is arranged on the rim of the base **172** and is positioned to detect rays diffracted from the crystal which is to be positioned at the axis **180** of the diffractometer. An X-ray source **184** is positioned adjacent the diffractometer to supply incident radiation to the crystal.

FIGURE 6 is a sketch in the vertical plane of the crystal mounting device on my invention positioned on the hub of the diffractometer illustrated in FIGURE 5. The keyway **60** of my mounting device is secured over the key **176** of the diffractometer hub **174** and the slit ring of my device is tightened to securely fasten the mounting device to the hub. In operation, the hub **174** is rotated by the diffractometer motor at a rate of θ radians per second around the diffractometer axis, while the detector **180** is rotated at twice this rate around this same axis. Referring momentarily to FIGURE 4, it will be seen that operation of the diffractometer in this fashion ensures that the incident and diffracted X-rays maintain the same angle with respect to the crystal planes so that diffraction at the Bragg angle may be detected and measured. Having obtained first order Bragg angle diffraction, the interplanar spacing may then be determined from tables or from the formula

$$d=\frac{n\lambda}{2 \sin \theta}$$

and the Miller indices corresponding to the spacing of the selected plane may be obtained from standard comilations such as those issued by the American Society of Testing Materials or the National Bureau of Standards of the United States. Since the interplanar spacing d is determined by the wave length and the Bragg angle θ, it is, of course, possible to obtain the Miller indices from these quantities directly without going through the intermediate step of determining the spacing d. Once this has been done, the crystal orientation is completely determined and the orientation and indices of the remaining planes may readily be determined from knowledge of the orientation and indices of the selected planes.

The crystal mounting device of my invention is also useful in translation periodicity studies. It is well known that the crystal may be considered to be composed of a basic unit cell which repeats itself indefinitely in all directions. With the aid of pulse height analysis, the period in which the structure of the unit cell repeats itself in the crystal may be measured by rapidly scanning even minute crystals and measuring the intensity of the diffraction and the angle at which it occurs. Further, the utility of my crystal mounting device as a universal mount for single crystal studies on a diffractometer will be apparent since the orientation of the crystal can accurately and rapidly be adjusted without disturbing the geometry of the diffractometer. It will be apparent that crystals of both large (greater than one inch in diameter) and small (any desired size) size can be accommodated on my device.

It will be apparent that variations may be made in the construction of the crystal mounting device of my invention to suit the particular requirements of the user or manufacturer. In particular, the carriage **64** may be mounted in the base plate **50** by means of slots **190** which are cut in the side walls of the bore **62** of the base plate as shown in FIGURE 7, the carriage then being fitted into these slots for axial movement along the base plate. The rear portion **192** will, of course, be made removable to allow the carriage to be so mounted. If this is done, the carriage may be formed as a single flat plate and the back plate **84** may be dispensed with.

The platform **114** may also be formed as a single piece with the carriage **64**. Although it may often be found convenient to have a detachable spacer **146** which can be changed in size to fit the requirements of the user, it will be apparent that this spacer may also be formed as a single piece with the platform **114** or the carriage **64**.

The threaded plug **144** illustrated in FIGURE 3 is designed to accommodate a goniometer of the type shown in FIGURE 2. If other types of goniometers or crystal holders are used, of course, the threaded plug **144**, which serves as an adapter between the crystal mounting device of my invention and the goniometer or crystal holder, will be changed to fit the particular goniometer or holder used. Further, although I have shown my crystal mounting device as used on a Philip's vertical diffractometer, it will be apparent that the mounting device may be used with any other type of vertical or horizontal diffractometer simply by adjusting the size or the geometry of the mounting portion **52** of my device.

From the above it may be seen that I have provided a simple but efficient method for determining crystal orientation. Further, I have provided a device which may be used in practicing the method of my invention and which readily allows an interchange of the crystal holder between a Laue arrangement and diffractometer geometry. It will also be apparent that I have provided a simple and inexpensive device for mounting crystals on diffractometers.

It will thus be seen that the objects set forth above, among those made apparent from the preceding description, are efficiently attained, and, since certain changes may be made in the above constructions without departing from the scope of the invention, it is intended that all matter contained in the above description and shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

It is also to be understood that the following claims are intended to cover all the generic and specific features of the invention herein described and all statements of the scope of the invention, as a matter of language, might be said to fall therebetween.

Having described my invention, I claim:

1. A method for determining the Miller indices associated with a given crystallographic plane of a crystal comprising the steps of

(a) mounting the crystal in a holder;
(b) taking a Laue photograph of the crystal;
(c) determining from the photograph the angular orientation of at least one plane in the crystal;
(d) transferring the crystal holder to a diffractometer having a source of essentially monochromatic radiation for incident X-rays and a detector for diffracted X-rays;
(e) orienting the normal to said plane in the plane of the incident and diffracted X-rays;
(f) irradiating the crystal and measuring the Bragg angle corresponding to said plane; and
(g) determining the Miller indices of said plane for the measured Bragg angle and the particular wave length of X-radiation used.

2. A method for determining crystal orientation comprising the steps of

(a) mounting the crystal in a holder;
(b) taking a Laue photograph of the crystal;
(c) determining from the photograph the angular orientation of a plurality of planes in the crystal;
(d) transferring the crystal holder to a diffractometer having a source of essentially monochromatic radiation for incident X-rays and a detector for diffracted X-rays;
(e) selecting a first crystal plane for examination by orienting the normal to said plane in the plane of the incident and diffracted X-rays;
(f) irradiating the crystal and measuring the Bragg angle corresponding to the selected plane;
(g) determining the miller indices of the selected plane for the measured Bragg angle and the particular wave length of X-radiation used, and
(h) repeating steps (e) through (g) for the remaining planes.