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A TYPEWRITING SYSTEM FOR THE SERIOUSLY HANDICAPPED

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With improvements in nursing and medical skills, a new situation has developed in which substantially totally paralyzed people are being kept alive and given life expectancies approaching the normal span. Perhaps the most infuriating and disturbing problem faced by such handicapped people is their inability to communicate with those around them. The personality of such a person remains normal or is even enhanced by reason of the struggle to make sense of life in such circumstances. The challenge is to provide them with forms of control over their immediate environment with effective communication both in a written and a spoken sense, and to endeavour to provide them with a means of livelihood through the achieving of a worthwhile skill.

The system to be described is a tentative step toward alleviating the communication problem for such handicapped individuals. It was designed for use in the limiting case of a tetraplegic patient who is completely paralyzed and without vocal power.

To operate this communication system, an appropriately designed transducer is located at some suitable control site on the handicapped patient's body. Any site which can provide two or three distinguished activities is suitable.

The proposed system is based on the principle of developing a general instrument which can be tailored to suit many of the needs of disabled and voiceless persons. The number and pattern of characters that the patient can communicate is variable to suit individual need. A subsidiary goal has been to design a system which is inexpensive and relatively compact in size.

The proposed system consists of three units. The main unit contains all of the logic circuitry as well as a visual display device, namely a Nixie alphanumeric tube. The second unit is a type 33 Send-Receive (KSR) Teletype set. It provides printed output for the system. The third unit provides control of the system and will contain transducers appropriate to the patient's capability. It provides control of the characters to be displayed visually as well as the possibility of printout. Both the control unit and the teletypewriter set are connected to the main unit through multiconductor cables.

The system displays a set of pre-determined patterns or characters which cycle through the display at a predetermined rate while the patient provides the equivalent of a contact enclosure via the remote control. When the character he wishes to communicate is displayed, the patient deactivates the "switch", which stops the cycling of the character.

A patient with sufficient capability may then activate another switch to print out the character displayed on the typewriter. The patient may proceed to select yet another character from the cycling set and repeat the process of typing as needed. Control is also available to reverse the order of the cycling patterns so that a patient who overshoots the character, and has sufficient capability, can return to the character he wants in a matter of one or two counts. The cycling rate is made adjustable to suit the capability of each individual patient.

The black diagram of Fig.1 shows the principles of operation of the typewriting system. An adjustable-rate clock triggers a 6-bit modulo-48 synchronous up/down counter. The direction of count is governed by an external control. A buffer output stage is used to avoid overloading the counter. The character decoder is a multiple-output rectangular diode matrix. Its output feeds two devices, namely, the character composition encoder and the teletype ASCII code generator. In the character composition encoder each input activates some subset of the 15 Nixie segment drivers. The selected Nixie drivers then energize the appropriate segment in the Nixie tube to form the character or picture desired. The ASCII code generator simultaneously translates the decoder output to the required teletype code which is transmitted through a suitable interface driver to the teletype machine.

Special display memory is not required since information is fed directly to the display from the counter. Once the desired character is placed on the display a patient who is sufficiently capable can enable the print command to initiate typing of the character.

Fig.2 indicates in schematic form the circuitry required to emplement the block diagram described.

Regarding the versatility and adaptability of the system, it may be obvious that by changing the counter one may vary the number of displayed patterns. By simple changes in the character composition matrix and the ASCII encoder, different sets of patterns can be implemented. In the limiting case, only a few picture symbols may be appropriate. So that interchange of circuits can be accomplished easily, all are wired on plug-in cards. Though at present, control transducers are simple microswitches, card receptacles are provided for the adaptation of the system to other means of control including nerve activity detection and eye motion detection.

The main unit has been packaged into a 8" x 12" x 9" high aluminum enclosure. Material cost is about $400 excluding the optional teletype machine which may be purchased for approx. $800.

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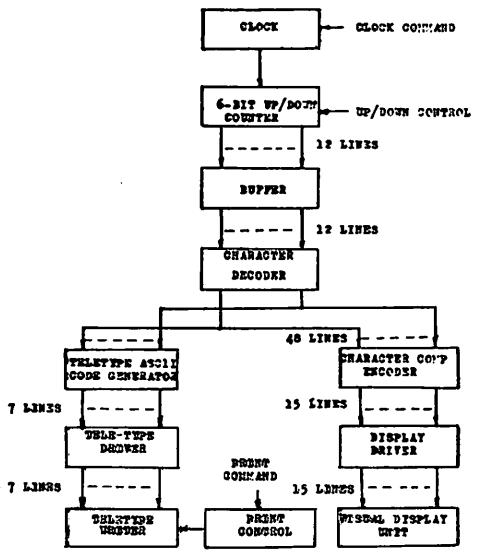

Fig. 1: The Block Diagram of the Typewriting System

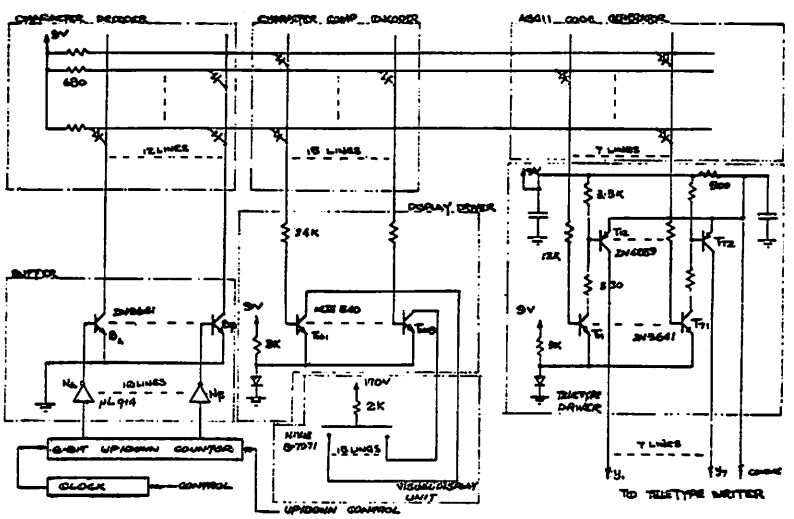

Fig. 2: Circuitry of the Typewriting System