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DOCUMENT FINDING.

(Non-conventional methods in document retrieval. 6).

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[Describes the method used in the selection of entries from the Catalogue-on-Tape in response to a query on a subject. After a precise formulation of the query, its subject is facet-analysed, and translated into a Class Number on the basis of a depth version of the Colon Classification. The computer compares, each of the digits in the Class Number for the query with each of the digits in the Class Number in each of the entries in the Catalogue-on-Tape, and selects those entries in whose Class Number a matching of the component digits with those in the Class Number for the query, is established. Mentions the provision made for print-out of the entries selected in a short as well as long format, for punching them on cards, and for transferring them on to another magnetic tape. Gives the step-by-step procedure and flow-charts used in the different stages of the work. Gives examples of queries and the print-out of the entries selected in response.]

1 Introduction

11 SCOPE OF THE PAPER

In paper Q in this issue, the preparation of a Catalogue-on-Tape and amending and updating it have been described. This Catalogue-on-Tape constituted the store in which search was made to select entries for documents to answer a reader's query. Each entry for a document consisted of the Class Number (=CN) according to a Colon Classification (=CC) depth schedule, Feature Heading and specification of the host document. For each document only one entry of this kind is

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made. But the selection can be made on the basis of any one of the elements in the entry, such as any one or more of the Isolate Numbers (=IN) in the (CN), any of the terms in the Feature Heading, and the Name of Author of document. This paper describes a method of selection of entries for documents relevant to a query about a subject.

12 TERMINOLOGY

A few special terms and symbols have been used in this paper to facilitate description of the work. They are:

1 DIGIT.— Any one of the characters used in the CC notational system.

2 CARD.— The location in which the digits in the (CN) of the query were stored.

3 WORK.— The location in which the digits in the (IN) of the (CN) for the query were rearranged in separate fields.

4 CARD(N).— The Nth digit of storage location CARD.

Note.— The first digit in a word is called 0 (zero). The counting of the position of digits also starts with it. For example, if the value of N is 7, it indicates the third digit of CARD - 1.

5 CARD(n).— The 0th word of storage location CARD + n.

Note.— If (n) is omitted, it is taken to represent the first location — that is, CARD.

6 CARD(N) (n).— The Nth digit of storage location CARD + n.

Note.— The n represents the address of the starting word. For example, CARD (5) (0) means 5th digit position of location in CARD.

7∇.— Represents a space.

Note.— Space is the only non-printing character. A blank column of a card is also read as a space.

8 R1, R2 etc.— R represents Selection Phase of the Program; R1, the Stage 1, R2 the State 2 etc of the Selection Phase.

Each of the Steps in a Flow Chart is numbered 1, 2, 3 etc. A Full Step Number will be R1.1, R2.1 and so on depending on the Stage of the Selection Phase.

2 Query Formulation

21 QUERY STATEMENT

The following is an example of a query statement:

“Required a classified list of documents on Automatic Assembly of Fountain Pens with Plastic Barrel and Gold Cap”.

The precise formulation of the query is based on reader-librarian dialogue.

22 BOUNDARY CONDITION

The boundary conditions for acceptance of the documents selected in answer to the query were stated as follows:

- 1 Both the isolates "Plastic Barrel" and "Gold cap" should concurrently qualify "Fountain pen";
- 2 The selected document might deal with any additional aspect of "Fountain Pen Production"; and
- 3 A print-out in Format 1 of the list of documents selected.

23 FACET ANALYSIS

The query is a statement about a subject. It can, therefore, be facet-analysed in the same manner as the subjects of the input documents were facet-analysed. The method adopted was essentially the Postulational Method for classifying a subject. In brief, it consisted of picking out all the kernel ideas, including those implied but not explicitly stated in the query, adding the Basic Subject (= BS) with which the subject of the query may be deemed to go, arranging the kernel ideas in a helpful sequence using the appropriate Principles for Helpful Sequence and representing the kernel ideas in standard terminology used in the scheme for classification. Facet analysis of the subject of the query mentioned in Sec 21 resulted in its transformation into the following statement in standard kernel terms:

Fountain pen, Plastic barrel, Gold cap,
Assembly, Automatic

24 CONSTRUCTION OF (CN)**241 Conventional Method**

The (CN) was constructed on the basis of version CC for depth classification of subjects going with the (BS) Pen Production. (See Sec 12 in Paper Q). The following (CN) was obtained:
MP85,3P6-2J1:7,6

242 By Machine

In the initial studies on feasibility, the construction of the (CN) for the subject of the query was done by human agency. However, a program has been drawn up for the machine to synthesise the (CN) when kernel terms are fed in (See Paper S in this issue).

25 QUERY CARD

The query, now transformed into a (CN), was punched on a card. No blanks were allowed between any two digits in the (CN). The maximum number of digits in an (IN) was restricted to 8. The maximum number of digits in a (CN) was limited to 80.

3 Selection Stage 1: Distribution of Query (CN)**3I GENERAL DESCRIPTION**

The program was divided into 5 stages. In Stage 1, described in Sec 3A to 3K, the query card was read into a storage area called CARD TO CARD + 19 (20 locations); and each of the (IN) rearranged as separate fields in a storage area called WORK A to WORK A + 39 (40 words). The first (IN) was stored in WORK A and WORK A + 1, the second in WORK A + 2 and WORK A + 3 and so on. The connecting Digit (= CD) prefixed to an (IN) was stored as its first digit.

3J FLOW-CHART (See Fig 1 in Appendix 1)

The operations described in Sec 3A to 3K, are those performed by the machine in Stage 1. For convenience, these Steps are indicated as R1.1, R1.2, etc.

3A READING IN QUERY CARD (R1.1)

The machine read a query card (See Sec 25). The query was stored in the location CARD to CARD + 19.

3B CHECKING FOR LAST CARD (R1.2)

Examined whether the card just read in was the last query card. If it was the last card, it implied that there were no further query cards to be read and the job was, therefore, over. The program then branched to Step R1.10.

3C FILLING WITH SPACE (R1.3)

The storage locations WORK A to WORK A + 39, to hold the (IN) as separate fields, were filled up with spaces.

3D SETTING UP VALUES OF M, N AND n (R1.4)

The value of M, N and n were each made equal to zero.

3E CHECKING FOR TERMINATION OF (CN) (R1.5)

CARD(M) was checked for space. If not a space, the program proceeded to Step R1.6. If a space, the content of WORK A + 2 was stored in a location called TEMP, and the program branched to Stage R2. (See Sec 4C).

Annotation.— A space indicated that the last of the digits in a (CN) had been checked. This condition will not, of course, arise in the first iteration.

3F CHECKING FOR (CD) (R1.6)

The digit in CARD(M) was checked for one of the (CD) used in CC. If it was, it indicated the beginning of another (IN)

which is to be stored separately. In this case, the program branched to Step R1.9. If it was not a (CD), it proceeded to Step R1.7.

3G TRANSFER TO WORK A (R1.7)

The substantive digit sensed in Step R1.6 was transferred and stored in location WORK A (N) (n).

Annotation.— In the first iteration, the values of (N) and (n) were each zero. Therefore, the digit was stored as the 0th character of location WORK A.

3H INCREASING THE VALUE OF M AND N (R1.8)

The values of M and N were each increased by 1 to facilitate dealing with the next digit in the (IN). The program then repeated Steps R1.5 onwards.

3J UPDATING THE ADDRESS FOR STORING (CD) (R1.9)

When a (CD) was sensed in Step R1.6, it was stored as the first digit of the (IN) following it. To facilitate this, the value of N was made zero and that of n increased by 2, to enable the storage to commence from the 0th position in WORK + N. The program then reentered at Step R1.7.

3K REWINDING TAPE (R1.10)

When the last card was sensed the machine typed out "Job completed" on the console typewriter.

3L ILLUSTRATION

Fig 2 in Appendix 2 illustrates the contents of the storage locations in CARD and WORK for the query Class Number MP85,3P6-2J1:7,6

4 Stage 2: Transfer from Catalogue-on-Tape

41 GENERAL DESCRIPTION

The steps in Stage 2 of the program were similar to those of Stage 1 (See Sec 3A to 3K). An entry from the Catalogue-on-Tape (See Paper Q in this issue) was read in and the (IN) in the (CN) were distributed in WORK B. The sensing of a virgule (/) in a (CN) indicated that all the digits of the (CN) have been read. The program for the distribution was written as a sub-routine and called in whenever required, the necessary parameters having been set up for the purpose.

42 FLOW CHART

Fig 3 in Appendix 3 gives a Flow-chart of the Steps. For convenience, they are indicated as Step R2.1, R2.2 etc. The Steps are described in Sec 4A to 4P.

4A READING-IN FROM CATALOGUE-ON-TAPE (R2.1)

The machine read in an entry from the Catalogue-on-Tape and stored it in locations BUF to BUF + 100.

Annotation.— It will be remembered that an entry contained the (CN), Feature Heading, and bibliographical specification for the Host Document. The (CN) was separated from the other sections of the entry by a virgule (/).

4B CHECKING FOR END SENTINEL (R2.2)

Checked for the End Sentinel. If it was sensed, the program branched to Step R2.1. If it was not, it proceeded to Step R2.3.

4C TRANSFER FROM TEMP (R2.3)

The content of TEMP is transferred to WORK A ÷ 2 (See Sec 3E).

Annotation.— WORK A ÷ 2 will contain the first Isolate Number (together with the (CD) prefixed to it) immediately following the Basic Class (= BC) Number.

4D FILLING UP WITH SPACE (R2.4)

The storage locations WORK B to WORK B + 39 were filled up with space, to facilitate the distribution of the digits in the (CN) read-in.

4E SETTING UP THE VALUE OF M, N, AND n (R2.5)

The value of M, N, and n were each made equal to zero.

4F CHECKING FOR VIRGULE (R2.6)

Checked whether the character transferred from BUF was a virgule. If it was, it indicated that the distribution of the (CN) was completed. The program then branched to Stage R3. If it was not, it proceeded to Step R2.7.

4G CHECKING FOR (CD) (R2.7)

Checked whether the character transferred from BUF was a (CD). If it was, the program branched to Step R2.10. If it was not, it proceeded to Step R2.8.

4H STORING OF DIGIT (R2.8)

The first digit in the (CN) read in from BUF was stored in WORK B(N) (n).

4J INCREASING THE VALUE OF M AND N (R2.9)

The values of M and N were each increased by 1, to facilitate dealing with the next digit of the (CN). The program then entered at Step R2.6 and the operations repeated.

4K STORING OF (CD) (R2.10)

When a (CD) was sensed in Step R2.7 it was stored as the first digit of the (IN) that followed it. To facilitate this, the value of N was made zero and that of n increased by 2, to enable the storage to commence from the 0th position in WORK B + n. The program then re-entered at Step R2.8.

4L EXAMINING CHECK (R2.11)

When the End Sentinel was sensed in Step R2.2, the location CHECK was examined whether it contained a zero or a number. If it was a number, the program proceeded to Step R2.12. If it was a zero, it branched to Step R2.13.

Annotation.— A number in the CHECK indicated the existence of a match for the query in an entry in the Catalogue-on-Tape.

4M INDICATION OF "READY FOR NEXT-QUERY" (R2.12)

The machine typed out 'Ready for Next Query'. The program then joined at Step R2.14.

4N INDICATION OF "NO SUITABLE DOCUMENT" (R2.13)

The machine typed out 'No Suitable Document'.

4P SETTING UP VALUE OF CHECK (R2.14)

The value of CHECK was made equal to zero. The program then re-entered at Step R1.1.

5 Stage 3: Comparison of (CN)**51 GENERAL DESCRIPTION**

In the two preceding Stages (See Sec 3 and 4), the (CN) for the query and a (CN) from the Catalogue-on-Tape were read-in and arranged as separate fields in WORK A and WORK B respectively. The unused areas were filled with spaces. Eight consecutive blank spaces in WORK A were used to indicate the termination of a (CN). In Stage 3 of the program, described below, the (BC) Number of the query was first compared with a (BC) Number in the (CN) read-in from the Catalogue-on-Tape. If they were not identical, another (CN) was read-in from the Catalogue-on-Tape and the comparison was repeated. This process was repeated till each of the (BC) Number in the (CN) on the Catalogue-on-Tape was compared with the (BC) Number of the subject of the query in WORK A. When a matching of the (BC) Number occurred, the (IN) immediately following it in WORK A was compared with each of the (IN) in the (CN) in WORK B. If there was no match, and if the (CD) preceding the first (IN) in the (CN) in WORK A was a "Comma", it was

replaced with a "Hyphen" and the comparison steps were repeated. In this way, each one of the isolates in the (CN) in WORK A were compared with each of the (IN) in the (CN) in WORK B. If there was no match, the machine read another (CN) from the Catalogue-on-Tape and the steps were repeated.

52 FLOW-CHART

Fig 4 in Appendix 4 gives a Flow-chart of the steps. For convenience, they are indicated as Step R3.1, R3.2, etc. The steps are described in Sec 5A to 5Q.

5A ADDRESS MODIFICATION (R3.1)

The values of the address modifiers m and n were each made equal to zero.

5B COMPARISON OF (BC) NUMBERS (R3.2)

The first two words of WORK A (that is, WORK A and WORK A + 1) were compared with the first two words in WORK B (that is, WORK B and WORK B + 1). If there was no matching, the program branched to Stage R2.

Annotation.— 1 This step involves the comparison of (BC) Numbers as the values of m and n were each zero.

2 The symbols ($m:$) and ($n:$) indicate that the comparison is to be done for the successive values of m and n — that is, $m, m + 1$ and $n, n + 1$.

5C RESETTING THE VALUES OF m AND n (R3.3)

The values of m and n were each made equal to 2.

5D CHECKING FOR 8 SPACES (R3.4)

WORK A(m) and WORK A($m + 1$) were examined for the occurrence of 4 consecutive spaces in each of them. If they were sensed, the program branched to Stage R4. If they were not sensed, it proceeded to Step R3.5.

5E COMPARISON OF (IN) (R3.5)

The (IN) in WORK A(m) and WORK A($m+1$) were compared with the (IN) in WORK B(n) and WORK B($n+1$). If there was a match, the program branched to Step R3.11. If there was no match, it proceeded to Step R3.6.

5F INCREASING THE VALUE OF n (R3.6)

The value of n was increased by 2.

Annotation.— An (IN) in the (CN) in WORK A may occur in any one of the fields in the (CN) in WORK B. Therefore, it was necessary to compare each of the (IN) in WORK A with

each of the (IN) in WORK B. Hence, the value of n was increased every time by 2.

5G COMPLETION OF CHECKING PROCESS (R3.7)

Checked whether the value of n was 40. If it was, the program proceeded to Step R3.8. If it was not, the Steps R3.5 onwards were repeated.

Annotation.— The total number of words in WORK B was 40. As the value of n was increased by 2 after each checking, when its value became 40, it indicated that the entire area of WORK B has been scanned for the purpose of comparison of the (IN).

5H CHECKING FOR COMMA (R 3.8)

Checked whether the (CD) following the (BC) Number in WORK A + 2 was a 'Comma'. If it was not, the program branched to Step R2.1 in the earlier Stage. If it was a "Comma", it proceeded to Step R3.9.

Annotation.— In Step R2.3, the content of WORK A + 2 will be the (IN) (together with the (CD) prefixed to it) immediately following the (BC) Number.

5J REPLACING 'COMMA' BY 'HYPHEN' (R3.9)

The 'Comma' prefixed to the (IN) in WORK A + 2 was replaced with a 'Hyphen'.

5K RESETTING THE VALUE OF n (R3.10)

The value of n was made equal to 2. The Steps from R3.5 onwards were repeated.

5L SETTING THE VALUE OF m AND n (R3.11)

The value of m was increased by 2 and that of n was made equal to 2. The program was re-entered at Step R3.4.

Annotation.— 1 The value of m was increased by 2 to facilitate the checking of the next (IN) in the (CN) for the query in WORK A. The resetting of the value of n to 2 indicated the starting address in WORK B.

2 In this process, some of the comparisons of (IN) may be duplicated. But this is not considered a serious drawback as the time taken for the process was practically negligible.

5M ILLUSTRATION

Fig 5 in Appendix 5 shows the distribution of the (IN) of the (CN) in WORK A and WORK B are indicated. The process of comparison is as follows:

WORK A(0,1) compared with WORK B(0,1). They match. Hence, WORK A(A2,3) compared with WORK B(2,3) (4,5) (6,7) and so on. No equality. Hence,

.3P6 replaced by -3P6 in WORK A and the above steps repeated. Equality found at WORK B(4,5).

WORK A(4,5) compared with WORK B(2,3) (4,5) and so on.

Equality found at WORK B(8,9)

WORK A(6,7) is all spaces. Therefore, it is the termination of the (CN) of the query in WORK A. Hence, the program branched to the next Stage.

6 Stage 4: Assembly for Output

61 GENERAL DESCRIPTION

When all the (IN) in a (CN) from the Catalogue-on-Tape have been checked, and an agreement with the (IN) in the query identified, the program entered Stage 4. In this stage the sections of the selected entry—consisting of (CN), Feature Heading, and specification of Host Document—, were distributed in different fields in the location OUB to OUB + 119. A maximum of 80 characters (20 words), 300 characters (75 words), and 100 characters (20 words), were reserved for locating the (CN), Feature Headings, and specifications of the Host Document, respectively. In the output stage (See Sec 7) each of the fields could be separately or simultaneously, worked upon. Further, as each of the fields begins at a fixed word on the tape it is convenient to sort by such elements as the (CN), Name of Author, and title of Host Document, when required.

62 FLOW CHART

Fig 6 in Appendix 6 gives a Flow-chart of the steps. For convenience, the steps are indicated as Step R4.1, R4.2 etc. The steps are described in Sec 6A to 6S.

The program provided checks for violation of the prescriptions of location. To simplify the Flow-chart the same not, however, indicated therein. The steps that were common in the program were used as subroutines.

6A FILLING OUB WITH SPACE (R4.1)

The 120 words of OUB to OUB + 119 were filled with space.

6B SETTING COUNTER (R4.2)

A location named COUNTER was made to hold a zero.

6C SETTING INITIAL VALUES OF ADDRESS MODIFIER (R4.3)

The values of M, N, and n were each set as zero.

6D CHECKING FOR VIRGULE (R4.4)

Examined whether the digit in BUF was Virgule. If it was, the program branched to Step R4.7. If it was not, it proceeded to Step R4.5.

Annotation.— The (CN) and the Feature Heading were separated by a Virgule. Therefore, the sensing of a Virgule indicated the termination of the (CN). The Feature Heading was stored in a separate field beginning from OUB + 20.

6F STORING IN OUB (R4.5)

The digit sensed in Step R4.4 was stored as the 0th character in OUB (N)(n).

6G INCREASING THE VALUES OF M AND N (R4.6)

The values of M and N were each increased by 1 to deal with the next digit. The cycle of operations from R4.4 onwards was repeated until a Virgule was sensed. The program then proceeded to Step R4.7.

6H MODIFYING BUF ADDRESS (R4.7)

The value of M was increased by 1 to deal with the character following the Virgule.

Annotation.— The Virgule sensed in Step R4.4 was not required in the output.

6J MODIFYING OUB ADDRESS (R4.8)

The values of N and n were made equal to 0 and 20 respectively.

Annotation.— The first character of the Feature Heading was stored in the 0th character position of OUB + 20.

6K CHECKING FOR VIRGULE (R4.9)

Checked whether the character in the Feature Heading was a Virgule. If it was, the program branched to Step R4.12. If it was not, it proceeded to Step R4.10.

Annotation.— The Feature Heading and the specification of the Host Document were separated by a Virgule. Therefore, the sensing of a Virgule indicated the termination of the Feature Heading. The specification of the Host Document is to be stored in a separate field beginning from OUB + 95.

6L STORING CHARACTERS OF FEATURE HEADING (R4.10)

The characters in the Feature Heading were stored beginning with the 0th character position of OUB + 20.

6M INCREASING THE VALUE OF M AND N (R4.11).

The values of M and N were each increased by 1. The cycle of operations from R4.9 onwards were repeated until a Virgule was sensed. The program then proceeded to Step R4.12.

6N MODIFYING BUF ADDRESS (R4.12)

The value of M was increased by 1 to deal with the character following the Virgule.

Annotation.— The Virgule sensed at Step R4.9 was not required in the output.

6P MODIFYING OUB ADDRESS (R4.13)

The values of N and n were made equal to 0 and 95 respectively.

6Q STORING HOST SECTION (R4.14)

The remaining characters in BUF (M) were transferred and stored in OUB (N) (n), starting with the 0th character position of OUB + 95.

6R SETTING UP COUNTER (R4.15)

The value in the COUNTER was increased by 1.

6S INCREASING THE VALUES OF M AND N (R4.16)

The values of M and N were each increased by 1.

6T CHECKING COUNTER (R4.17)

Checked whether the value in COUNTER was 101. If yes, the program branched to Stage R5. If no, the operations from Step R4.14 onwards were repeated.

Annotation.— 1 The maximum number of characters for the specification of the Host Document was fixed at 100. Therefore, a value of 101 in the COUNTER indicated the completion of all the transfers from BUF.

2 Although the location named COUNTER is indicated in the Flow-chart, in actual practice the value of N itself was used as the counter.

6U ILLUSTRATION

Fig 7 in Appendix 7 illustrates the assembly of the output before proceeding to Stage R5 of the program.

7 Stage 5: Output**71 KINDS OF OUTPUT**

The program provided for the following kinds of output:

- 1 On-line print-out according to a long or short format;
- 2 Punched card in short format; and
- 3 Bibliography on magnetic tape in long format for further processing, if desired.

711 Example of Long Format

The following entries are examples of the long format.

MP85,P4-J2-9R1-9H1-9B3-3P6-2Z1=5 / FOUNTAIN PEN, STUDENT USE, MEDIUM SIZE, NIB: GOLD, EXTRA FINE POINT, PLATINUM TIPPED, BARREL: PLASTIC, CAPACITY 1.5 ML/ROWAN P. STUDENT PENS. (MOD STAT. 44; 63; 18-21).

MP85,P4-J2-9R4-9H2-9B3-2Z2-2P6/ FOUNTAIN PEN, STUDENT USE, MEDIUM SIZE, NIB: NICKEL-SILVER, FINE POINT, PLATINUM TIPPED, CAPACITY 2 ML, PLASTC CAP./ EVONU K. M. STUDENT-PENS. (OFFICE EQUIP. 8; 62; 58-60).

MP85,P4-J2-C-9R4-9M5-9K5-9H2-9B3-616-602-5111-356-2Y8-2J1-231/ FOUNTAIN PEN, STUDENT USE, MEDIUM SIZE, SELF WASHING, NIB: NICKEL SILVER, RETRACTABLE, SPRING MECHANISM, FINE POINT, PLATINUM TIPPED, SUPPLY CHANNEL, PERIPHERAL, TWO, DRUM NECK, BARREL: BLUE, ROCKET SHAPE, TOP VENTILATION, GOLD CAP /PIDGEON O, SMITH K. RETRA CTABLE NIB. (CANAD STAT. 18; 58; 401-3).

712 Example of Short Format

The following entries are examples of the short format.

EVONU K. M. STU DENT PENS. (OFFICE EQUIP. 8; 62; 58-60).

PIDGEON O, SMITH K. RETRACTABLE NIB. (CANAD STAT. 18; 58; 401-3).

ROWAN P. STUDENT PENS. (MOD STAT. 44; 63; 18-21).

72 FACILITY**721 Printer**

The printer used was an on-line printer capable of printing 300 lines per minute, with 120 print positions.

722 Card Punch

The card punch was capable of punching 80-column cards at 100 cards per minute.

723 Magnetic Tape

The magnetic tape medium was similar to the one used as the input tape. The transfer rate was 60,000 characters per second.

73 SWITCHES

The particular output device was selected by appropriate console switches on the typewriter. For example, if Switch 10 was on it caused an output on magnetic tape; Switch 3 on the line printer; Switch 4 on punched card; and Switch 20 for short format. The first three facilities could be had simultaneously also.

74 FLOW-CHART

Fig 8 in Appendix 8 gives a Flow-chart of the steps. For convenience, the steps are indicated as Step R5.1 etc. The steps are described in Sec 7A to 7V.

7A TESTING FOR TAPE-OUTPUT (R5.1)

Switch 10 was tested. If it was on, the program proceeded to Step R5.2. If it was off, it branched to Step R5.4.

7B TRANSFER TO TAPE (R5.2)

The contents of OUB to OUB + 119 were transferred, as one block, on to the output magnetic tape.

7C SETTING CHECK COUNTER (R5.3)

A number was stored in location CHECK whenever a block was stored on tape or for print or for punched output.

Annotation.— It will be remembered that after scanning the whole tape, a location was tested to find out whether there were at all any entries for documents selected in answer to the query. This was done to facilitate the modification of the message given out on the typewriter.

7D TESTING FOR PRINT OUTPUT (R5.4)

Switch 3, for printed output, was tested. If it was on, the program proceeded to Step R5.5. If it was off, it branched to Step R5.15.

7E TESTING FOR KIND OF FORMAT (R5.5)

Switch 20, determining Long or Short Format, requirement was tested. If it was on, the program proceeded to Step R5.6, to give a print-out in Short Format—that is, Name of Author, Title and Specification of the Host Document only.

7F RE-SETTING VALUES OF X, N, AND n (R5.6)

The values of X, N and n were set as 100, 0 and 95 respectively.

Annotation.— X indicated the number of print positions, N the starting character position, and n the word address. It

will be remembered that the specification of the Host Document was stored in OUB + 95 to OUB + 119. (See Sec 61).

7G PRINTING THE CONTENTS OF OUB (R5.7)

The contents of OUB at this stage were printed out in Short Format.

7H SETTING CHECK COUNTER (R5.8)

The number 1 was added to CHECK. The program then branched off to R5.15.

7J SETTING VALUES OF X, N, n AND C (R5.9)

If Switch 20 was off, the value of X was made equal to 80 and those of N, n and C were each made equal to 0.

Annotation.— If switch 20 was off, it indicated that the Long Format was required in the print-out. The (CN) will occupy the first line, and was given a maximum of 80 digits. The Feature Heading and the specification of Host Document were given the next 4 lines with 100 characters each. C was used to indicate the number of lines printed and its value was increased by 1 every time a line was printed.

7K PRINTING THE CONTENTS OF OUB (R5.10)

The contents of OUB at this stage were printed out.

Annotation.— Since the values of X, N, and n were 80, 0, and 0 respectively, the contents of OUB to OUB + 19 — that is, the (CN) — were printed out.

7L SETTING THE VALUES OF X, N, AND n (R5.11)

The values of X, N, and n were set as 100, 0 and 20 respectively, to facilitate the printing of the Feature Heading.

7M PRINTING THE CONTENTS OF OUB (R5.12)

The contents of OUB at this stage were printed out.

Annotation.— The characters printed out will be the first 100 characters of the Feature Heading, starting from OUB + 20.

7N SETTING THE VALUES OF C, n AND N (R5.13)

The value of C was increased by 1 and that of n by 25. The value of N was made equal to 0.

Annotation.— Making N equal to 9 indicated that the next line should start at the character position 0. Increasing the value of n by 25 indicated that the printing would start from the twenty-fifth word — that is, OUB + 25.

7P - CHECKING THE NUMBER OF LINES (R5.14)

Checked whether the value of C was equal to 4. If it was,

the program branched to Step R5.8. If it was not, the Steps R5.12 onwards were repeated.

7Q TESTING FOR PUNCH OUTPUT (R5.15)

Switch 4 was tested. If it was on, the program proceeded to Step R5.16. If it was off, the program branched to Stage R2 to read the next block on tape.

7R SETTING THE VALUE OF X, N, AND n (R5.16)

The values of X, N and n were set as 80, 0 and 95 respectively.

Annotation.— X = 80 indicated that 80 characters were to be punched. Only the specification of the Host Document, as stored in OUB + 95, was to be punched. Hence, n was set as 0.

7S PUNCHING OUT CONTENTS OF OUB (R5.17)

The contents of OUB at this stage were punched on card.

7T SETTING THE VALUE OF X, N AND n (R5.18)

The values of X, N and n were set as 20, 0 and 115 respectively.

Annotation.— The maximum number of characters in the specification of the Host Document was restricted to 100. Eighty characters were punched in the earlier step. Hence, X was made equal to 20 to facilitate the punching of the remaining characters.

7U PUNCHING OUR CONTENTS OF OUB (R5.19)

The contents of OUB at this stage were punched on card.

7V SETTING CHECK COUNTER (R5.20)

The number 1 was stored in CHECK.

The program then branched to Step R2 to read the next block on the tape. The cycle of operations was repeated till the End Sentinel was sensed on the tape.

8 Examples

81 QUERY 1

Statement of the Query

- 1 List of documents on studies on the corrosion of metallic fountain pen barrel by ink;
- 2 Any other facet may be discussed in the document; and
- 3 Print out in long format.

812 *Kernel Terms in Sequence*

FOUNTAIN PEN. METAL BARREL. CORROSION BY INK.

- 813 *Class Number for Query*
MP85,2J,3;474-5
- 814 *Number of Documents Selected by Computer*
1
- 815 *Print out*
MP85,2J,3;474-5
FISHER T. PEN BARREL CORROSION STUDIES. (CORROSION.
1954;8-10).
- 816 *Number of Documents in the Catalogue-on-Tape Answering
the Query*
1
- 82 QUERY 2
- 821 *Statement of the Query*
1 A classified list of documents on the production of plastic
barrel pens;
2 Any other facet may be discussed in the documents; and
3 Print out in the long format.
- 822 *Kernel Terms in Sequence*
FOUNTAIN PEN. PLASTIC BARREL.
- 823 *Class Number for Query*
MP85,3P6
- 824 *Number of Documents Selected by Computer*
46
- 825 *Print-out*
(Omitted here for want of space)
- 826 *Number of Documents in the Catalogue-on-Tape Answering
the Query*
46
- 83 QUERY 3
- 831 *Statement of the Query*
1 A list of documents on comparison of triangular barrelled
pen with cylindrical barrelled pen with particular reference to
writing facility;
2 Any other facet may be discussed in the documents ; and
3 Print out in short format.

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- 832 *Kernel Terms in Sequence*
FOUNTAIN PEN. CYLINDER BARREL COMPARED WITH TRI-
ANGULAR BARREL. WRITING FACILITY.
- 833 *Class Number for Query*
MP85,2Y10m2Y3;9P3
- 834 *Number of Documents Selected by Computer*
1
- 835 *Print out*
WILLIAMSON S M. CYLINDRICAL AND TRIANGULAR BARREL
PENS. (MOD STAT. 45;64;35-40).
- 836 *Number of Documents in the Catalogue-on-Tape Answering
the Query*
1
- 84 QUERY 4
- 841 *Statement of the Query:*
1 List of documents on the production of gold capped
cylindrical bared pens;
2 Any other facet may be discussed in the documents;
3 Print out in short format.
- 842 *Kernel Terms in Sequence*
FOUNTAIN PEN. CYLINDER BARREL. GOLD CAP.
- 843 *Class Number for Query*
MP85,2Y1,2J1
- 844 *Number of Documents Selected by Computer*
Nil
- 845 *Print out*
"NO SUITABLE DOCUMENTS PLEASE"
- 846 *Number of Documents in the Catalogue-on-Tape Answering
the Query*
Although there are some documents listed in the Catalogue-
on-Tape answering the query, the computer did not select any
of them because the class number for the query given in sec 843
is incorrect. The correct class number is MP85,2Y1-2J1
- 85 QUERY 5
- 851 *Statement of the Query*
1 A list of documents on the production of plastic barrel,
gold capped pens;
- 348

- 2 Any other facet may be discussed in the documents;
- 3 Print out in the long format.

- 852 *Kernel Terms in Sequence*
FOUNTAIN PEN. PLASTIC BARREL. GOLD CAP.
- 853 *Class Number for Query*
MP85, 3P6-2J1
- 854 *Number of Documents Selected by Computer*
8
- 855 *Print-out*
(See Fig 9 in Appendix 9)
- 856 *Number of Documents in the Catalogue-on-Tape Answering the Query*
8

Annotation.— It will be noted that although the two Isolate Numbers are given consecutively in the Class Number for the query, in the Class Numbers of the documents answering the query these isolates do not occur consecutively in all cases.

91 APPENDIX I

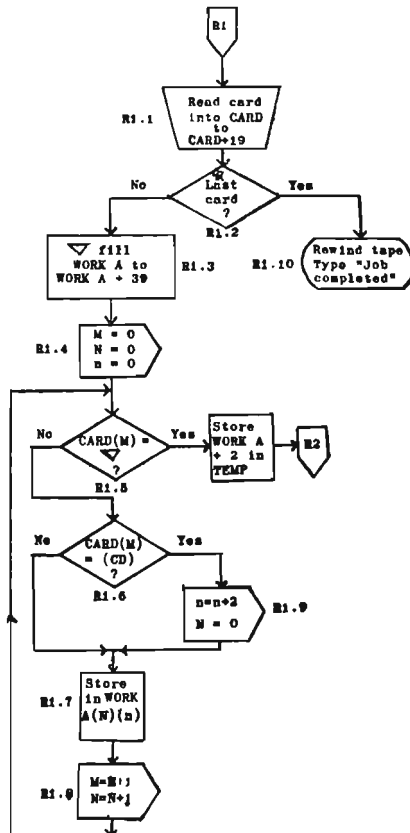


FIG 1. Flow-chart 3: Distribution of Query Class Number

92 APPENDIX 2

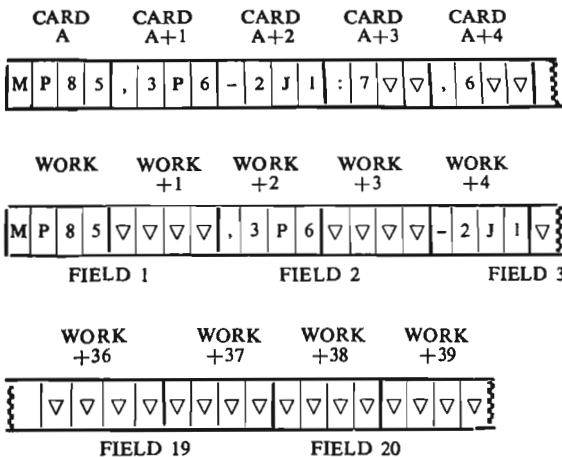


FIG. 2. Contents of storage locations

93 APPENDIX 3

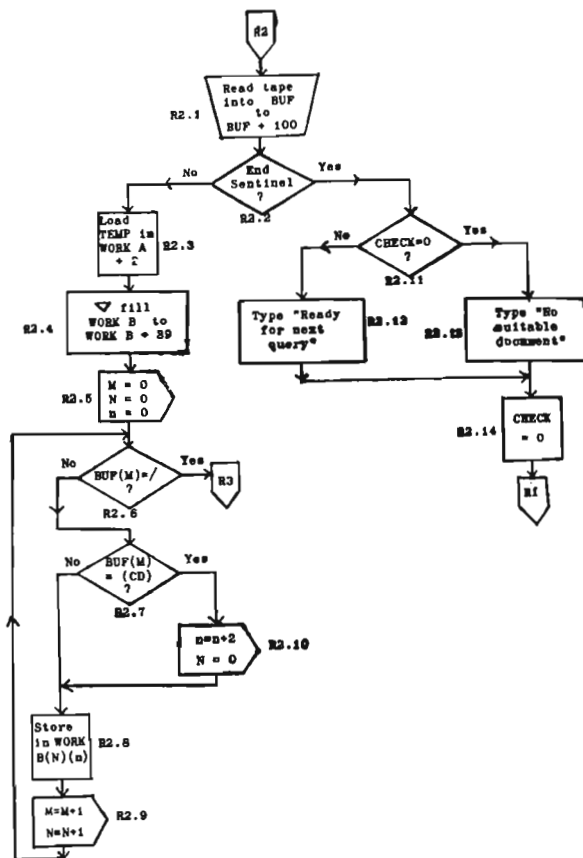


FIG 3. Flow-chart 4: Transfer from Catalogue-on-Tape

94 APPENDIX 4

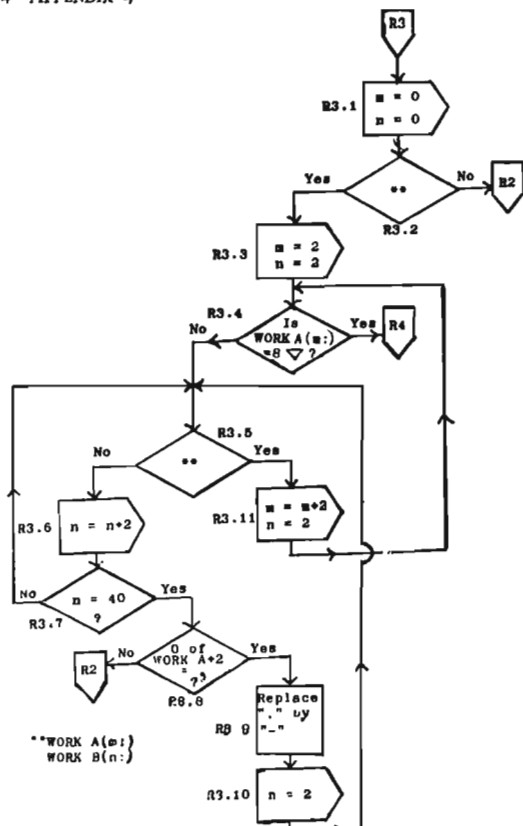


FIG 4. Flow-chart 5: Comparison of Class Numbers

95 APPENDIX 5

M P 8 5	0	M P 8 5	0
▽ ▽ ▽ ▽	1	▽ ▽ ▽ ▽	1
, 3 P 6	2	, S (4	2
▽ ▽ ▽ ▽	3) ▽ ▽ ▽	3
- 2 J 1	4	- 3 P 6	4
▽ ▽ ▽ ▽	5	▽ ▽ ▽ ▽	5
▽ ▽ ▽ ▽	6	- 2 N 5	6
_____	7	▽ ▽ ▽ ▽	7
		- 2 J 1	8
		
		▽ ▽ ▽ ▽	39

WORK A
(CN) of Query

WORK B
(CN) from Catalogue-on-Tape

FIG 5. Distribution of (IN)

96 APPENDIX 6

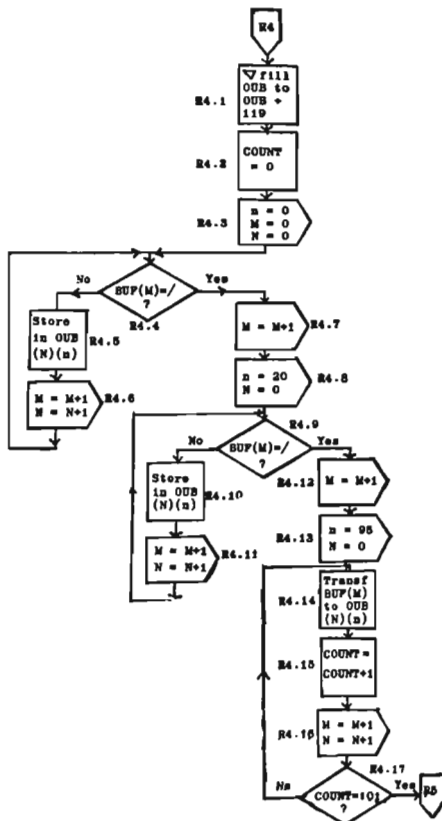


FIG 6. Flow-chart 6: Assembly for output

97 APPENDIX 7

B U F

MP 85	, 1 J,	2, 02	, OA:	7, 6/	FOUN	TAIN	PEN,	M
-------	--------	-------	-------	-------	------	------	------	---

AUTO	MATI	C/BO	HN▽R	.RINGING	▽THE	▽CAP	.
------	------	------	------	----------	------	------	---

BUF + 100 →

BENC	H. Δ1	6; 61	; 5-7	▽▽
------	-------	-------	-------	----

DISTRIBUTION

OUB +1 +2 +3 +4 +5

MP 85	, 1J,	2, 02	, OA:	7, 6▽	▽▽▽
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OUB+19

▽▽▽▽▽

OUB + 20

FOUN	TAIN	PEN,	META	LLIC	C
------	------	------	------	------	---

OUB+94

MATI	C▽▽
------	-----

OUB + 95

BOHN	▽R▽	RING	ING▽	THE▽	C
------	-----	------	------	------	---

OUB+119

▽▽▽▽▽

FIG 7. Assembly for output: Distribution

98 APPENDIX 8

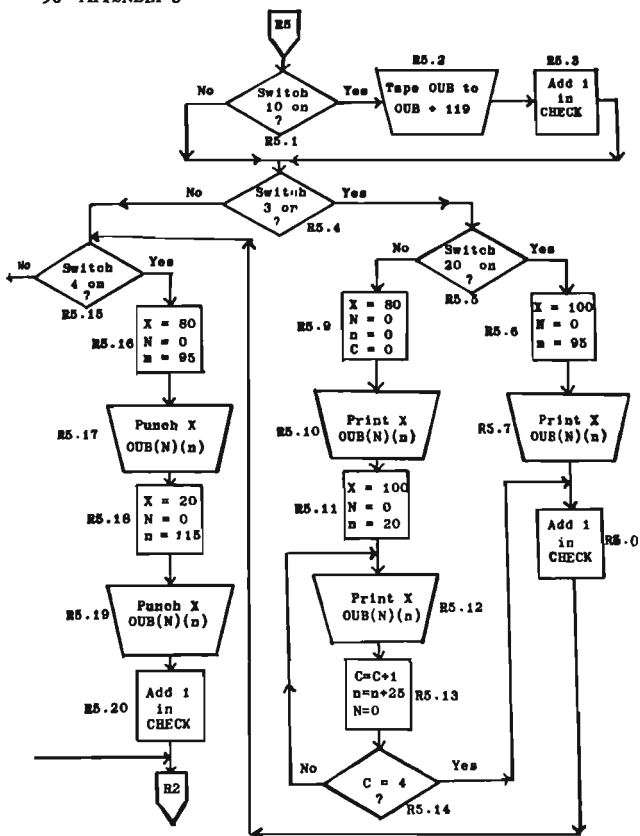


FIG 8. Flow-chart 7: Output

991 APPENDIX 9

- ACCN NO- 36
 MP5-FB-C-91-982-3P6-362-2J1/ FOUNTAIN PEN, AEROMATIC FILLING, SELF WASH'G, NIB: GOLD,
 PALLADIUM TIPPED, BARREL: TRANSLUCENT, GOLD CAP./ HARDY M. NEW AEROMATIC PENS. (MOD 31A
 T. 80759282-71).
- ACCN NO- 37
 P85-FB-C-91-908-3P6-361-2T41-2J1/ FOUNTAIN PEN, AEROMATIC FILLING, SELF WASH'G, NIB: GOLD,
 IRIIDIUM-PLATINUM TIPPED, BARREL: PLASTIC - TRANSPARENT, RECTANGULAR, GOLD CAP./ HARDY M, NE
 W AEROMATIC PENS. (MOD STAT. 6178011/-9).
- ACCN NO- 68
 MP55-15(D)-J6-944-943-3P6-2J1/ FOUNTAIN PEN, ENGINEER'S USE, THIN, NIB: NICKEL SILVER, PLATINUM
 TIPPED, PLASTIC BARREL, GOLD CAP./ MORGAN E. ELEGANTPENS FOR ENGINEERS. (OFFICE, 26:60:5-6).
- ACCN NO- 76
 MP95-257-9M5-9H1-9H2-3P6-361-2T1-2J1/ FOUNTAIN PEN, GERMAN MAKE, NIB: RETRACTABLE, EXTRA FINE
 POINT, PALLADIUM TIPPED, BARREL: PLASTIC, TRANSLUCENT, CYLINDER, GOLD CAP./ SCHNEIDER B. N
 EW EXTRA FINE FOUNTAIN PENS.(OFFICE EQUIP. 7:61:92-2).
- ACCN NO- 78
 MP5-273-L93-3P6-2J1/ FOUNTAIN PEN, US MAKE, HEARING AID LOCKINATION, PLASTIC BARREL, GOLD CAP
 ./ DATON A. SPECIAL PURPOSE PENS. (OFFICE MAG. 7:59:63-5).
- ACCN NO- 81
 MP95-26L-J6-9H2-904-626-3P6-2J1-231/ FOUNTAIN PEN, BLUE 91RD, THIN, NIB: GOLD CAP, TOP VENTILATIO
 N./ BLUEBIRD PENS. (OFFICE APPL. 59:62:881).
- ACCN NO- 82
 MP95-25C-9V2-9H2-9B3-3P6-304-2J1/ FOUNTAIN PEN, CARAT, NIB: STAINLESS STEEL/FINE POINT PLATINUM TIPP
 ED, BARREL: PLASTIC, OPAQUE, GOLD CAP./ CARAT PENS. (OFFICE EQUIP. 6162:88-90).
- ACCN NO- 94
 MP95-25-273-J6-9H1-9H2-904-3P6-2T1-2J1/ FOUNTAIN PEN, SHEAFFENS, US MAKE, THIN, NIB: GOLD, FINE PD
 INT, IRIIDIUM-PLATINUM TIPPED, BARREL: PLASTIC, TRANSLUCENT, CYLINDER, GOLD CAP./ SHEAFFER'S PEN CO. SHEAFFER
 'S LIFE TIME PENS. (MOD STAT. 58:57:80-1).

FIG 9. Print-out of Entries in response to query