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3,299,779

TOY FOR THREE DIMENSIONAL CARVING

Filed April 28, 1965

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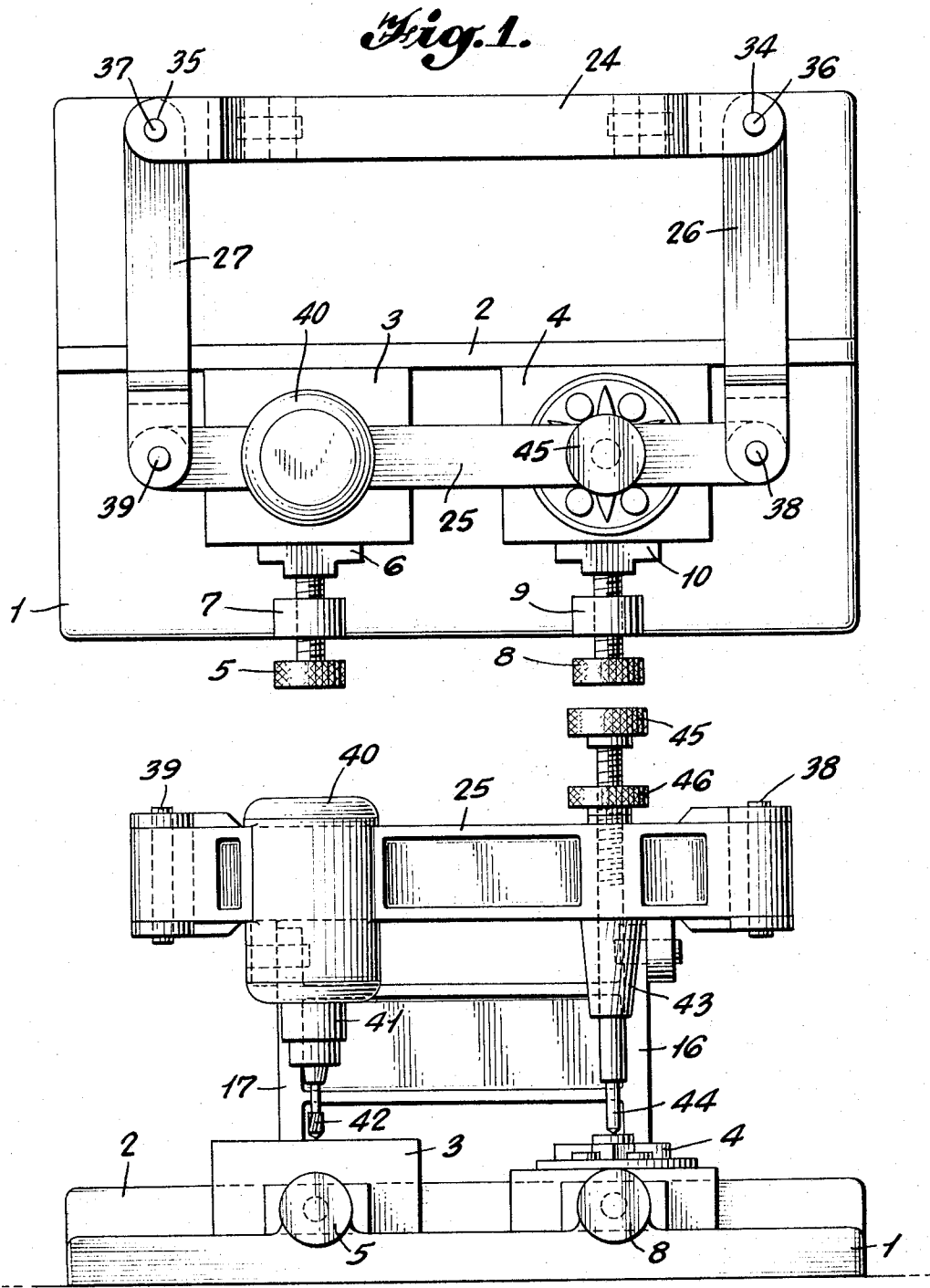


Fig. 2.

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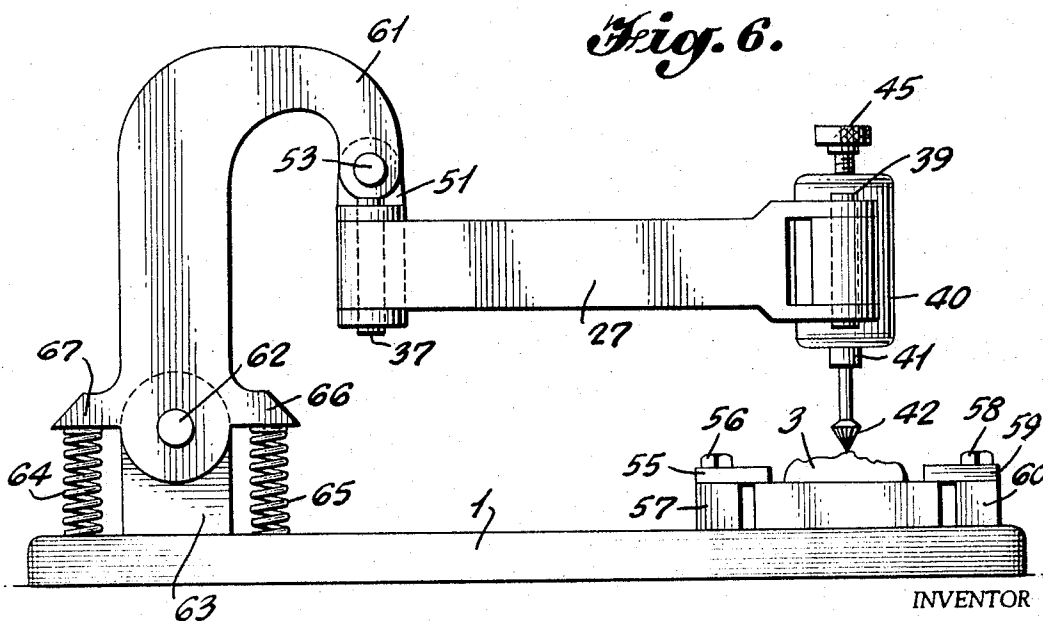
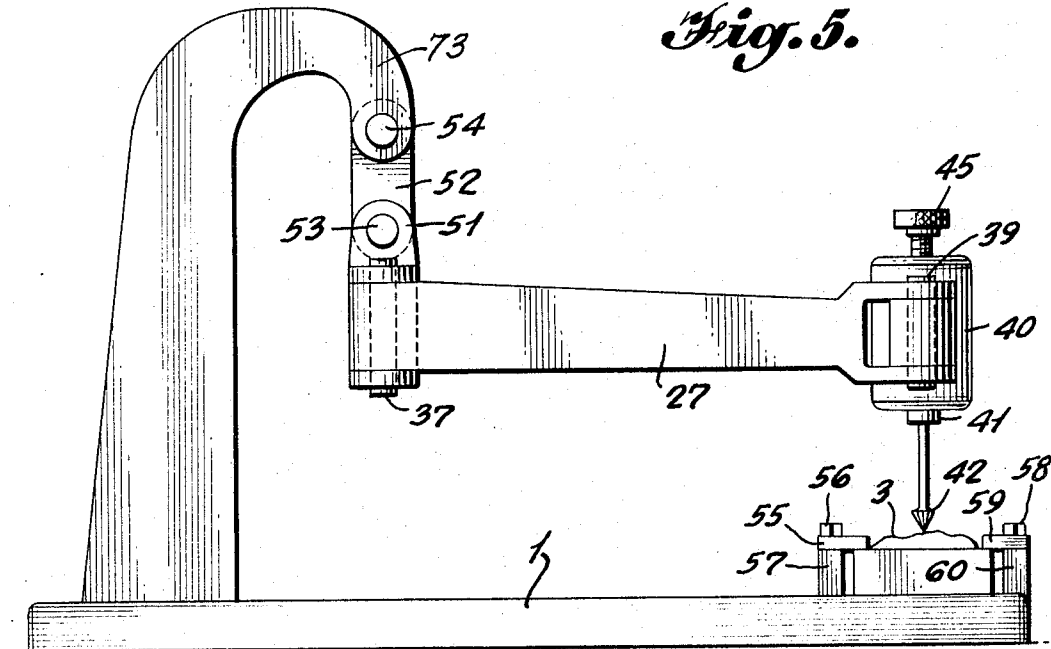
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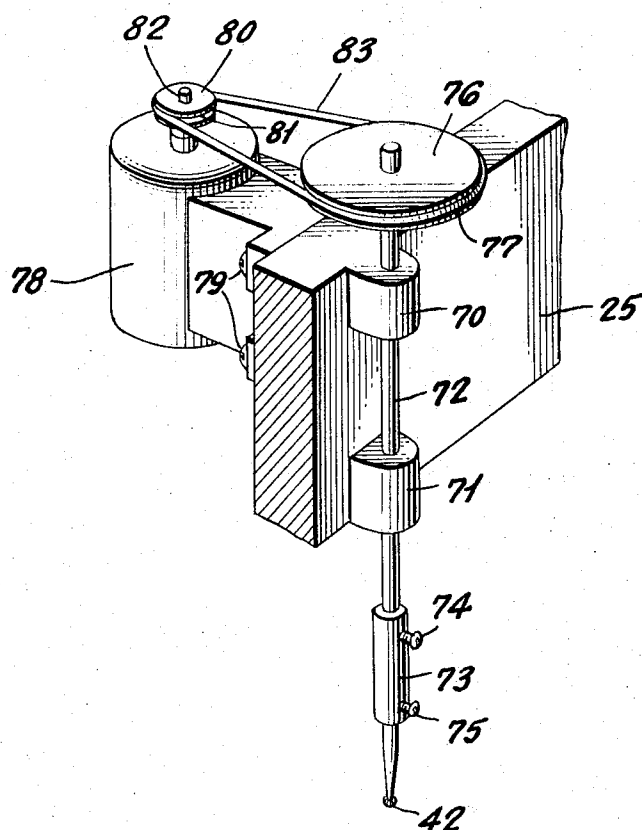
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Fig. 7.



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TOY FOR THREE DIMENSIONAL CARVING
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This invention relates to a three dimensional toy carving device and more specifically, to a three dimensional toy carving device for use by children for copying and reproducing a three dimensional configuration at a remote location.

Toys for copying flat two dimensional configurations at a remote location have been known in the art for many years and have enjoyed great popularity in the past. Toys of this type have been most acceptable for use in reproducing drawings, tracings and the like at a remote location wherein the mere following of a line by one portion of the copying device will immediately cause a reproduction of such line at the remote location. The prior art, however, has never known the use of toy carving devices capable of producing carvings in three dimensions at a remote location by following the outline in the three dimensions of the three dimensional object to be reproduced and reproducing same at the remote location.

In accordance with the present invention, there is provided a toy carving device for carving three dimensional objects at a remote location which are the reproductions of a three dimensional object to be copied which is positioned at a first location. The above is accomplished by providing a quadrilateral device having four pivotally attached arms, the pivot at each pair of adjacent arms being coupled by a connecting rod or the like to form a pivotal hinge designed to rotate in a plane substantially in the plane of the quadrilateral configuration. One of the arms of the quadrilateral device has secured therein a battery operated motor with a rotary file, burr or the like affixed to the shaft thereof and a tracer member having a depending tracer element positioned and affixed in the same quadrilateral arm and spaced from the motor. The quadrilateral device is also movable in all planes normal to the plane of the quadrilateral device. This movement is provided by means of a pivotable joint coupled to one arm of the quadrilateral device and parallel to this arm for rotating the quadrilateral device in an arc about said arm. The last mentioned pivotable joint is coupled to a further pivotable joint by means of a vertical arm or the like, the pivoting axes of the last mentioned joint and the further joint being parallel to allow the last mentioned pivotal to rotate about the said further pivotal joint. The further rotatable hinge or joint is mounted on a base member, the base member further including a work holder for holding a block to be carved and a work holder for retaining the object to be traced.

The three dimensional toy carving device described hereinabove is capable of copying in depth and therefore can produce carvings, base reliefs and the like. Furthermore, a toy carving device of the type set forth hereinabove is safe, easy to use and can be manufactured at a relatively low cost, thereby making such a device adaptable for use.

It is therefore an object of this invention to provide a three dimensional toy carving device for carving and reproducing a three dimensional object at a position remote from the object to be reproduced.

It is a further object of this invention to provide a three dimensional toy carving device which is safe for children's use, easy to use and which can be manufactured at a relatively low cost.

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It is a still further object of this invention to provide a three dimensional toy carving device having four pivotally attached arms forming a quadrilateral, the quadrilateral being rotatable about an axis parallel to one arm thereof and the axis being rotatable about a second axis parallel thereto to provide three dimensional movement.

The above objects and still further objects of this invention will immediately become obvious to those skilled in the art from a consideration of the following description of the preferred embodiments of this invention, wherein:

FIGURE 1 is a top view of a preferred embodiment of a three dimensional toy carving device in accordance with the present invention;

FIGURE 2 is a front view of a three dimensional toy carving device of the preferred embodiment of the present invention;

FIGURE 3 is a side view of a three dimensional toy carving device of the preferred embodiment of the present invention;

FIGURE 4 is a view taken along the line 4—4 of FIGURE 3;

FIGURE 5 is a second embodiment of a three dimensional toy carving device in accordance with the present invention;

FIGURE 6 is a third embodiment of a three dimensional toy carving device in accordance with the present invention; and

FIGURE 7 is a motor driven belt drive arrangement for driving the cutting tool of the present invention.

Referring first to FIGURES 1 to 4, there is shown a base member 1 upon which a three dimensional object to be traced and a three dimensional carving to be produced are positioned and to which are attached the supporting members of a carving device. The base member includes a vertically extending flange 2 against which a block 3 to be carved and a three dimensional object 4 to be traced is caused to abut. The block 3 is positioned and secured on the base of the carving device by rotation of a threaded screw member 5 which causes an abutting member 6 attached thereto to force the block 3 against the flange 2. The threaded screw member 5 is positioned to be received in a thread receiving member 7 which is integral with the base 1. The three dimensional object 4 is forced against the flange member 2 by means of a threaded screw member 8 which is received by a thread receiving member 9 integral with the base 1. Upon rotation of the threaded screw member, an abutting member 10 forces the three dimensional object 4 to be rigidly secured against the flange 2.

Also integral with the rear portion of the base 1 are a pair of posts or ears 11 and 12 having aligned apertures 13 and 14 therein. A vertically positioned brace member or link 15 having a pair of vertical arms 16 and 17 is positioned adjacent the posts 11 and 12. The end portions of the arms 16 and 17 each have aligned apertures 18 and 19, and 20 and 21, the apertures 18 and 19 being aligned with the apertures 13 and 14 and being secured in place by means of pins 22 and 23 to provide a hinge or pivotable joint.

The toy carving device further includes a quadrilateral or parallelogram shaped support frame having a rear member 24, a front member 25 and side members 26 and 27. The rear member includes a pair of depending extensions 28 and 29 integral therewith, the extension 29 including an aperture 30 aligned with the aperture 20 of the brace member 15 and the extension 28 including an aperture 31 aligned with the aperture 21 of the brace member 15. Pins or pivots 32 and 33 secure the members 24 and 15 in place with respect to each other and provide a hinge or pivotable joint.

The arm 24 further includes a pair of apertures 34 and 35 at the end portions thereof which are aligned with apertures in the end portions of the arms 26 and 27. These arms are pivotably secured with respect to each other by means of pins or pivots 36 and 37. The arm 26 has an aperture at its other end portion which is aligned with an aperture in one end portion of the front member 25. These apertures are pivotably secured in place by a pin or pivot member 38 to provide a pivot or hinge. Also, the arm 27 has an aperture at its other end portion which is aligned with an aperture at the other end portion of the front member 25. These apertures are aligned and pivotably secured in place by means of a pin or pivot 39 to form a pivot or hinge.

The front member 25 of the parallelogram includes a battery-operated motor 40 (batteries are not shown) secured adjacent one end of the front member 25. This motor includes a chuck 41 which retains a toothed cutter 42 such as a rotary file or a burr. Also secured in the front member 25 adjacent the right hand end thereof is a tracer 43 having a tracer point member 44 positioned therein. The tracer point 44 is positioned in a vertical direction by rotation of the threaded member 45 which is coupled thereto. The threaded member 45 is referred to as the tracer knob. The threaded tracer knob 45 is locked in the desired position by means of the lock nut 46.

In operation, the tracer point 44 is caused to traverse the outer surface of a three dimensional object to be traced and reproduced. The tracer point 44 is capable of free movement in three dimensions since the carving device has effectively three mutually perpendicular degrees of freedom. The first degree of freedom is the capability of the parallelogram composed of arm members 24, 25, 26 and 27 to be pivoted in a horizontal plane due to the pivots formed by the pivots or pins 36, 37, 38 and 39. In addition, the hinges or pivotable members formed by the pivot pins 32 and 33 in the extensions 29 and 28 allow the parallelogram to be rotated along a cylindrically extending area about an axis parallel to the arm 24, whereas, the pivots 22 and 23 in the posts 12 and 11 allow the said axis to be rotated along a cylindrically extending area about an axis parallel to the axis of the pivots or pins 32 and 33. It therefore follows that the carving device is capable of being effectively positioned in three different mutually perpendicular planes and, therefore, any movement of the tracer point 44 will be reproduced by the cutting member 42. In this manner, a three dimensional object positioned between the flange 2 and the member 10 as shown by the member 4 can be reproduced on a carvable medium 3 which is positioned between the flange 2 and the member 6 merely by following the outer surface of the member 4 with the tracer point 44.

The embodiment of FIGURE 5 is similar to the embodiment of FIGURES 1 to 4 and like numerals therein represent like components. The variation herein is in the rear member 24 and the means to secure the arm 24 to the base member 1. In the embodiment of FIGURE 5, the rear arm 24 is altered by providing a pair of upwardly extending portions 51 having an aperture therein to replace the extensions 28 and 29. Such upwardly extending portions are provided at both ends of the arm 24 in a manner similar to the extensions 28 and 29 of FIGURE 4. It should be understood, of course, that a single pivot may be used in place of the pair of pivots set forth herein though the double pivot provides better results. A pair of link members 52 having an aperture in both ends of each said arm member is aligned with the aperture in each member 51 and pins or pivots 53 secure the members 51 and 52 together to form a pair of pivotable members or hinges. The other aperture of each of the members 52 is aligned with an aperture of one of a pair of members 73 and secured thereto by a pin or pivot 54 to form a pair of hinges or pivotable members. The members 73 are secured to the base 1.

It will be noted that the device for securing the block to be carved to the base is altered in this embodiment in that the block 3 is positioned in place under a pair of securing members 55 and 59. These securing members are positioned to secure the block 3 rigidly in place by the adjustment of the screw members 56 and 58 in the screw receiving members 57 and 60 which are secured to the base member 1.

It can again be seen that the carving device embodiment of FIGURE 5 will have freedom in effectively three mutually perpendicular planes, one being the horizontal plane of the parallelogram arm members, the second and third degrees of freedom being provided by the combined rotation about the pivot pin 53 and the rotation about the pivot pin 54.

Referring now to FIGURE 6, there is shown a third embodiment of the present invention wherein, again, like numbers represent like structure.

In this embodiment, the pivots 54 of the embodiment of FIGURE 5 have been replaced by a pair of J-shaped arm members 61 having apertures at both ends thereof. One pair of these apertures is aligned with the apertures of the members 51 and secured thereto by the pins or pivot members 53 to form a pair of hinges or pivotable members. The second pair of apertures in the members 61 is aligned with the apertures at the top ends of each of a pair of lug members 63 which are integral with the base 1. The members 61 are secured to the members 63 by means of pins or pivot members 62 which form pivots or hinges.

Any rotation about the pivot members 62 will be restored upon removal of any bias thereon by means of a pair of springs 64 and 65 positioned between flanges 66 and 67 and the base 1 of each member 61. Movement about the pivots 62 will cause one of these springs to be placed in compression and the other to be placed in expansion. Removal of the bias will allow the springs to return to their original positions. It will again be noted that the carving device is capable of movement in effectively three mutually perpendicular planes as in the above embodiments and therefore is capable of carving out a three dimensional pattern in the manner set forth hereinabove.

Referring now to FIGURE 7, there is set forth a preferred apparatus which can be used to drive the cutting tool of any of the embodiments of FIGURES 1 to 6. A portion of the front arm member 25 is shown having a pair of spindle bearings 70 and 71 secured to the arm member 25 or integral therewith. A spindle 72 is positioned through apertures in the spindle bearings 70 and 71. A cutter bit collar 73 is secured to one end of the spindle 72 by a screw member 74 which passes through a threaded aperture in the collar and forces the spindle against the collar. The cutter 42 is positioned within the collar 73 and is secured therein by a screw member 75 which passes through a second threaded aperture in the collar and forces the cutter against the collar.

A spindle pulley 76 having an inwardly extending annular groove 77 about the end surface thereof is secured to the other end of the spindle.

A motor 78 is secured to the arm 25 by means of bolts 79. The motor shaft 82 includes a motor pulley 80 positioned and secured at one end thereof. The motor pulley 80 includes an inwardly extending annular groove 81 about the end surface thereof. An O ring belt drive 83 is taughtly positioned in the grooves 77 and 81 of the pulleys 76 and 80 to provide power transmission from the motor 78 to the cutter 44. The relative diameters of the pulleys 76 and 80 can be adjusted to provide the desired rotational speed to the cutter 44.

Although the invention has been described with respect to three preferred embodiments, many other embodiments and alterations and variations thereof will immediately become apparent to those skilled in the art.

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It is therefore the intention of the appended claims to be interpreted as broadly as possible in view of the prior art to encompass all such additional embodiments, variations and modifications thereof.

What is claimed is:

1. A three dimensional toy carving device comprising a support having a plurality of arms pivotally connected together to form a rectangular frame, a rectangular base, means adjacent one edge of the base mounting one of said arms on a face of the base for pivotal movement about parallel spaced axes, means mounting a cutting tool and a tracer on another arm of the frame parallel to said one of said arms, and clamping means adjacent the opposite edge of the base for clamping a work piece under the cutting tool and an object to be traced under the tracer on said face of the base, the means pivotally mounting said one arm comprising an ear extending laterally from said arm adjacent each end thereof, a support secured to said face of the base, and link means pivotally connected to said ears and support, the pivotal connection of said one arm with adjacent arms comprising spaced ears extending in opposite directions from the opposite ends of said one arm and pivot pins extending through said ears and the adjacent arms.

2. A device as defined in claim 1 wherein the support comprises spaced ears integral with the base and the link means comprises a frame mounted between the ears on the arm and frame.

3. A three dimensional toy carving device comprising a support having a plurality of arms pivotally connected together to form a rectangular frame, a rectangular base, means adjacent one edge of the base mounting one of said arms on a face of the base for pivotal movement about parallel spaced axes, means mounting a cutting tool and a tracer on another arm of the frame parallel to said one of said arms, and clamping means adjacent the opposite edge of the base for clamping a work piece under the cutting tool and an object to be traced under the tracer on said face of the base, the means pivotally mounting said one arm comprising an ear extending laterally from said arm adjacent each end thereof, a support secured to said face of the base, and link means pivotally connected to said ears and support, the support comprising spaced arms each having a portion overhanging

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the base and the link means comprises separate links pivotally connected to the overhanging portion.

4. A three dimensional toy carving device comprising a support having a plurality of arms pivotally connected together to form a rectangular frame, a rectangular base, means adjacent one edge of the base mounting one of said arms on a face of the base for pivotal movement about parallel spaced axes, means mounting a cutting tool and a tracer on another arm of the frame parallel to said one of said arms, and clamping means adjacent the opposite edge of the base for clamping a work piece under the cutting tool and an object to be traced under the tracer on said face of the base, the means pivotally mounting said one arm comprising an ear extending laterally from said arm adjacent each end thereof, a support secured to said face of the base, and link means pivotally connected to said ears and support, the support comprising spaced lugs and the link means comprises J-shaped members with the long leg of the J pivotally connected to a lug and the short leg overhanging the base and pivotally connected to an ear.

5. A device as defined in claim 4 further including oppositely extending flanges on the long leg of the J and spring means between said flanges and said face of the base to resiliently maintain the long leg of the J in a preselected position.

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