UNITED STATES PATENT OFFICE

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LOCATOR UTILIZABLE IN FORMING METAL ARTICLES

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3 Claims. (Cl. 33—174)

1 This invention relates to a means utilizable in forming articles of metal, wood or other character hereinafter termed a locator. The purpose is to provide a device securable to a piece to be formed by means of which all finished surfaces thereof are to be located in respect one to another and its location may be indicated on the engineering drawing and provides a point or center in which all measurements on the drawing may be related thereto. In the manufacture of the article the locator is positioned on the casting or other material to be formed corresponding to the position shown on the drawing and therefore is utilizable by the draftsman in making the layout shown by a drawing and the locator itself may be utilized in the construction of the device and in checking the part subsequent to completion of construction. The locator may be made integral with the part to be formed or removable subsequent to formation of the part and replaceable in the checking of the formed part.

These and other objects and features of the invention are hereinafter more fully described and claimed in the accompanying drawings in which—

Fig. 1 is an elevation showing the preferred form of the locator.

Fig. 2 is an elevation partly in section showing the locator applied to the work.

Fig. 3 is an illustration of the device located in an oversized aperture for a purpose hereinafter described.

Fig. 4 is a similar elevation showing the device as utilized with a bushing in an aperture of greater diameter than the portion of the device insertible therein.

Fig. 5 is an elevation showing the device supported in a piece of work by a clamp.

Fig. 6 is a perspective view showing the manner of its use in the location of a cutting tool relative to a piece or work to be formed thereby.

Fig. 7 is a perspective view showing the locator as applied to a piece of work in which apertures and surfaces to be finished are at an angle one to another.

Fig. 8 is a perspective view showing the locator as applied to another character of work piece.

Fig. 9 shows the relation of the device in respect to a taper bored work piece.

Fig. 10 is an end view showing the locator positioned on a part having angular side surfaces.

Fig. 11 is an end view of a part complemen tal to the part shown in Fig. 10 and provided with a way having angular side walls which may be assembled with the part shown in Fig. 10.

Fig. 12 is a plan of an element adapted for the receiving of shafts to be positioned at an angle one to another.

Fig. 13 is an elevation thereof showing the locator.

Fig. 14 shows a curved piece of work requiring apertures to be drilled therein at various angles and indicates the manner of use of the locator in determining the spacing of the apertures.

The locator in its preferred form consists of a ball like portion 1 having a base 2 with its under surface 3 at a predetermined distance from the center of the ball and a cylindrical shank 4 extending outwardly from the base and may be introduced into an aperture in a piece of work as shown at 4c in Fig. 2.

There is a recess 8 between the flat lower face 8a of the ball and the upper face 5 of the base 2 whereby the device may be held as by means of a clamp. The groove or recess 6 may also be utilized in removing the device as by means of a lever introduced thereinto. The device may be provided with a threaded aperture 1 to receive a threaded element in securing the device to a piece of work.

The utility of the device is illustrated in Fig. 6 wherein the ball 1 has its terminal portion 4 introduced in an aperture or recess provided therefor in the work piece 4. The ball end provides a means for locating the side and end portions 5b, 6b, 7b and 8 of the work piece and a cutting tool 9 is set in position to operate on the surface 1b by means of a measuring block 10 which may engage the ball 1 on one side and on the opposite side engage the face of the tool 9.

To finish the surface of the end portion 8 a measurement is taken from the ball to locate the line 11 and this surface 8 is then milled to the line 11, the tool being held at an angle at which the surface 8 is to be formed after the manner indicated in finishing the surface 1b. This is continued until the necessary surfaces of the work are finished. Thus with this single reference point all sides of a compound angle block for instance may be finished accurately with a few simple measurements.

In the work piece shown in Fig. 7 the ball is utilized as a point from which the surfaces 12 to 18 inclusive of the projecting members are determined and others, such as the surface 20 and the position of the apertures 21, 22 and 23. All these measurements are taken from the ball as a center. The surfaces and apertures are in proper relationship one to the other and are more accurately and quickly determined than is the case where no reference points, such as the ball 1, is utilized.

Another character of work piece is shown in Fig. 8 in which are the projecting members 24, 25, 26, 27 and a depression 28 to be formed in the
surface of the block. In the formation of this work piece the locator 1 is positioned in the block 24 and the sides of the block are machined in respect to the ball 1 as well as the positions of the several parts. If it is necessary to remove the locator when the fixture is in use and to replace it for conditioning, altering or inspecting it is preferably mounted in a bushing 29 as shown in Fig. 4.

In the arrangement shown in Fig. 9 the chuck 28 holds a taper bored piece of work 29a and the locator 1 is mounted on a pedestal 32 carried by the chuck. Thus the taper is readily determined by means of a block 30 indicated in dotted lines and the face of the work is determined from the surface of the ball as indicated at 31 and likewise the thickness of the work piece indicated by the numeral 33.

Fig. 10 shows the upper part of a "dovetail" with the ball 1 set with its surface coinciding with the line 36 and the surfaces 34 and 35 are measured from the surface of the ball as indicated at 35 and 37.

Fig. 11 shows the mating part of the dovetail shown in Fig. 10. In Fig. 11 the ball 1 is set on the base 44 so that the surfaces 43 and 45 are measured from the surface of the ball as indicated at 44 and 45 which are the same as the measurements 34 and 37 of Fig. 10 with the key 42 in place.

In Fig. 12 is shown the plan and in Fig. 13 the elevation of a piece of mechanism in which 44a is the bed plate having brackets 44a and 45a having holes drilled for the shaft 49 and similar holes in the similar bracket 44a. The ball 1 is so positioned that the shaft 49 is at the center of the ball thus eliminating calculation and reducing the number of measurements to be made from the ball. It is also to be noted that the apertures for the shaft 49 for the worm 52 for the worm wheel 50 are also determined from the ball 1 as a center which becomes a universal reference.

In all cases of use of the device it is the ball end which provides the center of measurement and from which all finished parts are to be located.

By reason of the stem 36a being less in diameter than the aperture 32a, as shown in Fig. 3, the ball element may be adjusted laterally at the center of the aperture and, by means of the calipers, such as shown in Fig. 14, the ball element 36a may be set in the desired position.

Upon removal of the calipers a drill may be positioned to be moved into the aperture 32a on the axial line of the ball subsequent to removal of the ball element 36a and parts connected therewith. Thus the aperture 32a is centered in respect to an adjacent aperture. By this arrangement the successive apertures may be accurately positioned relative one to the other as may be required.

One of the problems arising in drilling holes in curved parts, especially in stream line structures, is the locating of the centers as will be understood from the following:

The aperture or hole 54 is first drilled at a desired point in the part 54 to receive the stem 4 of the locator. The hole 32a is then located approximately with respect to the aperture of the hole 54 and is drilled larger in diameter than the diameter of the stem 32a of the locator. The locator is slidably positioned and secured in place by means of the screw 61 and washer 62. It may then be tapped slightly to position the ball end relative to the ball end of the locator in the aperture 54 to final position as determined by the micrometer 67.

It is then clamped solidly in place by the screw 75.

The part 54 is thereafter positioned so that the axis of the locator aligns with that of the drill spindle. The locator is then removed and the hole 63 bored to size. This method is repeated with other holes to be formed in a curved surface.

A special form of the locator is shown at 55 in Fig. 14 in which the ball is not provided with a stem but is secured in place by means of a long screw 60 extending through a washer 56a for clamping the same in place.

In Fig. 14 the ball 57 is shown as unprovided with a stem and a strap 55 is utilized to hold the ball. A screw 56 passes through the strap into the work piece 54.

Another form of clamp is shown at the right hand side of the figure wherein an aperture is provided in a curved surface. In this arrangement one end of the retainer strap 59 engages the locator 1 and is supported at its opposite end by block 67a to position the strap in a plane at a right angle to aperture 65. Like means may be utilized in determining the position for the aperture 65.

The several illustrations indicate a few of the possible uses of the locator as well as various forms thereof, particularly in respect to position the same in or on a work piece. It is to be understood however that the locator may be used in many ways not here shown but obvious to a workman acquainted with the utility of the device.

Having thus fully described my invention, its utility and mode of operation, what I claim and desire to secure by Letters Patent of the United States is:

1. A device for the purpose described, comprising an element having a terminal portion at one end for engagement in an aperture, an opposite end being of a ball-like form including a base for seating in fixed relation with the surface of an element having an aperture to receive the said terminal portion, the outer surface of the base being at a distance from the center of the ball equal to its radius, the ball end providing a station for location of other portions of the element in which the ball is seated.

2. A locator for the general purpose described, comprising a ball-like element, a stem therefor, a flange on the stem for engaging the work, the surface of the flange engaging the work being spaced from the center of the ball a distance equal to its radius.

3. A locator for the general purpose described comprising an element having a ball shaped portion and a stem extending radially therefrom, the stem having a flange providing a surface for engaging the surface of a work aperture to receive the stem, there being a groove between the flange and the ball-like end portion to receive a tool for removal of the device from the work piece.

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REFERENCES CITED

The following references are of record in the file of this patent:

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<thead>
<tr>
<th>United States Patents</th>
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<tbody>
<tr>
<td>Number</td>
</tr>
<tr>
<td>1,296,195</td>
</tr>
<tr>
<td>1,336,734</td>
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<tr>
<td>1,343,004</td>
</tr>
<tr>
<td>1,101,601</td>
</tr>
<tr>
<td>1,329,234</td>
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<tr>
<td>1,253,680</td>
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<td>2,178,293</td>
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