April 18, 1944. J. W. McBRIDE ET AL 2,346,773

MAGNETIC INDICATOR

Filed June 7, 1941

Fig. 2

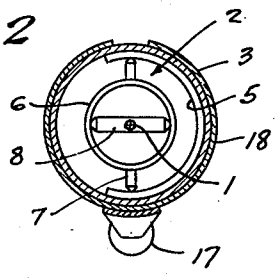


Fig. 1

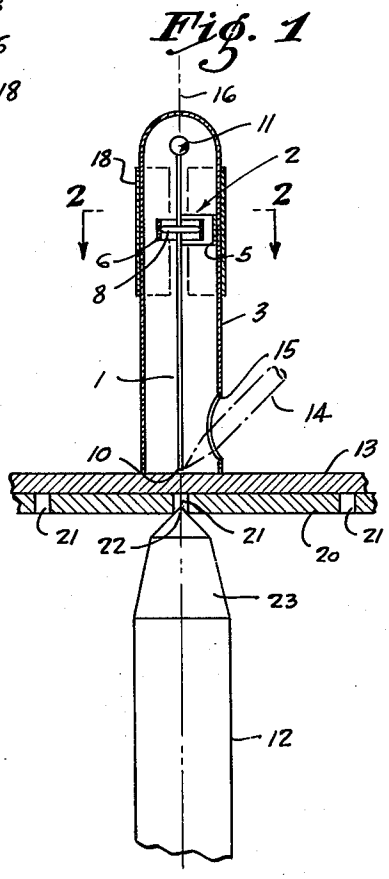


Fig. 3

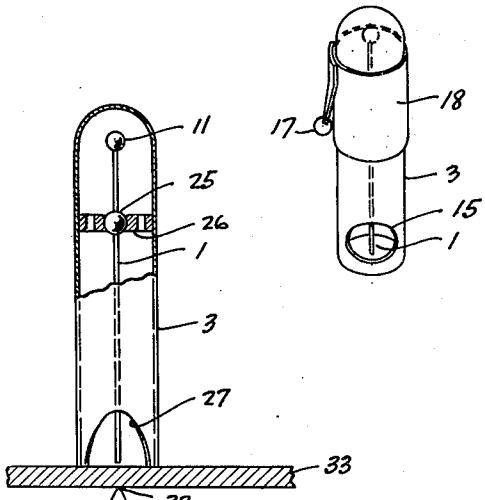
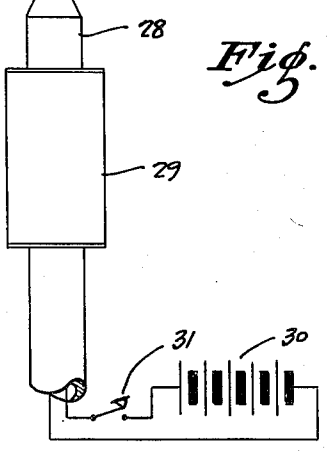


Fig. 4



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MAGNETIC INDICATOR

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4 Claims. (Cl. 175—183)

This invention relates to a magnetic indicator.

More particularly, the invention relates to a system whereby it is possible to transfer accurately a pattern or design from one side of a non-magnetic member to the opposite side, without the necessity of transferring measurements. Since such measurements obviously would require a transposition of the original pattern similar to the production of a mirror image, the possibilities of error under such circumstances are greatly multiplied. By the aid of the present invention, the pattern or design is very readily reproduced without the necessity of employing any measurements.

In assembling various structural parts made from sheet material, for example in airplane fuselages and wings, it is common practice to drill one of the members for the necessary attachment screws and bolts. The cooperating member to which the other member is to be attached may already be installed. To ensure proper alinement of the holes, the previously drilled member may be used as a pattern or template for drilling the other member. If there is enough room, the latter may be marked and drilled from the side to which the other member is attached. However, space limitations are frequently such as to require the member to be drilled from the opposite side. Thus, the location of the holes must be marked on this opposite side, and it is an object of this invention to provide means whereby this may be readily and accurately accomplished.

It is another object of this invention to provide such a device which is simple, compact and durable.

This invention possesses many other advantages, and has other objects which may be made more easily apparent from a consideration of several embodiments of the invention. For this purpose there are shown a few forms in the drawing accompanying and forming part of the present specification. These forms will now be described in detail, illustrating the general principles of the invention; but it is to be understood that this detailed description is not to be taken in a limiting sense, since the scope of the invention is best defined by the appended claims.

In the drawing:

Figure 1 is a transverse section of the device showing it in use;

Fig. 2 is a cross section on an enlarged scale, as seen on plane 2—2 of Fig. 1;

Fig. 3 is a pictorial view of the device of Fig. 1; and

Fig. 4 is a view similar to Fig. 1, showing a modified form of the invention.

Referring to Figs. 1, 2 and 3, a needle 1 of magnetic material, such as mild steel, is provided with a pivotal support 2 in an appropriate support, such as a transparent tubular member 3 so as to extend generally longitudinally of the tube 3. The pivotal support 2, as clearly shown in Fig. 2, is of the type commonly known as "gimbals" and includes a pair of pivots in perpendicular relationship. Thus an outer arcuate member 5 is suitably secured on the inside of tube 3. This member 5 pivotally supports a ring 6 by the aid of the radial pintles 7. The needle 1 of magnetic material is in turn supported in ring 6 by means of pintles 8 secured on needle 1. The axis of pintles 8 is at a right angle with the axis of pintle 7. In this way, the needle 1 is free to move in any direction about its support 2.

The lower end of tube 3 is open, and the needle 1 extends so that one end 10 is adjacent to the plane of this open end. The opposite end of needle 1 is provided with a small counterweight 11, whereby the needle is balanced and has no tendency due to its weight to assume any particular position about its support 2.

It may be assumed that it is desired to locate the positions of holes to be drilled in a flat, non-magnetic member 13, and that these holes are to coincide with holes 21 on another non-magnetic member 20. For this purpose member 13 is placed directly over member 20.

The device is used by placing a magnet, which may be a permanent magnet 12, at the point whose location it is desired to mark on the surface of a member 13. The device is then moved about in an exploratory manner over this surface, and as the point or pole center of the magnetic field produced by magnet 12 is approached, the end 10 of needle 1 will be drawn toward it, so that the needle points toward the location of the point. When this occurs, slight exploratory movements of the tube 3 will not disturb the position of the end 10, which nevertheless stays stationary even as tube 3 is moved about. Such a phenomenon thus serves effectively to indicate that the needle 1 has found its pole represented by the tip of the point 22 of the magnet 12; thus this end 10 of the needle "sticks" to the point exactly opposite the tip of magnet 12. The point to which the end 10 "sticks" may then be marked by a scriber or other suitable tool 14 inserted

through a suitable opening 15 provided in the wall of tube 3. Obviously, for the most accurate location of the point, the device should be moved until the needle stands normal to the surface being marked, and to make such adjustment easier, the surface forming the lower end of the tube 3 is perpendicular to the axis of the tube.

The device is not limited to use on a plane surface, but by appropriate manipulation may be used on any sort of curved surface. Further, although the device and its cooperating magnet 12 are shown as alined on a vertical axis 16, it is not at all necessary that this axis be vertical; it can as well be horizontal or inclined at any angle.

For convenience to the operator, the device may be provided with a clip 17 secured to a spring band 18 adapted to embrace tube 3. This clip 17—18 is similar to those used on fountain pens and pencils for securing them in pockets. By this means, the device may be easily secured in the operator's pocket when not needed where it will be handy and instantly available when wanted.

The pointed tip 22 of magnet 12 is adapted to enter the hole 21. It gives an accurate indication of its position by producing a magnetic field which is concentrated at the center of the hole. To reduce the space requirements of the magnet 12, the end portion 23 may be tapered.

In the modified form of Fig. 4, the needle 1 is supported for universal movement in tube 3 by a ball 25 secured on needle 1 and carried in a socket 26 secured in tube 3. Thus a ball-and-socket joint is formed. Opening 27 is for the same purpose as opening 15 but extends to the bottom of tube 3. An electro-magnet 28 is shown to create the magnetic field. It has a coil 29 arranged for energization from a suitable source 30 controlled by a switch 31. Also, in this figure, the device is shown as cooperating to transfer the location of a point 32 from the lower surface of the non-magnetic sheet member 33, to the opposite surface thereof. This point 32 is previously determined; or it may be scribed or prick-punched in the lower surface of member 32.

What is claimed is:

1. In a device of the character described, a needle of magnetic material, an open ended tubular member, and a universal pivot structure carried by the tubular member for said needle and so arranged as to position the free end of the needle adjacent the open end of the tube.

2. In a device of the character described, a tubular member open at one end, a needle of magnetic material, and gimbals supporting said needle centrally in the tube, so that one end of the needle is adjacent the open end of the tube, the needle being substantially balanced about its support, there being an opening in the side of the tube adjacent the open end.

3. In a device of the character described, a needle of magnetic material, means for universally supporting said needle, and a support for said means, said support having a contacting end defined by a surface transverse to the needle and so arranged that the free end of the needle lies near the said surface.

4. In a device of the character described, a needle of magnetic material, means for universally supporting said needle, a support for said means, said support having a contacting end defined by a surface transverse to the needle and so arranged that the free end of the needle lies near the said surface, and means for producing a magnetic field transverse to said surface.

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