DESCRIPTION OF SLOTTING • SERRATING SIMPLE FORM CUTTING

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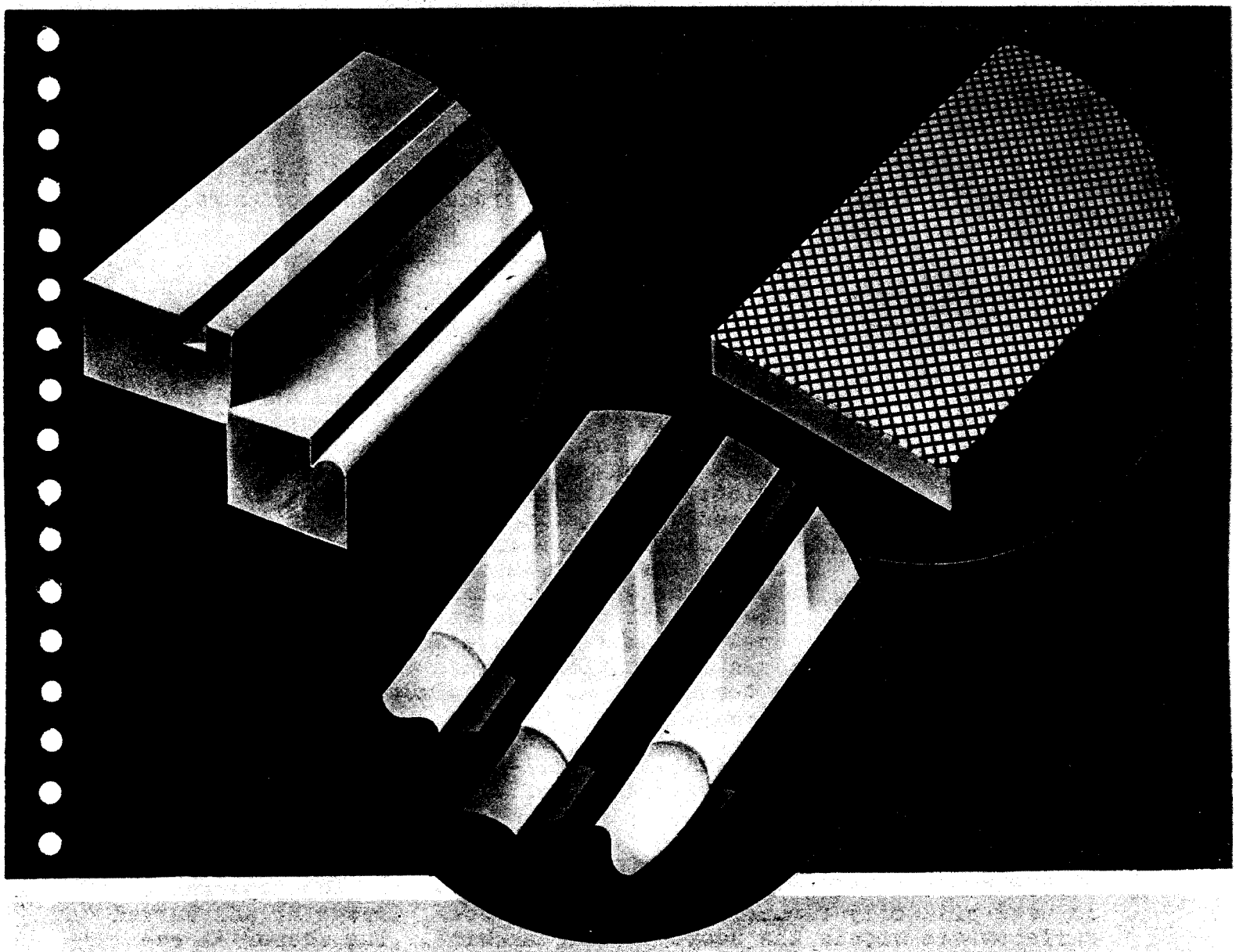


UNIVERSITY OF THE STATE OF NEW YORK
STATE EDUCATION DEPARTMENT
BUREAU OF INDUSTRIAL AND TECHNICAL EDUCATION

DESCRIPTION of SLOTTING • SERRATING • SIMPLE FORM CUTTING

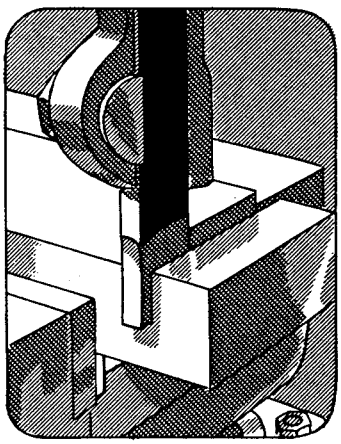
OBJECTIVES OF UNIT

1. To define the processes of cutting-off, slotting, and grooving.

2. To define the process of serrating, and to explain the purpose and use of serrated surfaces.

3. To give a description of contours, or form cuts, and to explain briefly the method used to produce these contours.

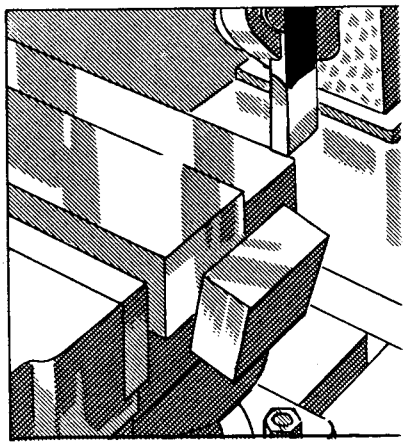
INTRODUCTORY INFORMATION



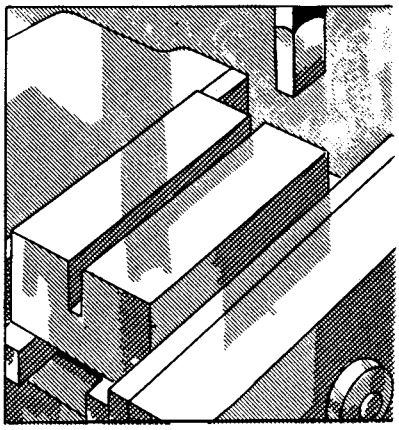
The terms parting, cutting-off, slitting, slotting, and grooving are often used synonymously and sometimes rather loosely. The definitions for these terms, it must be understood, are not all established definitions. For example, there is no established rule which says that a cut less than 3/16" wide is a slit or that a cut more than 3/16" wide is a slot; nevertheless, in this text, 3/16" will be used as a distinguishing and limiting factor. Similar comparisons may be made for some of the other terms in this group. Although the experienced mechanic is not confused by the different terms, the inexperienced operator may have some trouble in making a distinction between them. For use in this text, then, these terms will be defined more specifically and applied more definitely.

Serrating, on the other hand, is a well-established term, and no difficulty should be encountered in defining the process or understanding its purpose.

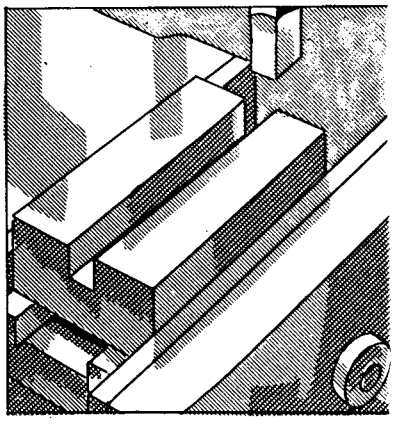
Contour, or form, also is an established term which indicates a curved surface or outline. Regardless of the fact that the shaper is used primarily for producing flat surfaces, irregular and curved surfaces are within the scope of this machine. The shaper is especially convenient when an irregularly shaped surface must be machined on a few pieces and when the outline of the surface can be easily shaped by manipulating the work and the tool to form the outline. Then again, large bulky pieces which have an irregular outline often can be placed in the shaper and the contour cut in a very satisfactory manner with a single-point tool.



Parting and cutting-off are terms usually used to indicate the same operation or process. The parting or cutting-off tool is fed down vertically into the material, and each succeeding stroke of the tool cuts deeper into the metal until the parts are separated. Parting, or cutting-off, then, is the process of separating or cutting off material. Parting is not usually considered an accurate process, although pieces are sometimes cut to within a few thousandths of the desired length.



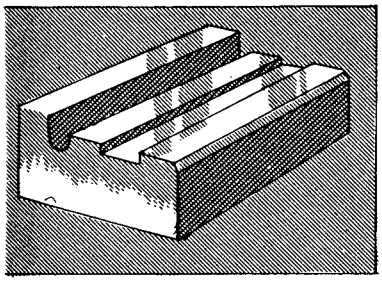
Slitting usually implies a narrow cut. The cut may be of any length, deep or shallow, and, although slitting may be understood to be a severing action, it does not necessarily mean that the metal should be completely severed. In fact, for use in this text, slitting will be limited to a cutting action which does not completely sever the parts. Slits, especially very narrow ones, should not be too deep, because of the difficulties encountered when a deep slit is being cut with a narrow tool. Slitting, therefore, implies that the cut is narrow — not over 3/16" wide — and does not completely sever or cut off the metal.



Slotting should be understood to indicate an opening that is wider than a slit. A slot may have one end open, both ends open, or both ends closed. The sides of the slot may be straight or sloping. A tool may be ground to the exact width of the slot and then used to cut the slot in one operation. If the slot is wider than the tool, the tool can be set to cut down one side of the slot first. When this side is cut, the tool can be raised, the work moved over the correct distance, and the tool fed down to complete the second side of the slot. If the slot is unusually wide and deep, a number of cuts can be taken with a wide tool and most of the excess metal removed. Afterwards, the sides and bottom can be finished with side-cutting tools.

Slots which are cut to a standard width and depth to receive rectangular blocks or keys, are called keyways. These keyways are cut in the same manner as slots, the only difference being that they are cut to standard sizes. A further description of keyways will be omitted here because they will be discussed fully in an advanced monograph on shaper operation.

Grooving should be considered the process of cutting a shallow slot. Such cuts may be square, rectangular, V-shaped, or circular.



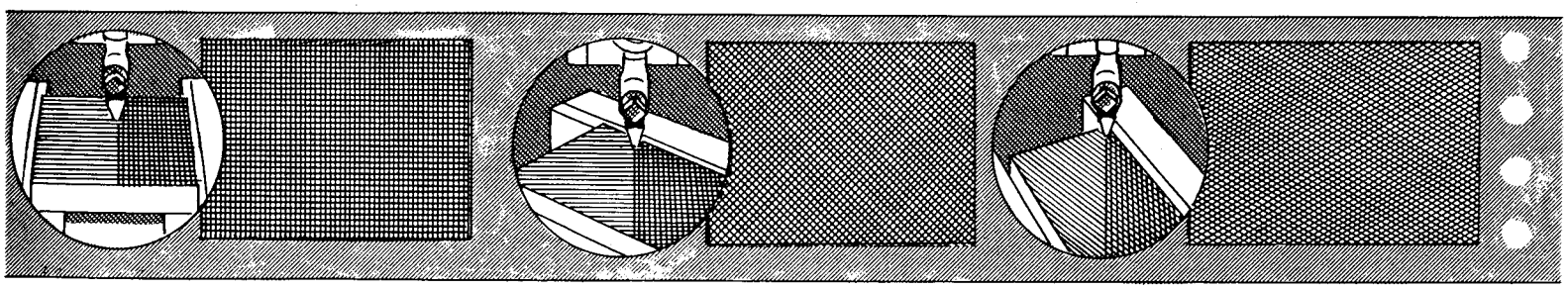
The chief difference between the groove and the slot, however, is that the groove is shallower. One important reason for having grooves in a flat surface is that they act as reservoirs for oil and as channels for the even distribution of the lubricant over areas which need it. They also may act as channels which aid in disposing of dirt and waste material. Grooves are often cut into the face of solids to provide clearance between the surfaces or to reduce slightly the area of the surfaces. Sometimes it is necessary to grind a surface close to a shoulder. With an ordinary disk wheel, it is impossible to do this without leaving a slight radius in the corner. However, if a groove is cut next to the shoulder, the surface can be ground without approaching too close to the corner.

Serrating is the process of cutting a series of equally spaced grooves upon the surface of a piece of work. The serrating consists of two sets of grooves which cross each other and leave small regularly shaped areas between the cuts.

If a series of grooves is cut parallel with the sides of the work and then a second series is cut at 90° to the first series, small square plane surfaces will be formed, bounded by the sides of the cuts.

The grooves may also be cut at an angle to the sides of the work, and then another series cut at an angle to the first set to form either square- or diamond-shaped areas. The shape of the flat surfaces, therefore, will depend upon the angle at which the grooves cross each other. If the grooves are cut at an angle of 45° with the sides of a square or rectangular piece, the flat areas will be square but the corners will be perpendicular to the sides of the work. If, on the other hand, the grooves cross each other at an angle other than 90°, the areas will be diamond-shaped.

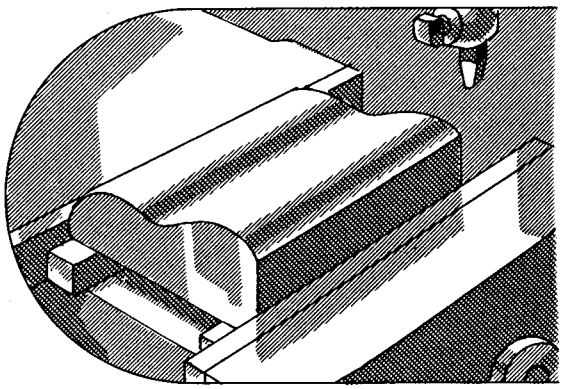
The purpose of serrating is to roughen the surface slightly and to increase its holding power. Although the main reason for serrating is to prevent slipping, it is frequently produced for ornamental and decorative purposes. The shapes of the grooves are not standardized. They are usually V-shaped with flat or rounded surfaces



at the bottom of the two tapered sides. In addition, there is apparently neither standard depth nor distance between the grooves. The depth and distance between the grooves determine the area or size of the numerous flat surfaces.

The piece to be serrated is supported upon parallels and held in the vise. Then a horizontal cut is taken across the top of the work, or, if the surface has been previously machined, the work is leveled in the vise without taking a cut. Finally, the vise is set in position for cutting one set of grooves, and afterwards swiveled to the desired angle for cutting the other.

SIMPLE FORM CUTTING



In addition to the straight-line cuts which are made horizontally, vertically, or angularly, irregular or curved surfaces may also be produced. These curved surfaces are called contours, and, although horizontal, vertical, or angular surfaces may connect the curved parts, only the curved portion should be considered the contour proper. The curves may be single-radius contours, or they may be a combination of many curves.

Often the form of the contour is laid out on the end of the piece, and, when this is the case, it is the duty of the operator to manipulate the work and the tool so that the finished surface conforms to the contour line. The contour may be produced in one of the following ways.

One method makes use of a single-point tool in the tool holder, and then, after each cut, the work is moved sideways and the tool vertically with the hand controls so that the path of the tool forms a curve. When this method is used, some experience and skill are required to produce a curve that is both regular and smooth.

A second method of cutting a contour is to engage the table feed so that the movement of the work is controlled mechanically while the operator controls the downward movement of the tool by hand. When this method is being used, the operator can concentrate on the downward movement of the tool. With a little experience, a very satisfactory and regular curve can be produced in this manner.

A third procedure can be followed by using a number of tool bits that have been ground to suit the different parts of the contour. The contour should be roughed out first; then each tool should be set and brought down to cut a definite part of the curve. The tools should be set so that each part of the contour joins the other in a continuous curve.

A fourth method of shaping a contour is to use a single forming tool to produce the curve. The cutter, or forming tool, may be a tool bit ground approximately to suit a simple curve, or it may be a specially made cutter accurately shaped to conform to an irregular outline and one which involves considerable time and work. The surface of the work which is to be shaped may be roughed out first with a single-point tool and then finished with a forming cutter.

Under some circumstances, the forming tool may be fed down to the proper depth before the work has been roughed out. When this procedure is used, the tool should be held with the cutting edge behind the point of support, or fulcrum, to allow the tool to spring away from the work when the pressure builds up. In addition, the speed must be reduced considerably in order to preserve the cutting edge and also to provide the increased power which is developed at the slower speeds. Furthermore, a coolant must be used with those metals which require one. The coolant not only carries away some of the generated heat, but also acts as a lubricating medium to help preserve the cutting edge of the tool.

For testing the shape of the contour, a metal gage is often used. A gage is usually a piece of sheet metal, the edge of which has been accurately shaped to conform to the exact shape of the contour. The gage is placed on the machined surface, and, by observation, the shape of the surface is compared with that of the gage. If the contour has irregular spots, they may be smoothed off by reworking the high spots with the tool. Sometimes a file may be used to level off the ridges and to smooth off the curve. In many cases, however, a smooth regular surface is not necessary and, therefore, the necessity of making a special gage to suit the contour of the surface is eliminated.

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