

TACTILE MARKS FOR THE VISUALLY HANDICAPPED

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1 Introduction

The Netherlands Bank was the first Central Bank to introduce tactile marks for the blind when on 4 January 1971 the 10 guilder note of the 1968 design bearing the portrait of the Dutch painter Frans Hals was issued. Other Central Banks have followed suit since, for example those of Belgium, Finland, France, Israel, Portugal and Switzerland. Still other Central Banks are considering the introduction, following up on the United Nations which proclaimed 1981 the Year of the Handicapped. Organisations of the blind and poorly sighted in the Netherlands and other countries have expressed their appreciation for the Bank's innovation. Yet, despite the fact that many Central Banks adopted the idea and despite the appreciation shown, we cannot call this innovation a complete success. It seems we have a problem here without a real solution as the marks used so far appear difficult to feel and their relief is quickly lost due to wear in the circulation.

2 Why tactile marks?

Banknotes, that is the images printed on the front and back and the shaded watermark, are typically designed for visual perception. As such, everyone can recognise them, except the visually handicapped. Since one of the printing techniques applied — plate printing or intaglio — leaves a mark clear to the touch in and on the paper, it should in principle be possible to exploit

this relief by way of special tactile marks for the visually handicapped. The ideal that the whole of the population be able to recognise a banknote, would be attained. It should be noted, though, that tactile marks are not intended as a security feature against counterfeiting but as a means of recognition only.

3 Tactile marks — for whom?

In general, three classes of visually handicapped can be distinguished. Each class could be helped best by means chosen with regard to their specific handicap.

The first class consists of people who were born blind or who became blind during the first four years of their lives. These people usually have an excellent sense of touch and are able to read, with their fingers, the plate-printed text and figures on the front of Dutch banknotes. Hence, for this class of visually handicapped no special tactile marks are required. On the latest 100 guilder banknote of the 1977 design with the image of a Snipe recognisability of the text was improved using a sans serif font while omitting border lines, which may diminish recognisability. Plate-printed letters were simply placed on a flat offset background.

The second class of people consists of those who turned blind later in life, for instance as the result of a traffic accident. These people may be compared with blindfolded persons. Their sense of touch usually is no better than that of normally sighted people. Special tactile marks would be of great help to them because they are unable to recognise either text or figures. Efforts to develop good tactile marks should therefore be aimed at this class of people.

The third class consists of those who are not entirely blind but poorly sighted. These people are usually able to distinguish the various bright colours of Dutch banknotes. Many of them can also read the large figures. So, no tactile marks are required for them either.

4 Would Braille characters be suitable?

Naturally, the first thing to think of are Braille characters. The raised dots of true Braille characters, however, are higher than the highest relief possible to achieve in the plate printing process. At the time, in the sixties, we believed that the lower height could be compensated for increasing the width of the dots. This subsequently appeared to be a mistake, as may be demonstrated in the following, simple experiment.

The thickness of a normal sheet of writing paper is approximately 0.1 mm thick, which is about as high as the maximum relief achieved in plate printing on Dutch banknotes. If such a sheet of paper is put on a flat table top, it will be easy for everyone, even for normally sighted people, to feel its edges. The smooth surface of the sheet, however, will not be recognisable. It was argued above that persons without a visual handicap but blindfolded may be held representative of the class of people for which the tactile marks are meant. The outcome of the experiment hence is that neither the height of the paper nor its upper surface can be recognised but only its sharp edges brought about by the difference in height. Thus, tactile marks will be optimal when they have the maximum height obtainable in plate printing and the minimum width necessary to realise that height technically. They should be printed about the width of one finger from each other so as to make them perceptible one by one.

The specifications of the tactile marks will then comprise the following typical dimensions:

relief	:	100	μm ,
width	:	0.5	mm,
interspace	:	10	mm.

5 What system of tactile marks?

True Braille characters are not very effective because only a small number of the blind are able to read Braille. In the Netherlands only 4,000 people out of an estimated 90,000 visually handicapped are proficient in Braille. Therefore, in the sixties, a simple system of circular marks was chosen, loosely based on the Braille principle. The higher the denomination of the note, the smaller the number of circular marks, with the highest denomination bearing no mark at all. This renders it difficult to change a denomination into a higher one because elimination of a mark without damaging the paper is not a simple matter.

Obviously, no new denomination can be introduced into such a sequential system. This problem we encountered when we decided to design a 50 guilder note, which did not exist. A system of mutually unrelated marks for different denominations would be more practicable. On further consideration, circular marks are not necessary either. Tactile marks may consist of narrow lines as well, provided they have the typical dimensions specified. But, then, it seems logical to abandon the Braille principle entirely.

We conducted a few experiments having a few people — some of whom some were blind, others normally sighted but blind-folded — assess proofs

of tactile marks. The results were unanimous and clear. Marks composed of narrow lines with an enclosed space equal in width to one finger, such as a square or a circle or a triangle, were recognised best. Marks without an enclosed space, such as various types of crosses, are hard to recognise, or would have to be very large. Accordingly, for the mark on the new 50 guilder note of the 1982 design bearing the image of a Sunflower we chose a triangle ∇ .

6 Are further improvements possible?

It does not seem unlikely that the tactility of the marks can be improved further. According to Willems [1], fingers are not only sensitive to a sharp edge with a certain relief (the amplitude), but also to oscillations of a certain frequency. Oscillations of a certain frequency can be generated running one's fingers with the corresponding speed over a ribbed pattern. If the marks mentioned in the previous section consist of double lines, they may generate this effect. The space between the lines would have to be about as wide as each line, which is 0.5 mm, so as to make sure that the double lines are not felt separately but reinforce each other's tactile effect. This would further enhance the tactility of the identification marks.

The effectiveness of this further improvement has to be tested yet in an experiment, having some people assess a number of proofs.

7 Will this solution be satisfactory?

From the above analysis it becomes clear that the solution found is an optimal one for plate-printed tactile marks. One drawback remains, namely that the marks wear off so rapidly in circulation; it seems that nothing much can be done about it. The conclusion is that special tactile marks are of some convenience to a certain class of visually handicapped, but that they do not benefit everyone under all circumstances. However, it would not be right to omit special tactile marks just because their use is not a one hundred per cent success.

Sometimes solutions of another type are suggested, like rounded corners, notched edges, etcetera. But technically such solutions are difficult to realise in the very large quantities of hundreds of millions of banknotes required. What is more, the edges of banknotes are yet more subject to wear and tear than plate-printed tactile marks.

References

- [1] P.J. Willems; *Inleiding in de psychology van de menselijke verrichtingen*, (*Introduction to the psychology of human actions*), Van Loghum Slaterus, Deventer 1981.

Note

Copies of this technical article, in Dutch or English, were handed out or sent to everyone who showed interest. The tactile marks for the visually handicapped developed for the 50 guilder banknote (1982, Sunflower) and the 250 guilder banknote (1985, Lighthouse) were based on it. This new translation of the original Dutch text was done in October 2006.

Dr Peter Koeze was, at the time of writing, Head of the Banknote Development Department, and retired from De Nederlandsche Bank in 2004.

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