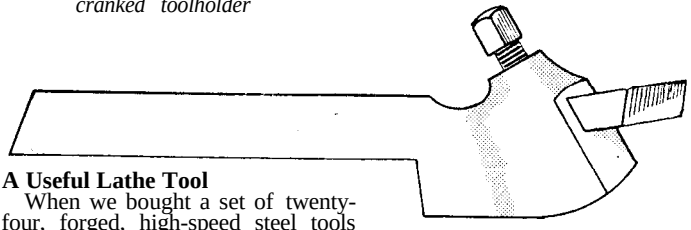


Fig. 3. *The Armstrong pattern cranked toolholder*



A Useful Lathe Tool

When we bought a set of twenty-four, forged, high-speed steel tools more than thirty years ago, some of the tools appeared to be of rather limited usefulness, but all, at one time or another, have proved almost indespensable for various awkward jobs in the lathe or shaping machine. The tool illustrated in Fig. 2 is no exception and it is now always used for machining V-grooves in pulleys. Although there is a great deal to be said in favour of a solid tool when heavy machining is undertaken, the Armstrong pattern, cranked tool illustrated in Fig. 3, is quite suitable for the present work and is more easily obtainable.

The forged tool has its cutting portion shaped like a parting tool, but the angular set enables the tool to be mounted in a way that avoids fouling the chuck jaws or shoulders on the work when machining the grooves in either a plain or a three-step pulley.

For the first operation, the tool is fed directly inwards, from the cross-slide, for a distance sufficient to give ample bottom clearance for the belt when running in the finished groove. As some workers have difficulty in what amounts to a parting-off operation, owing to the tool digging in and even breaking, it may be as well to remind them that these happenings can usually be avoided by tightening the slides until they become somewhat stiff to operate. This is best done by partially tightening the slide locking-screws, and there is then no need to interfere with the setting of the gib adjustment-screws.

Next, the top-slide is set over to half the included angle of the groove, and the first side of the groove is machined to the full depth and to half the finished width by taking a series of light cuts; the backgear should, of course, be engaged if the pulley is of large diameter or is made of cast-iron.

The finishing cut should be carefully taken in order to leave a smooth machined surface, as this is important in preventing belt wear. After the other side face of the groove has been turned in the same way, the belt should be tried in place to make sure that the back of the belt lies flush with the top of the groove. Finally, the outer, sharp edges of the groove are made slightly rounded so as to prevent the belt being damaged while running.

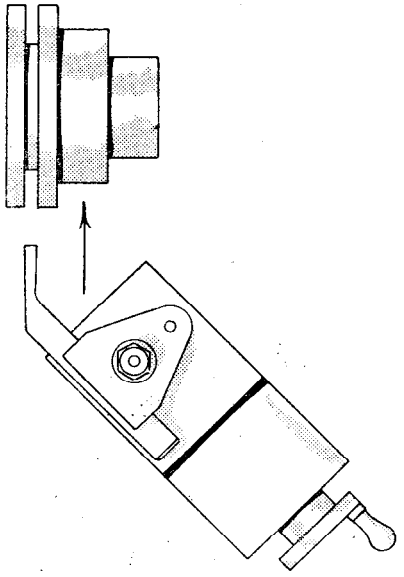


Fig. 4. The first operation of machining. the groove to the full depth

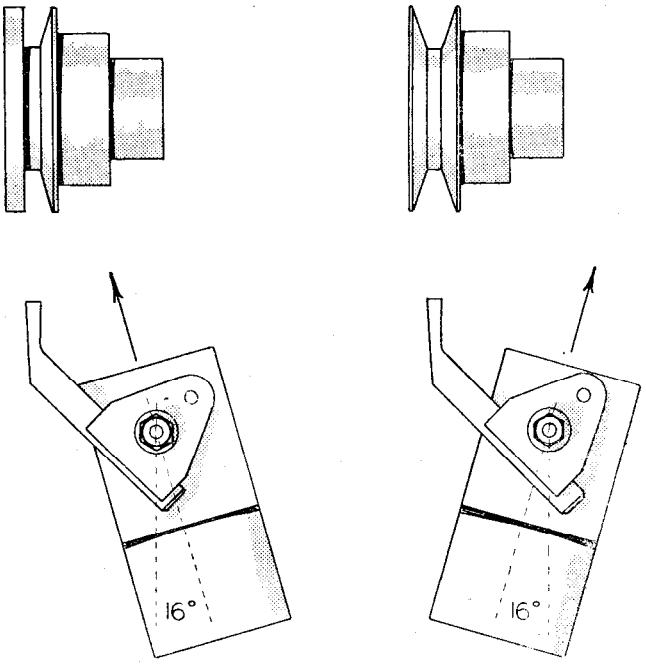


Fig. 5. Machining the two side faces to an included angle of 32 deg.