This invention relates to locating devices.

It is the principal object of the invention to provide a locating device which is simple in construction and operation for quickly and readily establishing a predetermined position in space, such as a point or angle, where a particular operation is to be performed.

It is also an object to provide a locating device which may be supported in fixed position upon a machine or tool which receives work material, and in which an optical image is made to appear in predetermined position in space so that the work material can be properly located or spotted with respect to the operation of the tool or machine.

It is a further object to provide such a device adapted for showing the location where machine operations such as punching, stitching, drilling, welding or the like are to be performed by producing an optical image appearing in fixed position in space at the point where such operation is to be performed, such image thus serving as a means for properly locating the work material in preparation for such operation.

It is a still further object to provide a locating device of this character adapted to produce an image appearing in definite fixed position in space at a work position in superimposed relation upon the material being handled to enable the operator to locate that material in a proper operative relation with respect to the work position, the image being seen by the operator in the course of his normal vision of the work, and leaving his hands free for the necessary manipulation of the work and the machine.

Other objects and advantages will be apparent from the following description, the accompanying drawing, and the appended claims.

In the drawing,

Fig. 1 is a view in side elevation of a locating device constructed in accordance with the present invention, certain parts being broken away and shown in section to illustrate more clearly the construction thereof;

Fig. 2 is a vertical sectional view on the line 2—2 of Fig. 1 showing the device in operative position upon a typical machine;

Fig. 3 is a broken detail view in end elevation showing the construction providing for the adjustment in the vertical positioning of the reflecting surface;

Fig. 4 is a view looking upwardly toward the light source in the direction of the arrows 4—4 of Fig. 2;

Fig. 5 is a broken detail view representing a modified construction which provides an adjustable light source of definite length and simulating in appearance a stitch or the like.

In the performing of various operations it is desirable to provide an indicating or locating device to establish a position fixed in space with respect to which the particular operation is to take place. For example, in operations such as stapling, stitching, welding, punching, cutting, drilling, or the like, the work material is first brought into a working position. Prior to the actual carrying out of the operation, however, it is usually necessary to definitely locate the work material with relation to the exact point at which the operation is to be performed. This is true not only with respect to lateral positioning of the work material, but is frequently true with respect to the vertical positioning as well, making it desirable to have a means for completely determining in advance the exact position in space at which the operation will be performed, to thereby enable the work material to be brought into proper position with respect thereto. As will be apparent, the above considerations apply for many different types of work material including, for example, the handling of wood, metal, fabric, paper, or other material.

The present invention provides a locating device which is mounted in a convenient location where it will not objectionably interfere with the free and normal handling of the work material itself as such material is placed within or removed from the machine which is to perform the operation desired. The locating device of this invention is such as to form an optical image which to the observer appears in space to be at the exact point where the machine operation is to be performed. The image may be merely a point of light, or may simulate in lateral dimensions the result of the machine operation. As applied to a machine for the stitching of sheet material, for example, the invention provides for producing an image which may appear as an accurate full scale representation of an actual stitch, such image appearing to the observer to be in fixed position in space at this location where the machine will form the finished stitch.

It will thus be apparent that the work material may be moved into operative position, and located properly so that the stitch when formed will be in a desired location upon the work material. Thus the work material may be moved laterally to bring the image of the stitch to the proper position desired, the work material being at all times within the clear vision of the operator.
in the normal course of his viewing the work, with the stitch image superimposed thereon. Thus by simultaneously observing the work material and the stitch image, and without requiring the use of the hands or any close observation of an optical eye piece, or the like, the operator may shift the work in such a manner as to bring the same into position to form the stitch at the proper lateral position desired. If the sheet is not at a proper level, the image will appear to be either suspended in space above the material, or parallel to, and not within the surface of the material. In either case the operator can make suitable adjustment in the vertical positioning of the work material to assure that it will be in the proper location in space when the machine operation is finally performed.

Where more than one, or a series of operations are to be performed in definite relation to each other, such as the effecting of a series of spot welds, punches or stitches, the invention provides for producing multiple images by means of a multiple image forming mechanism. The spacing between adjacent operations may be readily and accurately determined. Thus with two spaced images, the first at the point where the operation will be performed, and the second at a predetermined distance in advance with respect thereto, the operator merely moves the work progressively along to a point where each last-formed operation is coincident with the second image, the machine then being operated to produce the operation at the position of the first image. The series of operations being thus carried out in proper and uniform spaced relation.

Referring to the drawing which discloses a preferred embodiment of the invention, the device is represented, for purposes of illustration, as being applied to the front face of a machine, shown at 10 as a stitch forming machine, and is to be understood as merely representative of any desired type of mechanism in which an operation is performed at a definite position. This operative position is represented by point 11, being in the present case the level of the upper surface of the work material at which the stitch is applied. While the stitch has definite length in the direction normal to the plane of the point 11, it will be understood that the stitch forming mechanism 16 provides for forming the stitch and placing it in the work material in a definite uniform location, and the point 11 may be considered as the center of the location.

The locating device indicated generally at 15 is supported from the machine 10 by means of bracket 16 suitably bolted to the face of the machine by a pair of bolts 17, and so supported as to be above the working position and out of the way of the hands of the operator in his normal manipulation of the work material. The bracket 16 is provided with an upstanding cylindrical portion 18 within which there is received the fixed housing section 20. This housing is preferably of generally cylindrical form and such that it is supported centrally by the bracket part 18, being extended from the side thereof in overhanging relation.

Along its lower side, the housing 20 is formed with a continuously open slot 21 which is of such width as to cover the cross dimension of the image; in the present case the slot width is the same as the diameter of the wire used in the stitch. Centrally of the housing there is a short transversely extending slot 22 intersecting with slot 21 and forming therewith a light aperture in the form of a cross which serves as a definite and fixed index or reference point 23. The lower side of bracket 18 is drilled out as shown at 24 to make such point 23 visible from below, and the thickness of the bracket is also preferably reduced as shown at 25 in Fig. 2 to lessen the possibility of obstructing the clear vision of the cross and operator views the same from well to one side or the other of the position directly in front of the device.

A pair of cylindrical sleeve members 26 are received in telescoping relation on the overhanging portion 21 of the device, being of slightly larger internal diameter so as to be easily rotatable therewith. Each of these sleeves is arranged with a series of small apertures 27, disposed in a spiral relationship as shown, and so arranged that as the sleeves are independently rotated upon the housing, one after the other of the apertures is brought into registration with slot 21, each successive aperture when so aligned being at a different spacing from the index position 23. If desired the outer surface of the sleeves 26 may be covered with a knob at 28 and fixed spring members 29 carried by bracket 16 arranged to frictionally engage the knurled surface to yieldably retain the sleeves respectively in any desired position of rotational adjustment.

Sledding members 30 comprise a pair of respective housing sections 25 and held against axial movement by means of a frame comprising arms 30 which are rotatably received over the respective ends of housing 20, and which are held together by means of a cross brace 32, the entire assembly of arms 30 and brace 32 being rotatable about the axis of the housing, independently of the two sleeves 26.

An extension 34 is provided at one side of an arm 30 for receiving a lamp or light source 35 in which there is positioned a lamp or light source 35 supported within the interior of the housing.

The lower end of each arm 30 has a fixed guide pin 36 and an adjustable thumb nut 41 to provide for adjustably receiving brackets 42 the position of which may be adjusted lengthwise of arms 30 with the thumb nuts 41 being then tightened to retain the brackets in a desired position of adjustment. The brackets carry a cross plate 44 to which is secured the transparent plate 46, which is a plane surfaced material selected to have properties both of transparency and light reflection. While such plate may be formed of glass or other suitable material, it is preferred to use a non-breakable plastic material such as a plate of molded resilient material, preferably one which is relatively thin. As an example of a material which has been found to give very satisfactory results, the plate 46 may be made of a sheet of .050 inch thick vinylite material.

In order to accurately determine the angular positioning of the plate 46, an adjusting stud 50 is mounted in cross bar 32, and engages slot 51 so that by suitable adjustment thereof the entire assembly supported by arms 30 may be made to assume a proper angle as hereinbelow described, and retained in that definite angular relationship.

A locking clamp 52 is pivotally supported on bolt 53 carried by the lower part of cross bar 32. By swinging the clamp over bar 32 the device may be secured in its operative position; upon loosening bolt 53 and swinging clamp 52 to a clearance position, the entire assembly supported by arms 30 may be swung out of the way to the inoperative position indicated by dotted lines in Fig. 5, when it is desired to obtain completely unobstructed access to the machine.
When the light source 38 is illuminated, it will be seen that on the lower side of the housing 20 there is formed centrally of bracket 18 a lighted cross whose intersection at point 23 providing a fixed index, and depending upon the settings of sleeves 26, a second light spot is provided at the side of the central index position. It will be understood that either or both of sleeves 26 may be so turned as to shut off this second light source, when desired.

The plate 46 is so adjusted as to its vertical and angular positioning that it lies in the plane of the perpendicular bisector of the line joining the working position 11 and the above described spot of light or light source. Analysis will show that when the plate is so adjusted the operator may look downwardly through plate 46 at the working position 11, which he will be freely able to do because of the transparent character of plate 46, and he will in addition see a reflected image of the light source which, however, will appear to be fixed in space at the working position. This will be true regardless of the angle of vision of the operator as long as he views the working position through the plate 46, since for each angle of incidence there will be an equal angle of reflection, and the image will therefore be reflected to occupy the working position 11. Preferably the device is so mounted that the image of the index point 23 appears at the working position 11, with the other image or images produced by apertures 21 being laterally displaced therefrom a predetermined distance.

As a result, the operator sees the work at the working position in a clear and unobstructed manner, without the necessity of sighting through an eye piece, or making any use of his hands which are left free for the normal manipulation of the work and the handling of the machine. In addition there is visible to the operator an image of the light source which occupies a definite fixed position in space, being apparently fixed directly at the working position. In this respect it is in distinct contrast with the projection of a beam of light which has lateral direction without vertical fixation, and enables the operator to move the work material as may be desired both laterally and likewise vertically to bring the same into a proper position upon the machine. The work is thereby moved laterally to bring the image of the index light source 23 to the proper point on the surface and if the image of the light source appears either to be suspended in space above the work material or to be actually within the body of the material, the work is suitably adjusted to the correct elevation, the operator knowing in all cases when the work is in proper position for performing the operation.

In the event that there is any change in the actual working position of the machine, for instance where it is readjusted to operate in a different location, the plate 46 is suitably set at a proper angle by adjustment of stud 50 so that it lies in the plane perpendicular to the line extending from the light source to the new working position. Thereafter suitable adjustment is made in the position of brackets 42 in relation to arms 30 to bring the plate 46 into a position where it bisects such line from the light source to the new working position, whereupon it will produce the images in the appropriate positions as described above.

Where a number of operations are to be performed with a definite spacing, one or both outer sleeves 26, are rotated to bring a proper one of apertures 21 into alignment with slot 21 to establish the desired spacing of that aperture away from the central or index point 23. The operator then sees two images, one at the point where the operation will be performed by the machine, i.e., indicated by the image of the cross whose point of intersection is 23, and the other spaced from that position by the desired amount. It is then only necessary for the operator to move the work material to such position that the last previously formed operation coincides with the spaced or second image, and he will then know definitely that the machine operation will occur at the place indicated by the first mentioned or index image. In this way adjustment can be readily obtained for the spacing for a series of operations and they can be rapidly performed by the operator through this visual procedure without the necessity for individually locating or measuring for each operation. Through the use of the two sleeves 26, operations can be spotted either to the right or to the left of a previous operation and a definite and accurate series of such operations thus produced all in predetermined accurate alignment.

70 Fig. 5 shows a somewhat modified construction in which in place of the sleeves 26 having apertures 27, the sleeve 60 is received over the inner cylindrical housing member 61 having the open slot 62 therein, sleeve 60 being provided with a spiral slot 63 of definite length such that it uncovers a length of slot 62 corresponding for example to the actual length of a stitch as formed by the machine. The cross dimension of slot 62 corresponds with the diameter of the wire of which the stitch is made while the length of slot 63 corresponds with the actual length of the stitch, so that as a result there is produced an image which accurately simulates the appearance of the stitch. By rotation of the sleeve 60 upon housing 61, this image may be moved closer to or farther from the central aperture or index position to similarly provide for adjustment in the spacing of the two images as already described.

While the forms of apparatus herein described constitute preferred embodiments of the invention, it is to be understood that the invention is not limited to these precise forms of apparatus, and that changes may be made therein without departing from the scope of the invention which is defined in the appended claims.

What is claimed is:
1. A locating device of the character described comprising a hollow housing having an extended opening formed in the wall thereof, a light source within said housing, a sleeve adjustably mounted on said housing and having aperture-providing means adapted to be aligned with said opening in different positions of adjustment thereof to expose different portions of said opening and to produce a light zone area located at varying spaced points corresponding with the setting of said adjustable sleeve, a plate having properties of both light transmission and light reflection, and means providing a connection between said plate and said housing, said last named means supporting said plate in predetermined relation with said housing and with a working position to reflect an image of said light zone area appearing in space at said working position while said plate remains transparent for vision there-through.

2. A locating device of the character described comprising a hollow housing having an extended opening formed in the wall thereof, a light source within said housing, a sleeve adjustably mounted
on said housing and leaving exposed a portion of said opening to provide a light aperture, said sleeve having an aperture adapted to be aligned with said opening in different positions of adjustment thereof to expose different portions of said opening and to produce a second light aperture located at varying positions with respect to said first light aperture, said positions corresponding with the setting of said adjustable sleeve, a transparent plate having properties of light reflection from the surface thereof, and means providing a connection between said plate and said housing, said last named means supporting said plate between said light apertures and a working position to reflect images of said apertures appearing in space at said working position in predetermined spaced relation with each other while said plate remains transparent for direct vision therethrough.

3. A locating device of the character described comprising a generally cylindrical housing having an extended opening formed in the wall thereof, a sleeve adjustable mounted on said housing and having apertures therein adapted to be selectively aligned with said opening in different positions of adjustment of said sleeve and at different positions axially of said housing, a light source within said housing for projecting light through said aligned opening and aperture to produce a light aperture at varying locations corresponding with the setting of said adjustable sleeve relative to said housing, a transparent plate having properties of light reflection from the surface thereof, and means providing a connection between said plate and said housing, said last named means supporting said plate between said light aperture and a working position in position to reflect an image of said light aperture appearing in space at said working position while said plate remains transparent for vision therethrough.

4. A locating device of the character described comprising a generally cylindrical housing having an extended opening formed in the wall thereof, a sleeve rotatably mounted on said housing and having a continuous spiral slot therein adapted to be aligned with said opening at different positions as said sleeve is rotated with respect to said cylindrical housing, a light source within said housing for projecting light through said aligned opening and slot to produce a light aperture at varying locations corresponding with the setting of said rotatable sleeve relative to said housing, a transparent plate having properties of light reflection from the surface thereof, and means providing a connection between said plate and said housing, said last named means supporting said plate between said light aperture and a working position in position to reflect an image of said light aperture appearing in space at said working position while said plate remains transparent for vision therethrough.

5. A locating device of the character described comprising a housing having an opening therein of restricted dimensions, means within said housing for illuminating said opening to form a light source of definite size and location adapted to serve as an index mark to appear in space at a working position, said plate supporting means also being constructed to position said plate in the line of sight from an observer to said working position to provide for simultaneous viewing of said index mark and said working position.

6. A locating device of the character described comprising a housing having an opening therein of restricted dimensions to serve as an index mark for illuminating said opening to form a light source of definite size and location adapted to serve as an index mark, means for supporting said housing in operative relation with a machine having a predetermined working position and with said light source in predetermined spatial relation with said working position, a transparent plate having properties of both light reflection and light transmission, and means supporting said plate relative to said housing with said plate in a plane perpendicular to the direction of light projection from said source and positioned to intercept the projected light so as to cause said index mark to appear in space at a working position, said plate supporting means also being constructed to position said plate in the line of sight from an observer to said working position to provide for simultaneous viewing of said index mark and said working position.
9. Apparatus of the character described comprising, in combination, a machine having a working position at which a work operation is performed on a workpiece, means providing a light source adapted to serve as an index mark, means mounting said index mark relative to said machine and at a fixed position relative to said working position of said machine, a transparent member having properties of both light transmission and light reflection, and means supporting said transparent member in the plane perpendicularly bisecting a line from said index mark to said working position of said machine, said line extending in the direction of light projection from said index mark, and said member intercepting the projected light so as to cause said index mark to appear in space at said working position, said supporting means positioning said transparent member in the line of view of an observer to said working position to provide for simultaneous viewing of said index marks and said working position.

10. Apparatus of the character described comprising in combination, a machine having a working position at which a work operation is performed at successive locations on a workpiece, means providing a plurality of light sources of restricted dimensions adapted to serve as index marks, means mounting said index marks relative to said machine and at fixed positions relative to said working position of said machine, a transparent member having properties of both light transmission and light reflection, and means supporting said transparent member in the plane perpendicularly bisecting a line from one of said index marks to said working position of said machine, said line extending in the direction of light projection from said index mark, and said member intercepting the projected light from said index marks so as to cause said index marks to appear in space at said working position, said supporting means positioning said transparent member in the line of view of an observer to said working position to provide for simultaneous viewing of said index marks and said working position.

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