A PUNCHED-CARD METHOD FOR SYSTEMATIZING LITERATURE REFERENCES IN AGRONOMIC RESEARCH

THE punched-card system provides a means of dealing with the problem of numerous research publications. It can be used to facilitate the handling of a variety of subject materials such as abstracts, lecture notes, reprints, and reports. Because several topics can be assigned to a single card, it offers a convenient method of cross-referencing and classifying items.

A practical punched-card system has been designed and adopted for general use at the U.S. Water Conservation Laboratory. The card is a double-row, needle-sort, punched card as shown in Figure 1 and can be obtained on special order through office equipment suppliers. Orthographic, alphabetic, and numerical codings are used, each of which has its special function.

The top and right margins contain a modified orthographic coding similar to the one proposed by Gilbert and used by Stanberry. Each needle hole is coded with a letter pair starting from Ac and ending in Zt. The designation of the letter pairs to the needle holes is based largely on the probability of appearance of the letter combination in a descriptor word as presented by Gilbert in his table on the frequency of pairs of consecutive letters in technical descriptors.

The following steps indicate the operation of our orthographic system:

1. Three punches for each descriptor word.
2. A letter pair comprises a punch.
3. The first six letters of a descriptor word arranged in successive pairs make up the code. For descriptor words with less than six letters, a variation of letter pairing within the same word is used to get three letter pairs. This is shown in Table 1.

The paired-letter combination (column 4) of the descriptor word is punched on the card to correspond to the letter pair designated for the needle hole. For the word “pH” where the paired-letter combinations are Ph, Pp, and Hh, the needle holes Ph (35f), PzQz (340), and Hl (15i), respectively, are punched. The designation Pn includes all letter pairs from Pg up to and including Pn, PzQz includes all letter pairs from Po up to and including Qz, and Hi includes all letter pairs from Ha up to and including Ht. It is a simple matter then to find three letter pairs for a descriptor word and punch these at the properly designated needle holes as previously illustrated.

The descriptor word is selected similar to the method used in “Chemical Titles,” a journal published by the American Chemical Society. The key words from the title of the article plus additional selected words which are deemed more descriptive to the paper are chosen by the individual research worker. At least ten descriptor words can be used per card without affecting the physical condition of the card. The author has used an average of six descriptors per card with very little trouble from false drops. One important advantage of the system is that the usual complex classification and indexing schemes are not required.

The lower margin has the alphabetic code and is used to code the author. The first letter of an author is punched on the outside hole and the third letter to the inside hole. For the author “Smythe,” “S” is punched at needle-hole 68-outside and “y” at 74-inside. For two-letter surnames, the first and second letters are used.

The left-hand margin contains the numerical coding system for use by the individual worker for his own personal reference, classification, and where the numerical coding may be of advantage over the other methods. The 7-4-2-1 coding is a common code used in manual punched-card systems. Numerical values from 1 to 14 can be obtained by punching the proper needle holes. Number “1” is designated by punching needle hole 1, number “2” by punching needle hole 2, number “3” by punching needle holes 1 and 2, etc. Number “14” is obtained by punching holes 7, 4, 2, and 1. The author has used the first two numerical sections (numbers 79 through 86) to index all the chemical elements based on their atomic numbers and by utilizing the inside holes to include the more commonly encountered isotopes and acid radicals.

The versatility of the cards for use in agronomy and related fields has been proved by the fact that Laboratory personnel in soil physics and chemistry, agricultural engineering, meteorology, and plant physiology have used it. The coding schemes are simple and thus easily remembered, and, because of its simplicity, errors in punching are practically eliminated. The cost is reasonable—1.5 to 3 cents per card, depending upon the quantity ordered.—FRANCIS S. NAKAYAMA, Research Chemist, U.S. Water Conservation Laboratory, Southwest Branch, SWCRD, ARS, USDA, Tempe, Ariz.

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Table 1—Orthographic coding of descriptor words.

<table>
<thead>
<tr>
<th>Letters in descriptor</th>
<th>Example</th>
<th>Paired-letter sequence</th>
<th>Paired-letter combination</th>
<th>Punch* designation on card</th>
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* = outside hole punched, = inside hole punched.

1 Contribution from Soil and Water Conservation Research Division, ARS, USDA. Received Oct. 26, 1961.