April 27, 1965 P. R. FRANZEN 3,180,380

SLOT CUTTER

Filed July 18, 1962

Fig. 1.

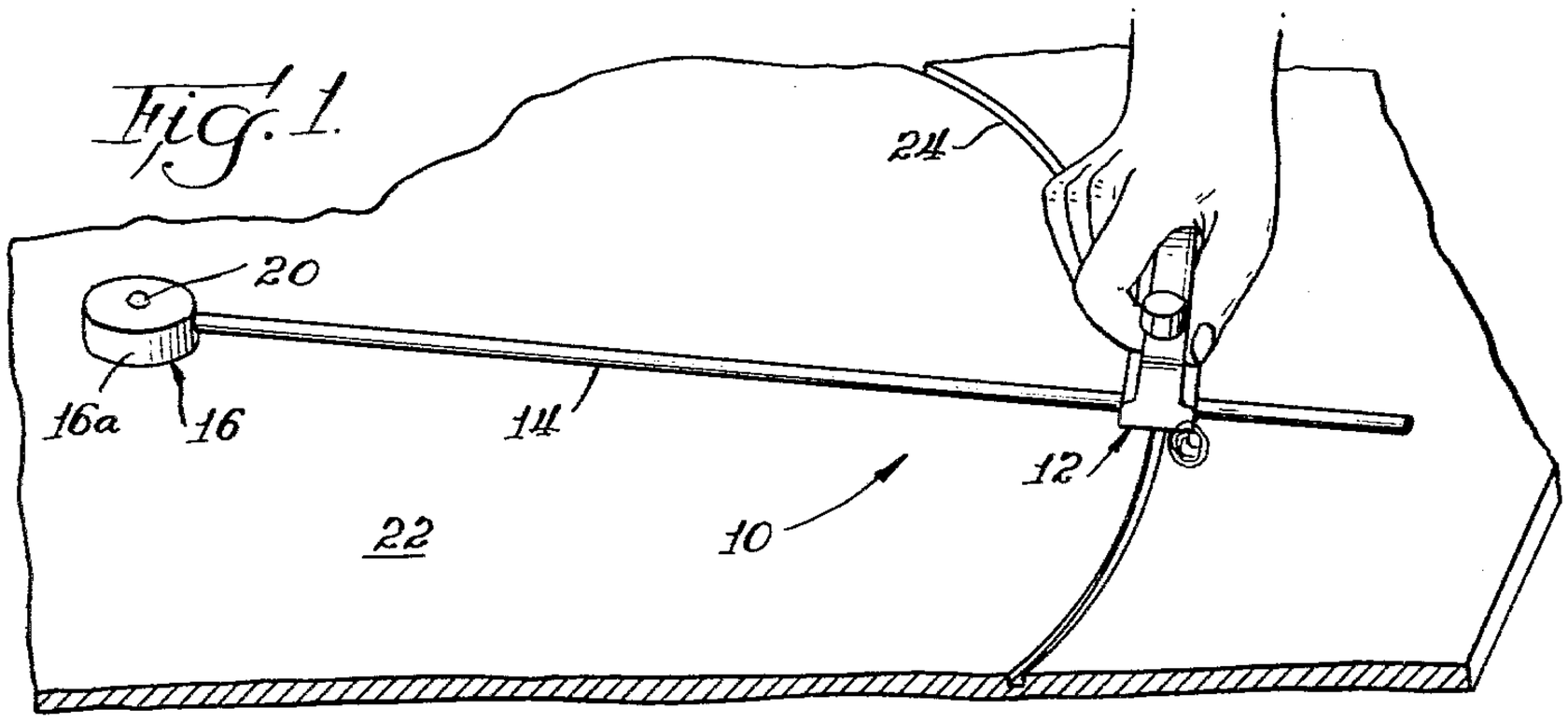


Fig. 2.

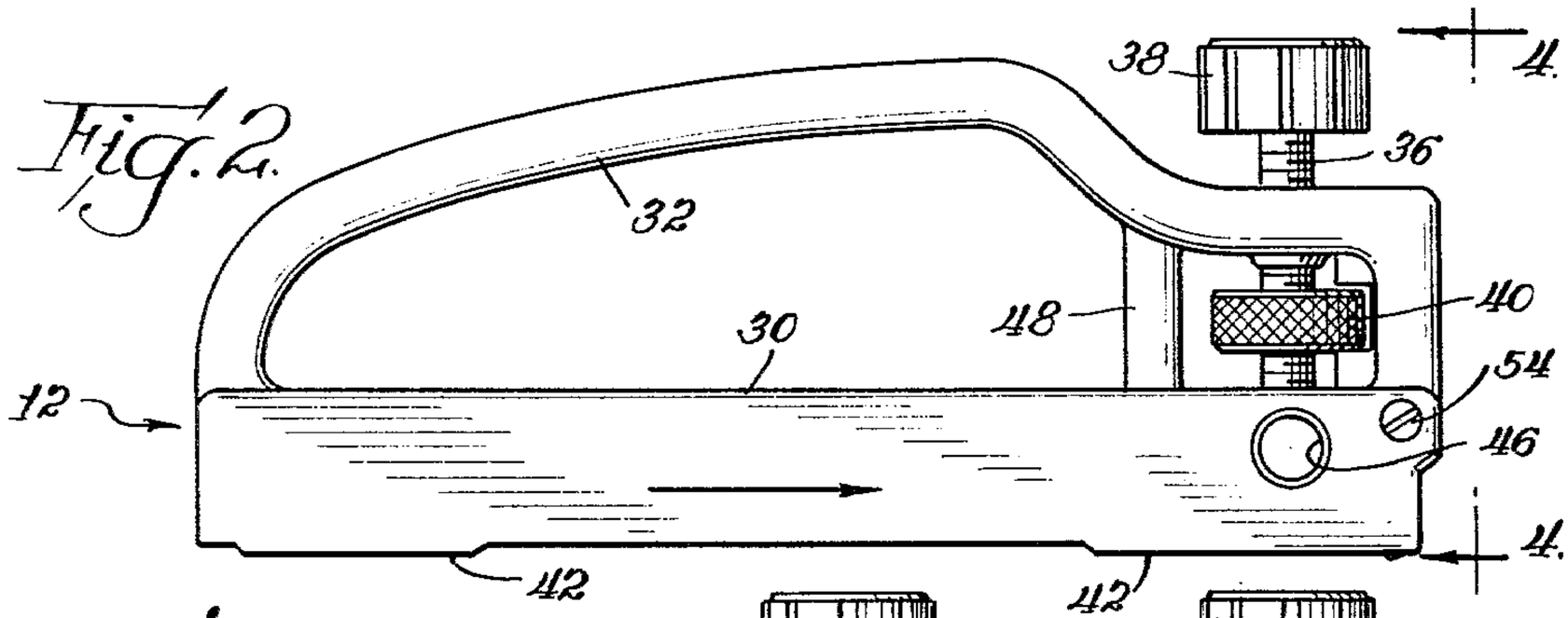
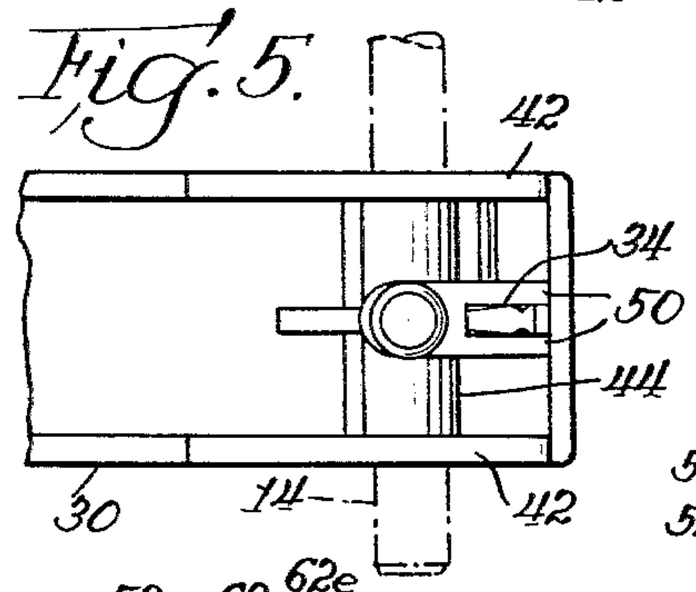


Fig. 5.



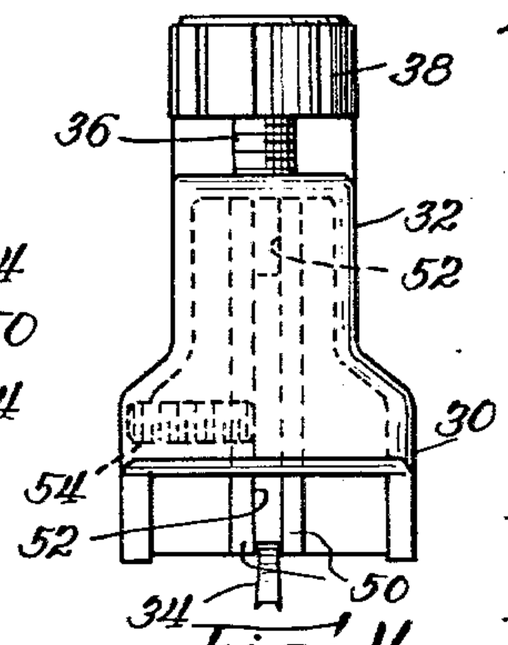


Fig. 4.

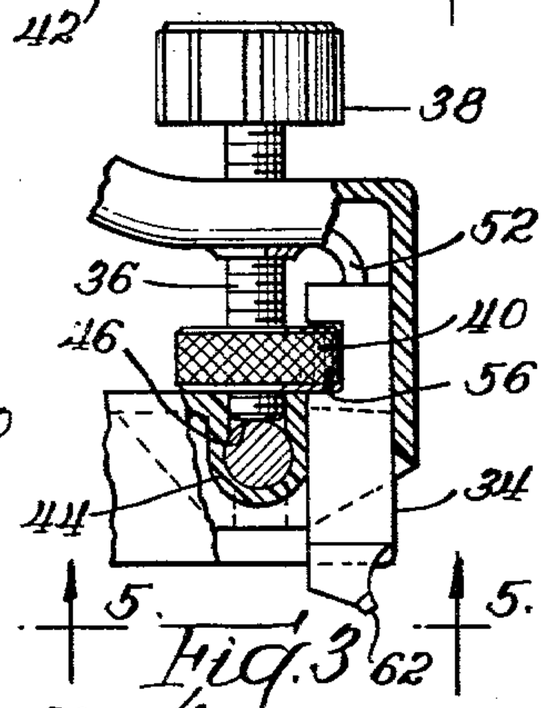


Fig. 3

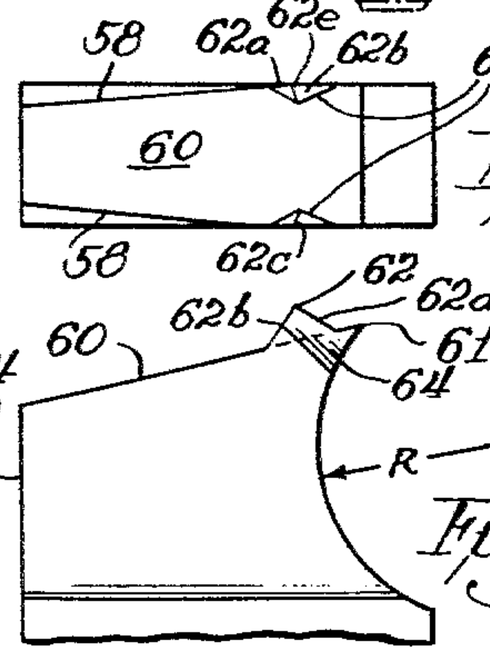


Fig. 6.

Fig. 7.

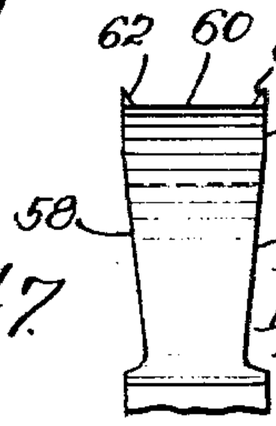


Fig. 8.

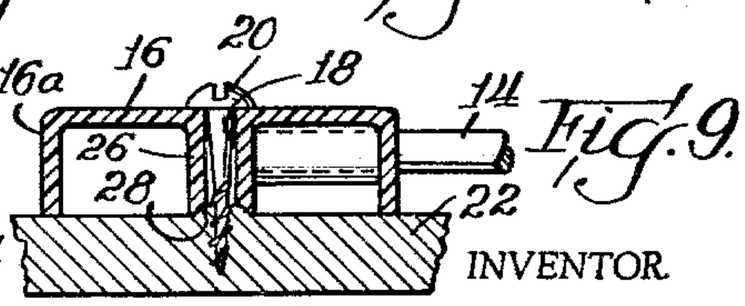


Fig. 9.

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SLOT CUTTER

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This invention relates to a cutting tool, and more particularly to a tool assemblage for cutting slots in sheets or panels such as pressed board, or "Masonite."

The tool of the present invention will be found especially well suited for use in forming slots, or grooves in pressed boards, which slots serve as tracks for miniature motorized racing cars. Each racing car has a depending blade, or rudder which rides in a track in the board to guide the car. The speed of the cars may be individually regulated by remote control means, to thus provide an exciting game which depends primarily upon the skill of each operator. Part of the skill required lies in judging the rate of speed which a car can be made to maneuver a curve without the depending blade becoming disengaged from the track. It therefore becomes important that the track have perfectly vertical side walls relative to the surface of the board. It is also important that the tracks be smooth on the curves, and accurately connect with the connecting portions of the curve.

In the past, such tracks have usually been cut with a router, which generally forms a wavy edge on the vertical sides of the track. Such imperfections tend to retard the movement of the car, thus reducing the maximum speed that can be attained without "jumping the track."

A primary feature of the present invention is that it may be used to form either straight or curved grooves having smooth and polished vertical walls. Means are provided for easy adjustment of the cutter blade whereby the depth of cut may be regulated. A further feature is the arrangement of the cuttter blade within the holder, whereby, upon encountering an obstruction during a cutting movement the blade will be automatically withdrawn from the slot if further cutting action is attempted. This automatic action not only avoids damage to the cuttter blade, but prevents gouging of the slot. Other features of the device of the invention include extreme simplicity of structure with a minimum of parts, as well as provision for positive tracking during cutting on curves resulting from a securely fixed pivot point.

A primary object of this invention is to provide a slot cutter which may be used to form either straight or curved grooves having smooth and polished vertical walls.

Another object is to provide a slot cutter wherein the cutter blade may be easily adjusted for regulation of slot depth.

Still another object is to provide a slot cutter which is arranged to provide automatic withdrawal of the blade from the slot when an obstruction is encountered during a cutting operation.

Another feature of the device of the invention includes extreme simplicity of structure with a minimum of parts.

A further feature is the provision for positive tracking during cutting on curves resulting from a securely formed pivot point.

These and further objects and features of the invention will become more apparent from the following description and the accompanying drawing wherein:

FIG. 1 is a fragmentary perspective-like view illustrating use of the device of the invention during a curved groove cutting operation;

FIG. 2 is a side view of a cutter tool shown in FIG. 1;

FIG. 3 is a fragmentary vertical section view of a front portion of the tool shown in FIG. 2;

FIG. 4 is a view generally as seen along line 4—4 in FIG. 2;

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FIG. 5 is a view generally as seen along line 5—5 in FIG. 3;

FIG. 6 is an enlarged bottom view of a cutter blade used in the tool of FIG. 2;

FIG. 7 is a side view of the same;

FIG. 8 is an end view of the same; and

FIG. 9 is a vertical section view of a pivot piece used in the device of the invention.

Referring now to the drawing, numeral 10 identifies a slot cutter assemblage illustrative of an embodiment of the invention, which assemblage includes a cutter unit 12, a radius rod, or arm, 14, and a pivot piece 16 having annular side walls 16*a*. The cutter unit 12 is adjustably secured to the radius rod 14, which is anchored to the pivot piece 16. The latter has a centrally arranged hole 18 adapted to receive a screw 20 whereby the pivot piece may be secured to the surface of a flat piece of board 22, which may preferably be made of composition material, such as "Masonite." The assemblage is shown in the process of forming a slot or groove 24 in the board 22, the radius of which is established by the mounting position of the cutter unit 12 upon the rod 14 relative to the pivot piece 16.

Attention is directed to the construction of the pivot piece 16 which may advantageously be of molded plastic. A center protrusion 26, in which the hole 18 is formed, projects slightly beyond the plane of the lower edges of the side wall 16*a* and has a conical countersink 28 at the lower end thereof as shown in FIG. 9. When a screw is inserted through the hole 18 and screwed into the board as shown, a certain amount of the board of material is displaced upwardly around the screw and is forced into and molded to the shape of the countersink 28. Such material serves as a centering bearing for the pivot piece 16, whereby the radius rod is securely maintained at its pivoted end against lateral displacement during its movement, thus providing accurate and positive tracking of the cutter unit during curved groove formation.

The cutter unit 12 includes a casting, or molding, which may be a plastic material, formed to provide an elongated rectangular box-like body portion 30 and an integral handle portion 32, extending from end to end of the body in spaced relation thereto and, at the forward end, a cutter blade 34, a vertically adjustable screw 36, a radius rod adjustment knob 38 affixed to the upper end of the screw, and a cut adjustment knurled knob 40 threadedly mounted upon the screw. The body portion 30 is open at the lower end or bottom, and four stepped portions are arranged on the lower edge which in effect form four relatively wide legs, or feet 42. These feet serve to prevent rocking action of the cutter unit in event of slight surface irregularities in the board 22, and also serve to provide clearance beneath the body portion to prevent chip build-up which could adversely affect depth and angularity of slot cut.

A horizontally arranged boss 44 is provided in the body portion 30 near the forward end, said boss serving as a portion through which a hole 46 is formed. The latter is adapted to slidingly receive the radius rod 14, which is secured against relative longitudinal movement by abutment of the end of the screw 36 threadedly supported in the handle portion 32. A rib or brace 48, may be arranged to extend between the handle portion 32 and the body portion 30, for strengthening purposes. A pair of vertically extending wall portions 50 are integrally formed at the forward end of the body portion 30, which wall portions define in part a slot 52 which extends upwardly in the front end of the handle portion 32.

The cutter blade 34 is slidably arranged in the slot 52; a set screw 54, horizontally positioned in the body portion 30, may be rotated into abutment with the side of the

cutter blade **34**, for holding the adjusted vertical position thereof. A recess or slot **56** is formed on an edge portion of the cutter blade **34**, toward the upper end, which recess is slightly wider than the thickness of the cut adjustment knob **40**, so that a portion of the latter will engage the recess. Rotary movement of the knob **40** upon the screw **36**, will cause reciprocal movement of the cutter blade **34**. The range of movement is, of course, designed to provide attainment of maximum cutting depth of the slot **24**.

It will be noted that the screw **36** serves a dual purpose, namely, it may be used to clamp the cutter unit **12** tightly upon the radius rod **14**, and it also serves as a mounting means for the cut adjustment knob **40**, thus eliminating the need for extra parts. The abutment of the knob **40** with the upper surface of the body portion **30**, determines maximum downward movement of the cutter blade **34**. In use of the cutter unit **12**, the knob **40** is turned to adjust the succeeding vertical positions of the cutter blade **34**; the slot **24** is, of course, not cut at a single pass, but is cut in a series of passes. For accurate work the knob **40** cannot be satisfactorily relied upon for holding the cutter in successive adjusted positions, because of the loose clearance between the knob and the blade slot **56**. Accordingly, the set screw **54** is used for holding the cutter blade **34** in a desired position between adjustments.

The cutter end of the blade **34**, which forms an important part of the invention, has sides **58** which are relieved, in the regions indicated, to reduce drag as the end of the blade moves along a slot **24** during a cutting operation, and also to provide clearance as the cutter moves in a curved groove, to thus prevent scoring of the side surface of the groove. A radius "R" is formed in a forward surface of the blade end, which radius meeets at one end with a slanted surface **60** to provide a cutting edge **61**. A pair of lips or scoring teeth **62** project from the slanted surface **60**, the outer surfaces of the teeth being substantially coplanar with the unrelieved sides of the blade as shown in FIGS. 6 and 8, the teeth being disposed a short distance rearwardly of the gouging edge **61** with reference to the normal direction of movement of the cutter unit as indicated by the arrow in FIG. 2. The inner or facing sides of the teeth each have two tapered or sloping intersecting surfaces **62***a* and **62***b* which converge to form a scoring point **62***c* opposed cutting edges **62***d* and a median line **62***e*. These teeth are so dimensioned that when the cutter is disposed in operative position relative to the work with the gouging edge **61** against the surface of the board as shown in FIG. 1 the scoring points of the teeth project a distance of approximately .015 to .022 below the surface of the work. This relationship contributes materially toward the required perfection in the slot and in the ease of operation. As the cutter is moved in either direction the teeth first form two spaced scores in the work. Because the outer sides of the teeth are vertical with respect to the work and the inner sides are provided with the tapered surfaces **62***a* and **62***b* the portion of the board necessarily displaced by the entrance of the teeth is displaced inwardly between the teeth so that as the teeth progress further into the board, the gouging edge **61** first removes this displaced material and with continued entry of the teeth removes the narrow band of stock already separated from the adjacent side surfaces by the score lines. Thus, at each forward pass of the cutter, the gouging edge **61** removes the material between the scoring cuts and the teeth provide the score cuts for the next pass. The inward displacement of the material prevents the formation of ridges on the surface of the board along the opposed edges of the slot. The relationship should be such that the teeth produce score cuts of a depth substantially equivalent to that removed by the cutter to enable the cut to be produced without undue effort. If the length of the teeth is inadequate, the edge of the slot will not have the required smoothness whereas

if too long, the cutter becomes difficult to pass through the work.

The feet **42** at the forward end of the cutter unit, will be seen (FIG. 2) to extend slightly beyond the forward cutting edge of the surface **60**. This provides a fulcrum so that in event the cutter blade encounters an obstruction, or hard spot, during a cutting operation, a tilting action will result which causes the blade to be pulled out of the slot. Accordingly, such an occurrence will not produce a gouge in the work, as may be the case if this fulcrum was to the rear of the cutter point.

The operation of the cutter assemblage **10** in the formation of a curved surface, will be obvious from the foregoing. In cutting a straight slot, the cutter unit **12** is not mounted on the radius rod **14**, rather, it is moved along a straight edge which is positioned for cutting of the desired slot. In using the cutter assemblage of the invention, it is recommended that curved portions of a closed track, as determined by the slot layout, be first formed, followed by cutting of the joining straight portions of the track. In the usual case, wherein the slots are to be used in racing car arrangements, more than one parallel closed track will be formed.

From the foregoing it will be obvious that the cutter assemblage above disclosed, will satisfy all of the objectives of the invention.

The foregoing description has been given in detail without thought of limitation since the inventive principles involved are capable of assuming other forms without departing from the spirit of the invention or the scope of the following claims.

I claim:

1. A cutter for cutting a slot having spaced parallel sides comprising in combination an elongated rectangular body portion, a handle portion extending above the body portion in spaced relation thereto and affixed to the body portion, said body portion and said handle portion being arranged to provide a mounting slot near one end of the cutter which mounting slot extends normal to the longitudinal axis of the body portion, a cutter blade having a thickness substantially equal to the width of the slot to be cut slidably arranged in said mounting slot and having an end movable beyond an edge of the body portion, said end having a slanted end surface and a pair of teeth, one on each side of the blade, said teeth projecting beyond the slanted surface, and a recess on one edge thereof, said body portion being formed to provide a transverse opening for the reception of a mounting member which opening extends through the body portion in a plane parallel with the bottom edge of the body portion, a screw means threadedly supported in the handle portion and movable into said body portion opening to a position to engage a mounting member for securing the body thereto, and a knob threadedly supported on said screw, said knob being in engagement with the cutter blade recess whereby to adjust the cutter position in response to movement of the knob on the screw means.

2. A cutter for cutting a slot having spaced parallel sides comprising in combination an elongated rectangular body portion, a handle portion extending above the body portion in spaced relation thereto and affixed to the body portion, said body portion and said handle portion being arranged to provide a mounting slot near one end of the cutter which mounting slot extends normal to the longitudinal axis of the body portion, a cutter blade having a thickness substantially equal to the width of the slot to be cut slidably arranged in said mounting slot and having an end movable beyond an edge of the body portion, said end having a slanted end surface, a forward curve surface which intersects the slanted surface, and a pair of parallelly arranged teeth, one on each side of the blade and at a position slightly behind the point of intersection of the curved and slanted surfaces, said teeth projecting beyond said point of intersection, and a recess on an edge thereof,

a screw mounted in the handle portion and extending into the body portion and a knob threadedly supported on said screw, said knob having its peripheral side edges in engagement with the cutter blade recess whereby to adjust the cutter position in response to rotation of the knob on the screw means.

3. A cutter for cutting a slot having spaced parallel sides comprising in combination an elongated rectangular body portion, a handle portion extending above the body portion in spaced relation thereto and affixed to the body portion, said body portion and said handle portion being arranged to provide a mounting slot near one end of the cutter which mounting slot extends normal to the longitudinal axis of the body portion, a cutter blade having a thickness substantially equal to the width of the slot to be cut slidably arranged in said mounting slot and having an end movable beyond an edge of the body portion, said end having a slanted end surface, a forwardly curved surface which intersects the slanted surface, and a pair of parallelly arranged teeeth, one on each side of the blade and at a position slightly behind the point of intersection of the curved and slanted surfaces, said teeth projecting beyond said point of intersection, each of said teeth being beveled on an inner surface, said blade having opposite sides relieved so that the blade tapers backward from the curved surface, a screw supported in the handle portion and projecting into the body portion, and a knob threadedly supported on said screw the knob being in engagement with the cutter blade whereby to adjust the cutter position in response to movement of the knob on the screw means.

4. The combination of claim 1 having leg means in the

form of ribs on the bottom edge of the body positioned adjacent each side thereof and extending less than the length of the body portion to support the body on the workpiece at spaced points and thereby minimize the effect of irregularities in the surface of the workpiece.

5. The combination of claim 4 wherein the leg means includes ribs on the bottom edge of the body at the forward end of the body which extend forwardly beyond the projecting end of the cutter blade to provide a fulcrum for tilting the body and thereby raise the cutter from the workpiece in the event the cutter encounters an obstruction.

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