Orientation Maps for the Visually Handicapped

A blind person who has to find his way round a strange town is faced with two major problems: firstly, the problem of walking along pavements and crossing roads without getting seriously injured, and secondly the problem that the blind person has no knowledge of the layout, or names, of the streets. If a blind person has some form of mental picture of the street layout he can then add pieces of information to this basic picture. The problem becomes more serious with children who are born blind since they often have great difficulty in understanding the layout of roads and road junctions; for instance the author found that a considerable number of blind teenagers did not realise the purpose or shape of a roundabout. An embossed map can sometimes be useful in these situations.

In making an embossed map the first problem is to choose suitable landmarks for a blind pedestrian. This is not trivial since a guidedog is trained to avoid obstacles such as pillar boxes. Noises and even smells can sometimes be useful in determining one's position.

The information, to be included on the map, has to be embossed in a way that is both clear and unambiguous. The sense of touch is relatively poor compared with vision, so much less can be marked on an embossed map than on a visual one. Contrary to popular belief, blind people do not have a better sense of touch than their sighted peers. The blind often have difficulty understanding visual symbols such as the compass rose; on an embossed map the north edge is usually marked by a row of dots.

The map designer can use variation in elevation to convey extra information. For instance a line, saw-tooth in cross-section, can be used to indicate direction since it will feel smooth in one direction and rough in the other (Figure 1). This type of line is sometimes used to indicate a road going uphill which can be a useful cue to a blind person.

A road can be represented by either one or two lines (Figure 2). Blind children often think of a road as two pavements so they find a map with

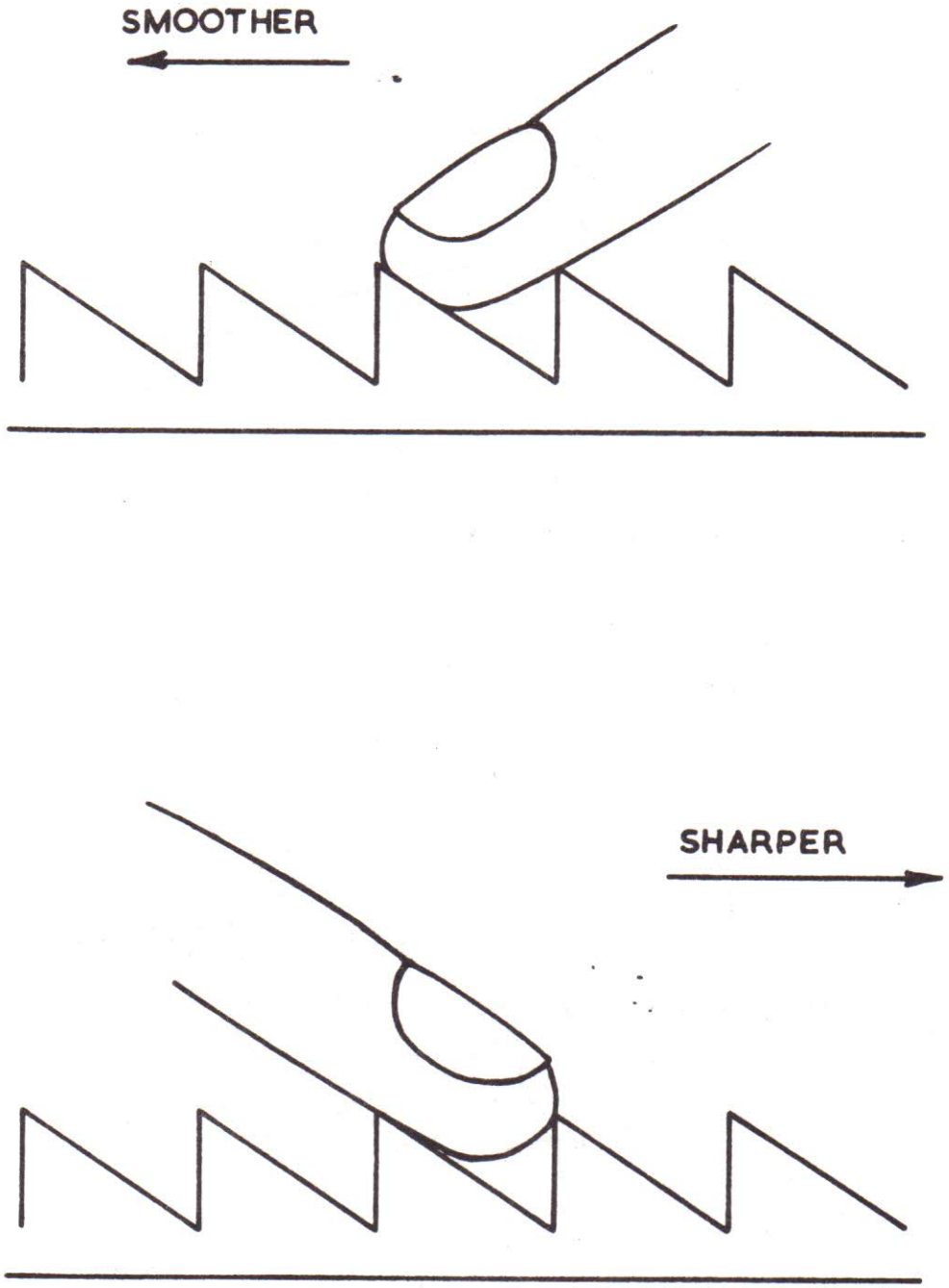

FIG. 1.

A directional line.

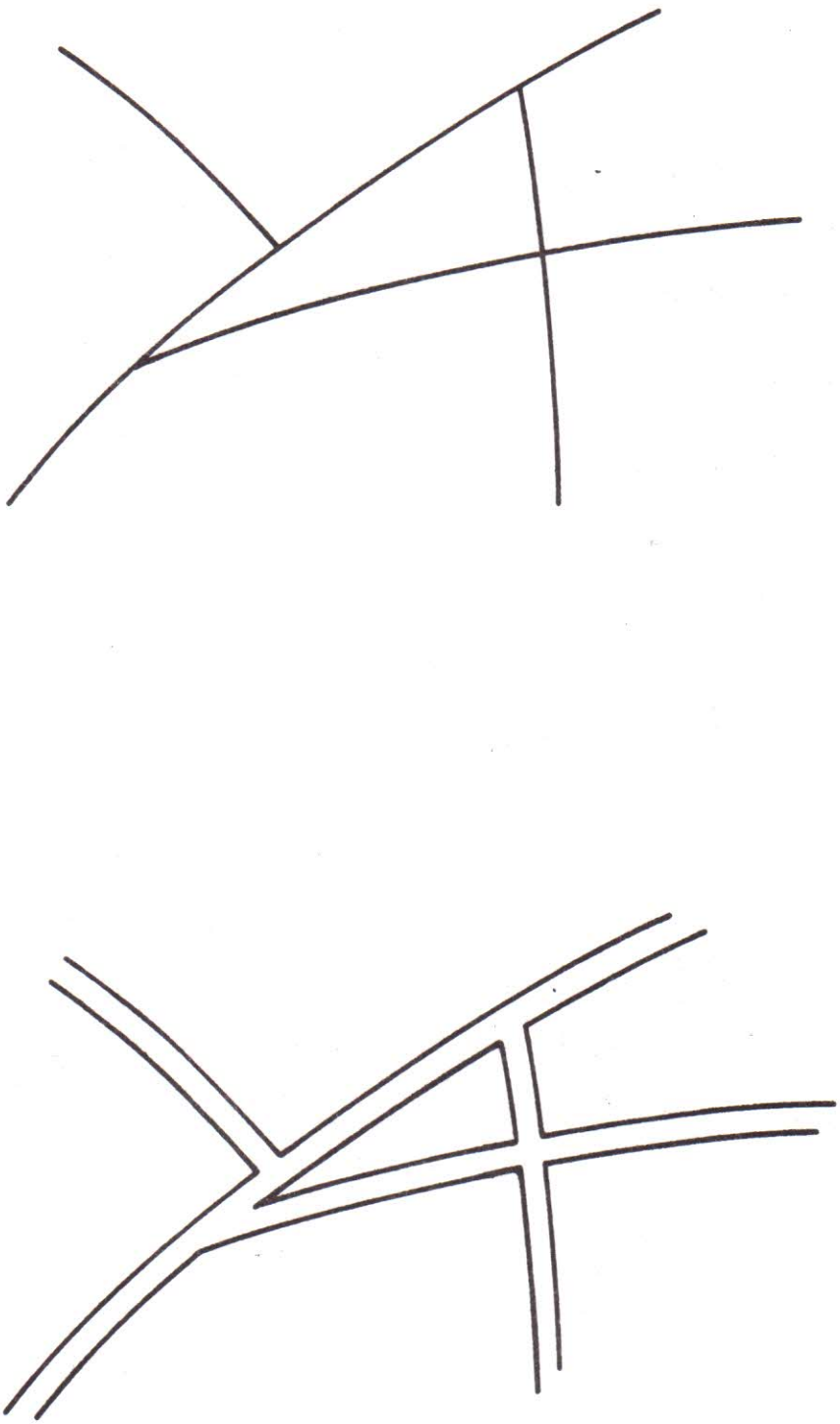

FIG. 2.

Single and double line representations for a road.

two lines for a road is easier to understand. However less space is taken up by a single line road which leaves more room for other information to be included on the map.

Embossed maps are often made by sighted volunteers, for local blind people, by building a master from string, sandpaper and fabrics. Plastic copies are made by a vacuum-forming process which involves heating a sheet of plastic and then sucking it down to conform to the shape of the master. This method is inexpensive on materials but tends to be very time-consuming.

Most blind people have never used an embossed map. Someone who was born blind has to be taught how a map can be a scaled and coded representation of the environment. It is also necessary to teach a blind child to scan a map in a systematic manner in order to build up some form of mental picture of the area. This is similar to the problem of a sighted person reading a large wall map but only being allowed to look at one square inch at a time.

Braille is an embossed system for representing letters and numbers by the use of from one to six raised dots. Braille takes up a considerable amount of space so special methods have been developed for avoiding braille on a map. One method involves using an overlay which is a separate sheet of braille positioned over the map so that the blind person can read the map with one hand and the overlay with the other.

To make a clear map by any manual method is very time-consuming and therefore expensive if one takes into account the cost of labour. With these methods it is very difficult to change the scale of the map. A computer-assisted system was developed to overcome these problems.

A large scale map is marked up with the extra information which will be useful to a blind pedestrian. This information may include gradients, bus stops, names of shops and likely destinations.

The operator goes selectively round this map with a stylus which is connected to the computer (Figure 3). The map is simultaneously displayed on the screen of the visual display unit. The operator can now modify the map

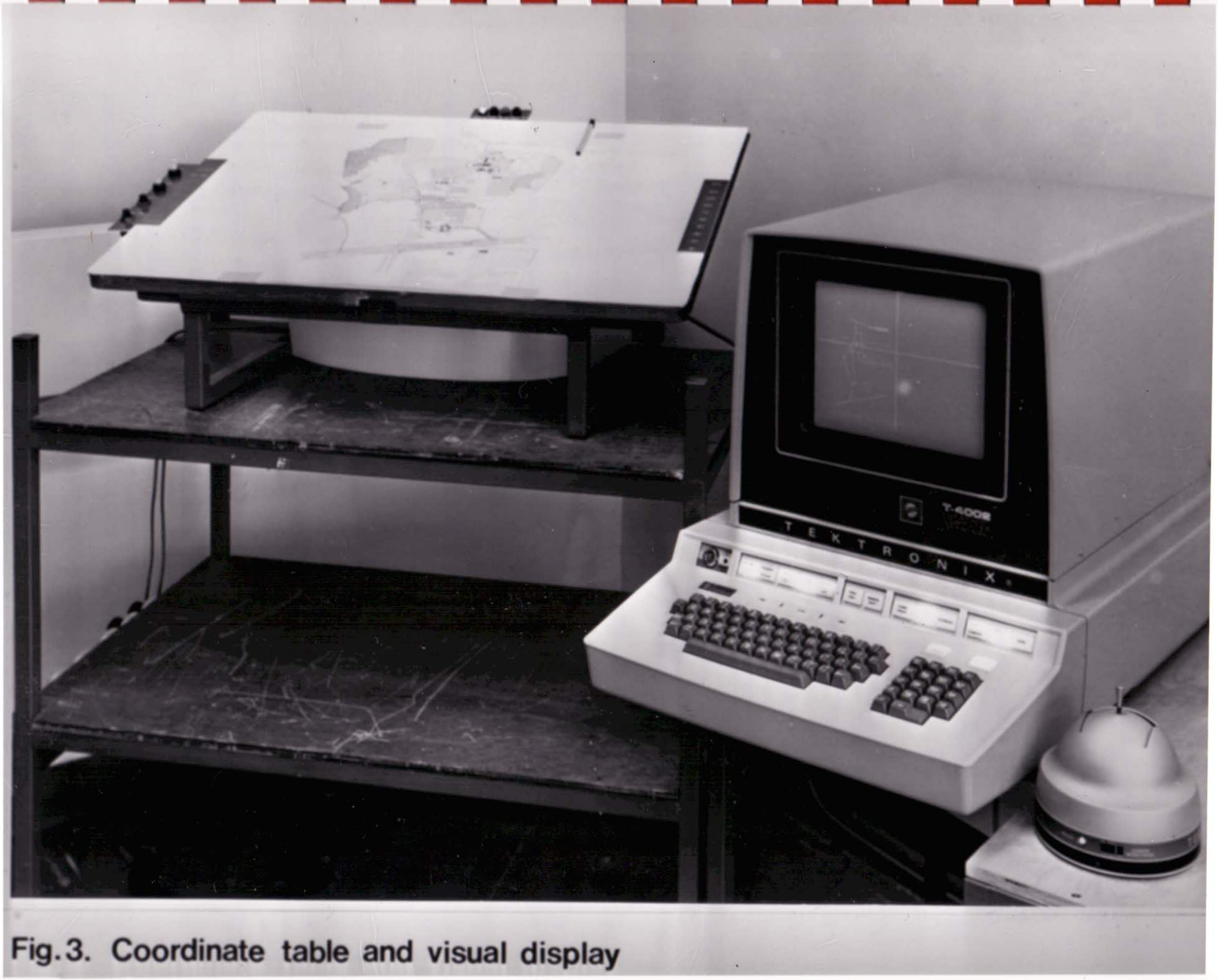

Fig. 3. Coordinate table and visual display