

SYSTEM FOR USE IN
RECORDING AND PROCESSING STENOGRAPHS

This invention relates to a system for recording and processing stenographs.

Recently, international conferences have often been held with participants attending them from various countries. In the international conferences, it is of very importance to promote a mutual understanding among the participants. However, it frequently happens that a part of the participants can speak languages designated for the conferences and the remaining participants cannot speak the designated languages. Under the circumstances, the remaining participants cannot accurately and clearly understand the speech and cannot respond thereto.

It is mentioned here that written words or sentences can often be understood even by the participants who cannot speak the designated languages. Therefore, proceedings or procedures can be expedited in the conferences if each speech of speakers can instantaneously be displayed in the form of written words or sentences. Moreover, a mutual understanding can considerably be promoted among the participants if a record of the proceedings can be gotten simultaneously with completion of the conference.

Consideration might be made about the use of so-called conventional speech recognition devices so as to convert each speech of speakers into words or sentences. However, all of the conventional recognition devices can recognize only specific words

spoken by a specific speaker or speakers. Anyway, it is very difficult to recognize a great number of words spoken by unspecific persons for the time being.

It is an object of this invention to provide a system wherein a great number of words spoken by unspecific persons can be recorded as a stenograph and visually displayed in the form of words or sentences substantially simultaneously with a speech.

It is another object of this invention to provide a system of the type described, which serves to expedite proceedings of international conferences.

It is a specific object of this invention to provide a system of the type described, wherein a record of proceedings can be readily obtained at the end of each conference.

According to the present invention there is provided a system for use in recording stenographs and for producing an output signal which can be used to provide a visual display of speech represented by the stenographs, the system comprising means for producing a sequence of stenograph signals from a sequence of said stenographs, and means for processing said sequence of stenograph signals to form said output signal, wherein the stenograph signal producing means comprise a recording medium which is transportable in a predetermined transport direction through a writing zone, in which the sequence of stenographs is written on to the recording medium, and an extension zone, which is adjacent to the writing zone and is located in the transport direction therefrom, a stand which is movable over the recording medium within the writing zone, means for supporting the

stand adjacent the recording medium so as to allow movement of the stand along the transport direction, drive means coupled to the recording medium and adapted, when activated, to drive the recording medium in the transport direction towards the writing zone, and reading means which are located above the recording medium within the extension zone, the reading means being adapted to read the sequence of stenographs written on the recording medium within the writing zone and to supply a sequence of first electric signals representing the sequence of stenographs to the processing means.

The invention will now be described, by way of example, with reference to the accompanying drawings, in which:-

Figs. 1(a) through (e) show symbols for use in describing the Pitman shorthand system as an example;

Figs. 2(a) through (d) show other symbols for use in describing the Pitman shorthand system as an example;

Fig. 3 shows a block diagram of a system for recording and processing stenographs according to the invention;

Fig. 4 shows a block diagram of a part of the system illustrated in Fig. 3; and

Fig. 5 shows a schematic plan view of an input device for use in the system illustrated in Fig. 3.

Referring to Figs. 1 and 2, a principle of this invention resides in converting a speech composed of a succession of sounds, such as phones, phonemes, syllables, and the like, into stenographs by the use of shorthand written on a recording medium and thereafter in further converting the stenographs into words which are to be

(5)

- 4 -

visually displayed. By way of example, description will be made about the Pitman shorthand having a high regularity. With the Pitman shorthand, each sound is written down by the use of predetermined stenographs in a manner to be described. A single sound or sounds are written down in the form of a single or a combination of the stenographs of the Pitman shorthand.

Herein, let description be made about the stenographs, namely, symbols representative of vowels and

consonants so as to facilitate an understanding of the Pitman shorthand. The vowels are classified into six-kinds of short vowels $\check{a}$, $\check{e}$, $\check{i}$, $\check{o}$, $\check{u}$, and $\check{oo}$ and six-kinds of long vowels composed of ah , $\bar{a}$, $\bar{e}$, $\bar{aw}$, $\bar{o}$, and $\bar{oo}$.

5 On the other hand, four sorts of signs or symbols are prepared in the Pitman shorthand to represent the twelve vowels. Specifically, three ($\check{a}$, $\check{e}$, and $\check{i}$) of the short vowels are represented by a light dot illustrated in Fig. 1(a) while the remaining short vowels ($\check{o}$, $\check{u}$, and $\check{oo}$) are represented by a light dash illustrated in Fig. 1(b). Likewise, three (ah , $\bar{a}$, and $\bar{e}$) of the long vowels are represented by a heavy dot illustrated in Fig. 1(c) while the remaining long vowels ($\bar{aw}$, $\bar{o}$, and $\bar{oo}$) are represented by a heavy dash illustrated in Fig. 1(d).

15 Under the circumstances, each of the short and the long vowels can not be individually specified by the above-mentioned signs. However, each vowel can individually be specified in connection with consonants succeeding or preceeding each vowel in a manner to be presently described.

20 In Fig. 1(e), a ruled or reference line is shown by a broken line. Each of the vowel signs and consonant signs (to be described later) is written with reference to the ruled line, although the ruled line is not always drawn visually. The exemplified oblique thin sign or stroke is representative of a consonant P and has a front part and a rear part on the lefthand and the

righthand sides of the thin stroke, respectively. The
 illustrated stroke may therefore be called a consonant
 sign P. The front part is divided into first, second,
 and third front places depicted at f_1 , f_2 , and f_3 , respec-
 5 tively. Similarly, the rear part is divided into first,
 second, and third rear places depicted at r_1 , r_2 , and
 r_3 , respectively.

Antecedence of each vowel to an adjacent consonant
 is indicated by assigning each vowel sign to a front
 10 part of each consonant sign. To the contrary, subsequence
 of each vowel after the adjacent consonant is indicated
 by allocating each vowel sign to a rear part of each
 consonant sign. In addition, the first through the
 third front places or the first through the third rear
 15 places serve to individually specify three sorts of
 the vowels, such as ($\check{a}$, $\check{e}$, $\check{i}$); ($\check{o}$, $\check{u}$, $\check{oo}$); (ah , $\bar{a}$, $\bar{e}$);
 and ($\bar{aw}$, $\bar{o}$, $\bar{oo}$).

By way of example, an indication of the light
 dot (Fig. 1(a)) attached to the first rear place r_1
 20 of the consonant sign P denotes a sound "pă" as one
 of the sounds. Similarly, indications of the light
 dots located at the second and the third rear places
 r_2 and r_3 of the consonant sign P denote sounds "pě"
 and "pĩ," respectively. Likewise, indications of the
 25 light dash (Fig. 1(b)) located at the first through
 the third rear places r_1 to r_3 denote sounds "pǒ," "pũ,"
 and "pǒǒ," respectively.

In addition, indications of the heavy dots (Fig. 1(c)) located at the first through the third rear places r_1 to r_3 of the consonant sign P denote sounds "pah," "pā," and "peē," respectively, while indications of the heavy dash (Fig. 1(d)) located at the first through the third rear places r_1 to r_3 of the consonant sign P denote sounds "pāw," "pō," and "pōō," respectively.

Symbols or signs illustrated in Figs. 2(a) through (d) represent consonants attached thereto. Arrows are also attached to the respective symbols to show an order of writing which is important to define the first through the third places of each symbol, as mentioned in conjunction with Fig. 1. It is to be noted as regards the specific symbols that each pair of voiceless and voiced consonants, such as (p, b); (t, d); (ch, j); (^k~~h~~, g); (sh, zh); (th, TH); (s, z); and (n, ng) is assigned to each of the specific symbols. It is possible to distinguish the voiceless consonant of each pair and the voiced consonant thereof by thin and thick outlines of each specific symbols, respectively.

The symbols are divided into straight strokes (Fig. 2(a)), curved strokes (Figs. 2(b) and (c)), and specially formed upstrokes (Fig. 2(d)). The straight strokes are also subdivided into straight downstrokes, a straight upstroke, and straight horizontal strokes. Likewise, the curved strokes are subdivided into a curved upstroke (*l*), curved horizontal strokes (m, n, and ng), and the remaining curved downstrokes.

In addition to the above-mentioned symbols, various types of symbols, are defined as stenographs in the Pitman shorthand to specify diphthongs, triphones, and the phrases which frequently appear in each speech. For convenience of description, when the vowels, the consonants, the diphthongs, the triphones, and the phrases can be represented by independent stenographs, they will be called sounds, respectively.

Referring to Fig. 3, a system according to a preferred embodiment of this invention is for use in recording stenographs representing a speech or talk by a speaker 11 and for producing from the stenographs a succession of word signals which can be visually displayed. More specifically, the speech is composed of a succession of sounds and is written down by a stenographer 12 at a high speed on a recording medium (not shown in Fig. 3) in the form of a succession of stenographs as described in conjunction with Figs. 1 and 2. Anyway, the stenographs are phonetically indicative of the sounds, respectively, and are successively sent to a stenograph processor.

The stenograph processor comprises a scanner 13 for reading the stenographs written down on the recording medium. The scanner 13 may be known in the art and optically scans the stenographs to produce a sequence of first electric signals E_1 representative of the stenographs, respectively. The first electric signal sequence may be called a sequence of stenograph signals.

The first electric signal succession E_1 is supplied to a normalizer 14 which is for normalizing each of the first electric signals E_1 . As a result, each of the stenographs is normalized in size, dots, dashes, strokes, and the like. Such normalization is possible by the use of a comparatively simple electric circuit because the rule of the Pitman shorthand is strictly determined and the stenographer should write the stenographs in accordance with the strict shorthand rule. In other words, the stenographs are written down with less variation in comparison with manuscript letters or characters.

At any rate, the normalizer 14 supplies a processing unit 15 with a succession of normalized signals NS representative of the stenographs and serves to preliminarily process the first electric signals E_1 . The normalizer 14 may be a part of the controller 15.

It should be noted here that the stenographs are phonetic signs which can be converted into phonetic letters, such as the alphabets, and that the converted letters are not always indicative of correct spelling of each word spoken by the speaker. For example, words "knee" and "bowl" are represented in the form of the phonetic letters "n-ee" and "b-oh-l," respectively.

Under the circumstances, the processor 15 converts the stenographs represented by the normalized signals NS into the corresponding phonetic letters to produce a sequence of phonetic letter signals PL representative of the phonetic letters. For this purpose, the processor

15 comprises a stenograph-to-letter converter 16 operable
in cooperation with a pattern generator 17 in a manner
to be described. The pattern generator 17 stores a
predetermined number of reference patterns which specify
5 the stenographs described with reference to Figs. 1
and 2.

It is mentioned here that about 75 to 80% of
English language can be covered by seven-hundreds of
common words which are frequently used. Accordingly,
10 it is possible to cover about 75 to 80% of an English
speech by selecting the seven-hundreds of common words.
Taking the above into account, the reference patterns
may preferably include patterns for these common words
in addition to patterns for vowels, consonants, short
15 forms, and the like. The predetermined number of the
reference patterns is equal to 2000 or so.

Responsive to the normalized signal NS, the
stenograph-to-letter converter 16 produces an enable
signal EN to access the pattern generator 17. Supplied
20 with the enable signal EN, the pattern generator 17
successively produces a reference pattern signal RS
representative of each reference pattern. Each reference
pattern signal RS is compared or collated with the normal-
ized signal EN in the stenograph-to-letter converter
25 16. When coincidence is detected between the normalized
signal EN and a specific one of the reference pattern
signals RS, the specific reference pattern signal is
produced as the phonetic letter signal PL.

From the above, it is readily understood that the pattern generator 17 may be a read-only-memory or a programmable read-only-memory.

Temporarily referring to Fig. 4, the stenograph-to-letter converter 16 comprises first and second registers 21 and 22 for storing a current one of the normalized signals NS and each of the reference pattern signals RS, respectively. Responsive to each normalized signal NS, a timing controller 23 delivers the enable signal EN to the pattern generator 17. Each of the reference pattern signals RS is sent from the pattern generator 17 and kept in the second register 22.

A comparator 24 is coupled to the first and the second registers 21 and 22 to compare the current normalized signal NS with each of the reference pattern signals RS successively sent to the second register 22. Such comparison is carried out under control of the timing controller 23. When the current normalized signal NS is coincident with the specific reference pattern signal RS, the comparator 24 supplies a conversion memory 26 with a coincidence signal CD representative of coincidence between the normalized and the reference pattern signals NS and RS.

The conversion memory 26 is accessed by the specific reference pattern signal and the coincidence signal CD to produce a specific one of the phonetic letter signals PL. The conversion memory 26 may be supplied with the current normalized signal instead

of each of the reference pattern signals RS.

It should be recollected that the phonetic letter signals PL represent the phonetic letters which may be different in spelling from the corresponding words.

5 Turning back to Fig. 3, each of the phonetic letter signals PL is delivered to a memory 31 so as to convert the phonetic letters into the corresponding words. The memory 31 stores word signals representative of the words in a plurality of addresses, respectively.

10 Thus, each of the phonetic letter signals PL is supplied to the memory 31 as an address signal for specifying each address of the memory 31. Accessed by each of the phonetic letter signals PL, the memory 31 derives a specific one of the word signals from a specific one

15 of the addresses specified by each phonetic letter signal PL and produces the specific word signal as each of second electric signals E_2 .

 If the memory 31 stores no word signal corresponding to a particular one of the phonetic letter signals,

20 the particular phonetic letter signal may directly be produced as one of the second electric signals E_2 , as symbolized by a broken line. In addition, when a homonym is represented by a selected one of the phonetic letters, a plurality of words may be derived from the memory

25 31 in correspondence to the homonym to be produced as the second electric signals E_2 . If it is possible in each conference to define one word corresponding to the homonym, such one word alone may be produced from

the memory 31. This applies to the case where only a single one of the words corresponding to a homonym is frequently spoken in a conference.

Each of the second electric signals E_2 is success-
5 sively visually displayed on a display device 32 in the form of a sequence of words. The display device 32 may be coupled to a copying machine 33 for copying visual displays on a copy sheet. Thus, the speech of the speaker 11 is momentarily visually ^{DISPLAYED} ~~displaced~~ on
10 the display unit 32 by reading stenographs written down on the recording medium 41. With this structure, it is possible to promote a mutual understanding among participants attending a conference. Moreover, proceedings can be obtained by copying the visual displays on the
15 display unit ³² ~~33~~.

Referring to Fig. 5, an input device is for use in combination with the scanner 13 to draw stenographs and is operated by the stenographer 12 (Fig. 3). In the example being illustrated, the input device comprises
20 a desk 35 for the stenographer (not shown in this figure), a drive roll 36 fixed to the leftside end of the desk 35, and an idler roll 37 fixed to the righthand side of the desk 35 and spaced apart from the drive roll 36.

25 A recording medium 41 is laid between the idler roll 37 and the drive roll 36 along a transport direction. A ruled line 42 is drawn at a center portion of the illustrated recording medium 41 along the transport

direction. However, the ruled line 42 may not be drawn on the recording medium 41 if the center portion of the recording medium 41 can be indicated optically or the like. The recording medium 41 is set or threaded on the idler roll 37 at one end of the medium and anchored to the drive roll 36 at the other end thereof. The recording medium 41 is transported from the idler roll 37 to the drive roll 36 and taken up by the drive roll 36 when the drive roll 36 is driven in a manner to be described later.

The drive roll 36 is coupled through a drive circuit 44 to a push-button switch 46 which is placed on the desk 35 and which is manually operated. The illustrated scanner 13 is located adjacent to the drive roll 36.

A pair of tracks 48 runs between the scanner 13 and the idler roll ³⁷~~36~~ in parallel to each other along the transport direction. Each of the tracks 48 is terminated by a pair of stoppers 49 adjacent to the scanner 13 and the idler roll 37. A movable stand 51 is carried on the tracks 48 and movable along the tracks 48 leftwards or rightwards of this figure. The stenographer places his or her hand on the movable stand 51 and writes down a succession of stenographs on the recording medium 41 with reference to the ruled line 42, moving the stand 51 rightwards of this figure.

In view of easiness of writing, it is preferable that the recording medium 41 is in close vicinity of

the stenographer's hand. Therefore, a design is made so that a distance between a plane of the recording medium 41 and a plane of the stand 51 becomes as short as possible.

5 Let a certain stenographer hear a speech of a speaker on a conference and write down stenographs corresponding to the speech on the recording medium 41. In this event, the stenographer places his or her hand on the movable stand 51 and successively moves
10 the stand 51 from the lefthand side of this figure towards the righthand side with the recording medium 41 kept still. When the stand 51 is brought into contact with the righthand stopper 49, the stenographer depresses the push-button switch 46. A drive signal DR is sent
15 from the push-button switch 46 to the drive circuit 44 comprising a motor. As a result, the drive circuit 44 drives the drive roll 36 to move the recording medium 41 through the scanner 13 leftwards of this figure and to take up the recording medium 41 on the drive roll
20 36.

 The stenographs written down on the recording medium 41 are read out of the recording medium 41 by the scanner 13 when the recording medium 41 passes through the scanner 13. Thus, the first electric signals E_1
25 are sent from the scanner 13 to the normalizer 14 (Fig. 3). In the example being illustrated, the drive roll 36 is driven during depression of the push-button switch 46. When depression of the push-button switch 46 is

released by the stenographer and the stand 51 is moved leftwards of this figure, the stenographer again writes down stenographs on the recording medium 41.

With this structure, the recording medium 41 is intermittently moved by the stenographer while he or she fails to describe the stenographs. In other words, the stenographs are described only when the recording medium 41 is not moved. This means that the stenographer can stably describe accurate stenographs.

While this invention has thus far been described in conjunction with an embodiment thereof, it will readily be possible for those skilled in the art to put this invention into practice in various other manners. The first electric signals E_1 may be supplied direct to the processor 15 without passing through the normalizer 14. It is needless to say that shorthand used in this invention is not restricted to the Pitman shorthand. The second electric signal E_2 may be converted into voice signals again and may be processed to translate the speech into the other language. The second electric signals may be recorded or printed on a recording sheet by the use of a printer.



28

CLAIMS:

1. A system for use in recording stenographs and for producing an output signal which can be used to provide a visual display of speech represented by the stenographs, the system comprising means for producing a sequence of stenograph signals from a sequence of said stenographs, and means for processing said sequence of stenograph signals to form said output signal, wherein the stenograph signal producing means comprise a recording medium which is transportable in a predetermined transport direction through a writing zone, in which the sequence of stenographs is written on to the recording medium, and an extension zone, which is adjacent to the writing zone and is located in the transport direction therefrom, a stand which is movable over the recording medium within the writing zone, means for supporting the stand adjacent the recording medium so as to allow movement of the stand along the transport direction, drive means coupled to the recording medium and adapted, when activated, to drive the recording medium in the transport direction towards the writing zone, and reading means which are located above the recording medium within the extension zone, the reading means being adapted to read the sequence of stenographs written on the recording medium within the writing zone and to supply a sequence of first electric signals representing the sequence of stenographs to the processing means.

2. A system as claimed in Claim 1, wherein said processing means



comprise normalizing means which are coupled to the reading means and serve to convert the first electric signals into a sequence of normalized signals, means for comparing each normalized signal with a plurality of reference signals each representing a reference pattern, the comparing means being adapted, upon detecting coincidence between a normalized signal and one of the reference signals, to produce an intermediate electric signal representing the said one of the reference signals, and output means for outputting the intermediate electric signal as said output signal.

3. A system as claimed in Claim 2, wherein the output means comprise converting means coupled to the comparing means for converting the intermediate electric signal into a word signal representative of the word which is represented by the said intermediate electric signal, and display means supplied with said word signal as said output signal for visually displaying the word represented by the word signal.

4. A system as claimed in Claim 2, wherein the output means comprise converting means coupled to the comparing means for converting the intermediate electric signal into a word signal representative of the word which is represented by the said intermediate electric signal, display means for visually displaying the word signal to provide a visual display of the said word, and copying means coupled to the display means and supplied with said word signal as said output signal for copying the visual display on



to a copy sheet.

5. A system as claimed in Claim 2, wherein the output means comprise means for recording the intermediate electric signal on a recording medium as said output signal.

6. A system as claimed in Claim 2, wherein the intermediate signal is representative of a phonetic sign, and the output means comprise means for producing the intermediate signal as said output signal without conversion, and display means supplied with said output signal for visually displaying said phonetic sign.

7. A system for use in recording stenographs and for producing an output signal which can be used to provide a visual display of speech represented by the stenographs, the system being constructed, arranged and adapted to operate substantially as hereinbefore described with reference to, and as illustrated in the accompanying drawings.
