356/150 CROSS REFERENCE SEARCH ROOM

Dec. 2, 1969 M. R. KANTZ 3,481,039

TANGENT FITTER INCLUDING A STRAIGHT EDGE AND AN IMAGE SPLITTING ELEMENT

Filed March 22, 1967

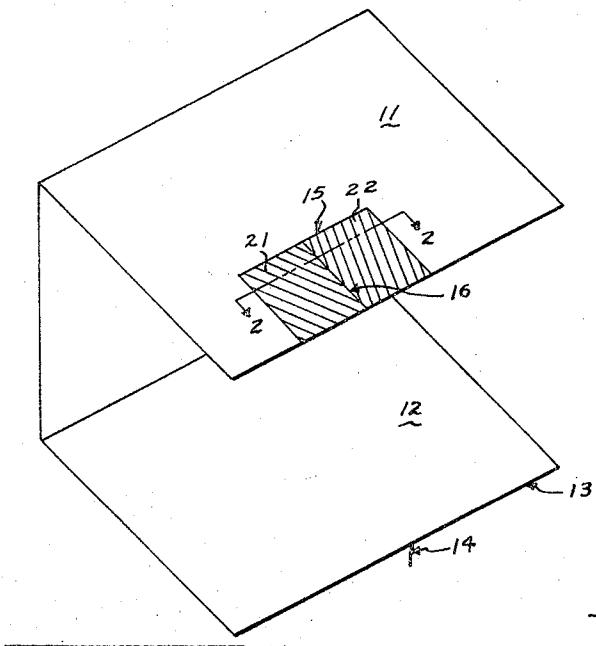


Fig. 1

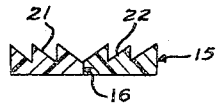


Fig. 2

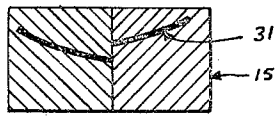


Fig. 4

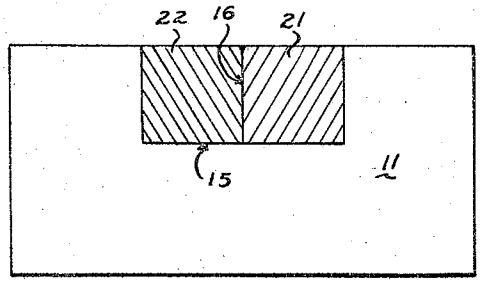


Fig. 3

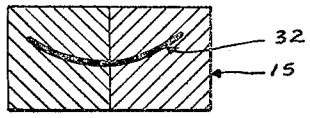


Fig. 5

INVENTOR.
MELVIN R. KANTZ

BY Robert M. Dickey
attorney

United States Patent Office 3,481,039 Patented Dec. 2, 1969

3,481,039

TANGENT FITTER INCLUDING A STRAIGHT EDGE AND AN IMAGE SPLITTING ELEMENT

Melvin R. Kantz, Philadelphia, Pa., assignor to Monsanto Research Corporation, St. Louis, Mo., a corporation of Delaware

Filed Mar. 22, 1967, Ser. No. 625,141
Int. Cl. B43l 7/00, 13/00; G06g 1/00
U.S. Cl. 33—75 4 Claims

ABSTRACT OF THE DISCLOSURE

This invention relates to a device for establishing a line tangent to a curve, which consists of a base plate containing a straight edge, a pivot, and a top plate containing an image splitting-viewing element, all arranged in a critical configuration.

BACKGROUND OF THE INVENTION

The invention described herein was made in the course of, or under, Contract AT–33–1–GEN–53 with the U.S. Atomic Energy Commission.

This invention relates to a device used to draw a straight line through a point tangent to a curved line. By placing the device at a point on a curved line and appropriately aligning the device, a straight line can be drawn tangent to the point.

In the course of preparing engineering drawings and prints, or preparing other graphical presentations where it is necessary to draw a line tangent to a curved line, it is extremely difficult, even for a skilled illustrator to draw a tangent accurately. Such a task becomes even more difficult if it is necessary to draw a line tangent to a point on a free-form curve where the symmetry of a circle or a chord is not present.

Thus, there is a need for a device for use by the draftsman, artist, or illustrator to aid him in drawing a tangent to a curve at a point with significantly greater accuracy. The present invention satisfies the need for such a device.

SUMMARY

One object of the present invention is to provide a device to establish a line tangent to a curve.

Another object of the invention is to provide a means of drawing tangents to a curve with improved precision and accuracy.

These and other objects are obtained by the use of a device consisting of a base plate containing a straight edge, a pivot pin, and a top plate containing an image splitting element, all arranged in a critical configuration.

DESCRIPTION OF THE DRAWINGS

FIGURE 1 is one embodiment of the present invention showing the relationship of the parts.

FIGURE 2 is a cross-sectional view of the transparent image splitting element.

FIGURE 3 is a top plan view of the top plate containing the transparent image splitting element.

FIGURES 4 and 5 are views of the expected images seen as the present invention is used. FIGURE 4 is a view that might be seen by the user, indicating that the device is not appropriately aligned to draw a line tangent to a curved line, whereas FIGURE 5 is a view, as seen by the user, indicating that the device is appropriately aligned so that a line tangent to the curved line may be drawn.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

In the embodiment, shown in FIGURE 1, clear plastic sections are bonded together in such a way that the top

plate **11** is parallel to, and directly opposite to, the bottom section that forms the base plate **12** of the device. The longer free edge of the base plate **12** is a straight edge **13**, and a steel pivot pin **14** is cemented to the center of the straight edge **13**. The top section **11** of the device is maintained in a constant position relative to the straight edge **13** and steel pivot pin **14**. The transparent image splitting element **15** is recessed in the top section **11**. A center line **16** bisects the image splitting element **15** directly above the pivot pin **14** and perpendicular to the straight edge **13**.

FIGURE 2 is a cross-sectional view of the image splitting element **15** showing the center line **16**. The image splitting element is made of two sets of triangular prisms **21** and **22**, one set on each side of the center line **16**, and so oriented that the light from beneath is refracted toward the center line.

FIGURE 3 shows a closer view of the image splitting element **15** recessed in the top section **11**. A center line **16** bisects the image splitting element **15**, which is made of a transparent material such as plastic or glass. The triagular prisms **21**, in one half of the image splitting element **15**, radiate out from the center line **16** at an angle other than 90°. The triangular prisms **22** in the other half of the image splitting element **15** radiate out from center line **16** in mirror image of the set of triangular prisms **21**.

In operation, the pivot pin **14** is placed at the point on the curved line where the tangent line is to be drawn. The operator looks through the image splitting element **15** and observes the curved line. If the image **31** appears as in FIGURE 4, i.e., the image is not continuous, the straight edge **13** is not tangent to the point and the device must be rotated until the image **32** appears continuous as in FIGURE 5. If the two halves of the image **32** connect continuously through the image splitting element **15**, the straight edge **13** is tangent to the curve at the point of the steel pin **14** and a line can be drawn along the straight edge **13** to permanently record the observation.

In the embodiment above, the device, described as being constructed of clear plastic, could be fabricated using metal, glass, wood, opaque plastic or other materials with sufficient structural strength to withstand normal handling of the user. The sections were described as being bonded together, although the device could be constructed of one piece, or in sections joined by any number of means, depending upon the material of construction and the skill of the fabricator. It is important, however, that the top plate is parallel to the base plate.

The pivot pin in the above embodiment was constructed of steel; however, any number of materials would be satisfactory for use in a device of this type as one skilled in the art might choose.

The distance from the image spliting element **15** to the curved line and the straight edge **13** is not critical, provided that the distance is not so great that the curved line is difficult to see, or so close that the optical properties of the image splitting element do not permit the eye to determine if the device is properly aligned. It is important, however, that the top plate containing the transparent image splitting element is parallel to the base plate, and that the center line of the image splitting element is perpendicular to the straight edge on the base plate and opposite to the pivot pin.

The image splitting element **15** was described as being made of a transparent material such as clear plastic or glass containing parallel sets of prisms, one set on each side of the center line. However, any number of techniques could be used to make the image splitting device, provided that the optical density of the parallel prisms would refract the light toward the center line. Two triangular prisms could be used for the image splitting element if they were placed together in such a way that a

center line was formed where they touched, and the prisms were oriented in such a way that the light from either side would be refracted toward the center line. In this embodiment the prisms would be parallel to the center line. On the other hand, a Fresnel lens might be divided and rejoined in such a way to produce an image splitting device having a center line and two opposing sets of parallel prisms, one set of prisms on each side of the center line.

Indeed, grooves could be machined in a transparent material, such as clear plastic or glass, in such a way that two sets of triangular prisms were formed in mirror image of each other, one set on either side of the center line, as shown in FIGURE 2.

It is however, critical that the prisms in the image splitting element **15** radiate outward from the center line **16** at an angle other than 90°, and that the prisms on one side of the center line **16** in the image splitting element **15** are substantially a mirror image of the prisms on the other side of the center line **16** to avoid distortion during use.

It does not matter if the prisms are straight or curved along the length of the image splitting element provided that the prisms are spaced substantially equidistantly apart and are substantially parallel to each other. Curvature of the prisms is not undesirable, provided that the amount of curvature does not cause undue distortion.

Any number of means might be used to fasten the image splitting element to the top section, and the method of attachment is not considered to be a part of this invention, provided that the image splitting element is aligned properly with the straight edge and pivot pin.

Other details of construction and use may be applied as might occur to one skilled in the art and have not, therefore, been shown in detail. Other embodiments of the invention might be developed without departing from the spirit or scope of this invention. Thus, it will be seen that this tangent fitter is a new device of a simple construction and ease of operation.

What is claimed is:

1. A device for establishing a line tangent to a curve which comprises a base plate, one longitudinal edge thereof constituting a straight edge; a pivot pin located at the center of said straight edge, and perpendicular to said base plate, a top plate containing a transparent image splitting element, means for connecting said top plate in parallel alignment with said base plate, asid image splitting element bisected by a center line perpendicular to said straight edge at the point of the pivot pin and having two opposing sets of triangular prisms, one set on each side of the center line, said center line and triangular prisms being integral parts of said image splitting element.

2. The device of claim **1** in which the image splitting element is made of Fresnel lens divided and rejoined to produce said image splitting element having a center line and two opposing sets of concentric prisms, one set on each side of the center line.

3. The device of claim **1** in which the image splitting element is composed of two triangular prisms arranged in such a way that a center line is formed where they touch, said prisms being oriented in such a way that the light is refracted toward said center line.

4. The device of claim **1** in which the image splitting element is made of a transparent material containing machined grooves so that two sets of triangular prisms are formed in mirror image of each other, one set on either side of the center line.

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JEWELL H. PEDERSEN, Primary Examiner

ORVILLE B. CHEW II, Assistant Examiner

U.S. Cl. X.R.

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