

[54] LIGHT PEN

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[58] Field of Search.....240/10.66, 44.27, 240/6.46 R, 6.46 CL, 2 S, 2 E; 200/60, 160; 95/12 P

[56]

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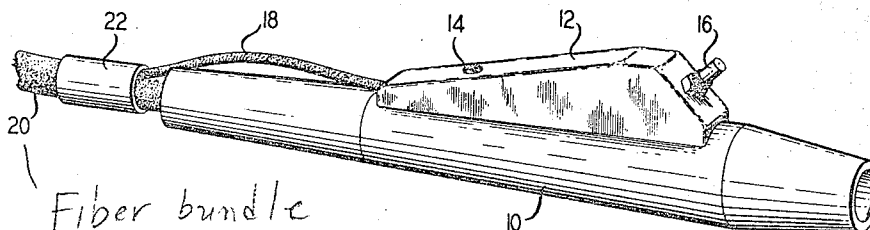
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[57]

ABSTRACT

An improved light pen including an actuator switch which is affixed to the body of the light pen at an acute angle to its longitudinal axis.

4 Claims, 3 Drawing Figures



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FIG. 1

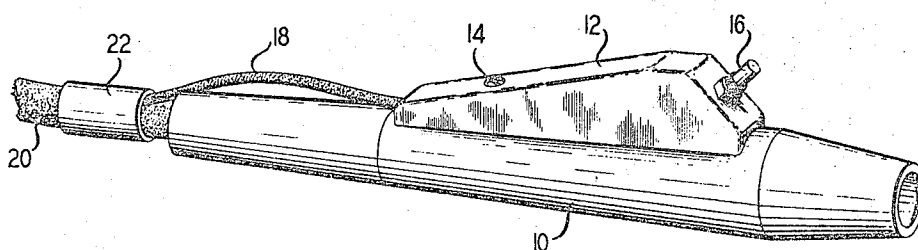


FIG. 2

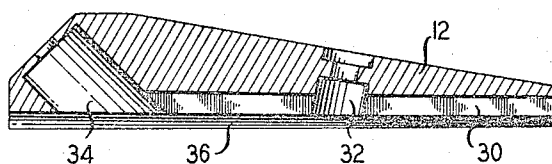
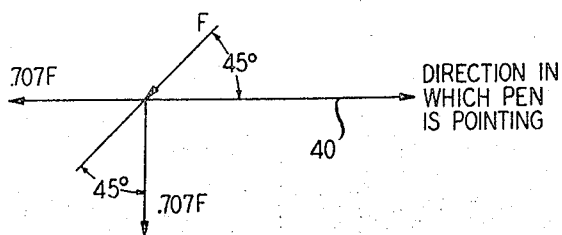


FIG. 3



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LIGHT PEN

GOVERNMENT CONTRACT

The invention herein claimed was made in the course of or under a contract with the Department of the Army.

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention pertains to position locating devices and, more particularly, to an improved light pen including an actuator switch which is designed to facilitate the accurate location of symbols displayed upon a cathode ray tube.

2. Description of the Prior Art

Light pens are well known to the prior art as providing a convenient means for graphical input. This is illustrated, for example, by the article "Man-Machine Console Facilities for Computer-Aided Design" by Robert Stotz which appears on pages 323-328 of Volume 23, AFIPS Conference Proceedings 1963 Spring Joint Computer Conference, and by the article entitled "Sketchpad A Man-Machine Graphical Communication System" by Ivan E. Sutherland, which appears on pages 329-346 of the same volume.

The light pens that have been provided heretofore generally take the form of an elongated structure which is to be held in the user's hand. One type of light pen includes a photosensitive means and transistor amplifier directly in the body of the light pen. Another type of pen comprises a fiber-optic bundle, one end of which terminates in the body of the light pen. The other end of the fiber-optic bundle is connected to a photosensitive device in the display unit. This shifting of the photosensitive device from the body of the light pen to the display results in a less bulky pen. Both of these types of light pen require the use of an actuator switch to provide a signal to enable the light detection means at the proper time.

The prior art provides a variety of ways of implementing the required actuator switch. For example, one possible embodiment is to place the actuator switch on the display console. This has the disadvantage of requiring a cumbersome two-handed operation. Another possible embodiment is to put the switch directly on the light pen itself. A disadvantage of this, when the switch is mounted perpendicularly to the longitudinal axis of the light pen as taught by the prior art, is that pressing the switch tends to deflect the light pen from the display object at which the user is pointing. This disadvantage is particularly objectionable when the light pen is being used to locate objects on a crowded display since it often results in the selection of an object that was not intended to be selected.

Accordingly, it is an object of this invention to provide a light pen which is designed in accordance with human factors engineering so as to provide an accurate and easy to use graphical input tool.

It is another object of this invention to provide an improved light pen which will facilitate one-handed operation.

It is a further object of this invention to provide an improved light pen which can be easily activated by the user without the pen's being deflected by the actuating force.

It is a still further object of this invention to provide apparatus which can be easily attached to the body of

an existing light pen to convert it into an improved light pen.

SUMMARY OF THE INVENTION

These objects are achieved in accordance with the invention by the provision of a miniature normally open momentary-contact push button switch contained in a support member which is affixed to the body of a light pen in such a manner as to hold the switch at an acute angle to the longitudinal axis of the pen.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a pictorial view of the improved light pen comprising this invention;

FIG. 2 is a cross-section view of the support member which is attached to the body of the light pen shown in FIG. 1; and

FIG. 3 is a free-body diagram showing the resolution of the actuating force that is achieved by the novel placement of the actuation means of this invention.

DETAILED DESCRIPTION

FIG. 1 is a pictorial view of the improved light pen of this invention. The light pen 10 may comprise either a custom designed or a commercially available unit. Its exact size is immaterial to the present invention. However, it will normally take the form of an elongated casing as shown in FIG. 1. Support member 12 is attached to the light pen by means of screw 14. Support member 12, which may be formed from metal, plastic, or other suitable material, serves to fixedly attach and properly position switch 16 to light pen 10 so as to allow easy operation of switch 16 by the user's index finger. It has been discovered that, from a human factors engineering viewpoint, the optimum position for switch 16 to allow ease of operation is at an angle with the longitudinal axis of the pen that is 45 degrees or less. Switch 16 may comprise any miniature, normally open, momentary-contact push button switch such as, for example, the No. 39-1 miniature switch manufactured by the Grayhill Company.

Cable 18, shown in FIG. 1 as emerging from support member 12, is a two-wire cable which is directly connected to the contacts of switch 16. The point of connection of the other end of cable 18 depends upon the type of light pen used. In the first of the two aforementioned types of light pen, that is, the type having the immediately associated electronics inside the light pen itself, cable 18 may run from the switch contacts directly into the body of light pen 10 to provide an on-off control to the associated electronics. In this case cable 20, shown in FIG. 1, comprises a wire for conducting electrical signals.

In the second of the aforementioned types of light pen, which is the one specifically shown in FIG. 1, cable 20 would comprise a fiber-optic bundle for transmitting light from the cathode ray screen to the display unit. In this case, cable 18 is connected to the display unit in conjunction with cable 20 to provide an on-off signal for use in controlling the electronics that converts the optical signal to an electrical signal. In this embodiment a plurality of annular clamps, such as clamp 22, are used to hold cable 18 against cable 20 to facilitate the handling of the light pen. The electronics that utilize the on-off signal provided by switch 16 form no part of this invention and will not be further discussed as they are well-known to the prior art.

FIG. 2 is a cross-sectional drawing of support member 12. Support member 12 is seen to contain a channel 30 for placement of cable 18, a suitably countersunk screw hole 32, a hole 34 to contain switch 16, and a groove 36 having a radius of curvature which allows support member 12 to fit snugly against the body of light pen 10.

FIG. 3 is a free-body diagram showing the resolution of the actuating force that is achieved in this invention. The actuating force F intersects the longitudinal axis 40 of the light pen at an acute angle which is specifically shown in FIG. 3 as a 45 degree angle. By using well-known principles of statics this force is seen to be resolvable into two perpendicular forces, one of which is parallel to axis 40 and one of which is perpendicular to axis 40. The magnitude of each of these forces will be $0.707F$. The force perpendicular to axis 40 is the portion of the actuating force F which will tend to deflect the light pen. As the angle at which force F intersects the longitudinal axis 40 of the light pen becomes less than 45 degrees, the magnitude of this force will decrease. Thus it can be seen from FIG. 3 that the novel placement of the actuator switch in accordance with the teaching of the instant invention results in decreasing this deflection force to less than 71 percent of the value it would have if the actuator switch were placed perpendicular to axis 40.

What is claimed is:

1. A manually operated position signal generator for indicating a pointing position comprising
an elongated pointing body having a sensing member

at one end thereof and adapted to be held in the hand in the manner of a writing instrument grasped between the thumb, index finger and third finger, and

a momentarily operatable switching member disposed on said pointing member at said one end and at an acute angle inclined toward said sensing member and adapted to be operated by the index finger to generate a component of force directed away from the pointing direction of said sensing member.

2. A manually operated position signal generator according to claim 1 wherein said acute angle is substantially 45 degrees.

3. An improved light pen of the type including an elongated pencil-shaped pointing member with a light-sensing member at the pointing end thereof and adapted to be held in the hand by an operator in the manner of a writing instrument grasped between the thumb, index finger and third finger, wherein the improvement comprises

an index finger operatable pushbutton switch disposed on said pointing member adjacent said pointing end and inclined at an acute angle toward said sensing member so as to generate, when operated by the index finger of the operator, a component of force directed away from said sensing member.

4. The improved light pen of claim 3 wherein said acute angle is 45°.

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