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CIRCUIT ARRANGEMENT FOR CHECKING THE FAULTLESS TRANSMISSION OF TELEPRINTING CHARACTERS

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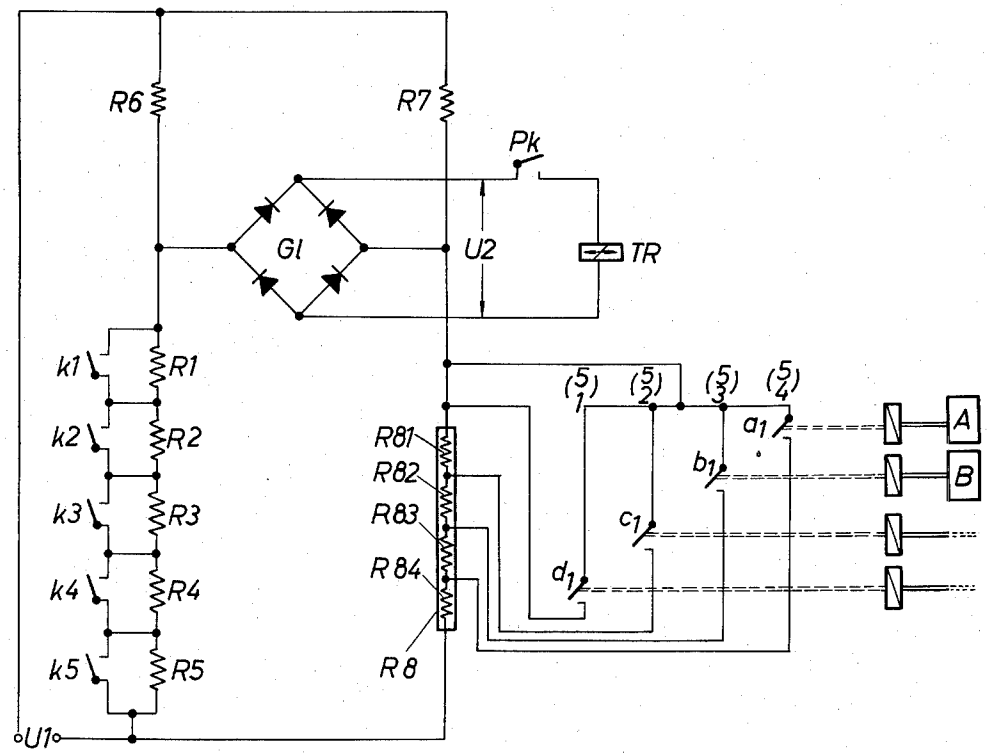

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CIRCUIT ARRANGEMENT FOR CHECKING THE FAULTLESS TRANSMISSION OF TELEPRINTING CHARACTERS

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This invention relates to a circuit arrangement for checking the faultless transmission of teleprinter characters, in particular for the use in the data processing field.

The checking of the faultless transmission has become of particular importance in the data processing field, because in many applications the processing results are not only supposed to be printed out or perforated into punched cards, but also electrically transmitted over greater distances. For the transmission there are generally used the well known teleprinting apparatus. To this end the data processing results have to be punched into a perforated tape from which the informations are transmitted. At the receiving station the arriving pulses are again fed to a data processing machine and are printed, perforated or otherwise recorded by this machine. It is also possible however, for the purpose of effecting the electrical transmission, to take the necessary pulses directly from the data processing machine.

It is obvious that the transmission of the informations from one data processing machine to the other one has to be carried out if possible in a faultless manner, because any faulty transmission may be entailed by serious consequences. At the transmission of an ordinary text by teleprinters the faulty transmission of one or more letters is in most cases not regarded as being so very serious, because the correct letters may easily be inserted according to the sense. In the case of accounting processes there are transmitted mostly only figures (such as abstract of accounts) which have to be transmitted in an absolutely correct manner. To this end, for the transmission of accounting processes there is not used the international teleprinting code, but for the figures and any possible additionally occurring functional signs there are selected from such a code the combinations which are capable of being tested. For the ten figures 0 . . . 9 there may be selected e.g. the "2 out of 5" code combinations, i.e., the signals comprising two "current" and three "no current" signal elements, providing altogether ten possibilities. A signal arriving over the transmission line, or perforated in a perforated tape may now be easily checked with respect to its accuracy, by determining whether two and only two signal elements are of the "current" type.

If the transmission of figures is not sufficient, in other words, if still other functional signals consisting of letters are supposed to be transmitted then it is possible to select for this purpose the "3 out of 5" code combinations of the teleprinting code, which are likewise capable of being checked and also provide ten possibilities.

For the transmission of the characters they are punched at the transmitting station into a perforated tape and the holes are examined in the course of the faulting process. For this checking purpose a circuit arrangement has become known, which is substantially constructed as a Wheatstone bridge and is fed at one diagonal with a constant voltage U_1. Whenever the bridge is not in the balanced state it will be possible to take off at the other diagonal a voltage U_2. The voltage U_2 is supposed to appear i.e., supposed to appear only when, for instance, in

the "2 out of 5" code either more or less than two holes are being punched into the tape. The voltage U_2 is in such cases used for effecting an alarm.

In this conventional arrangement it is only possible to check one code. For business machine purposes, however, it is often required that a second and in some cases also a third code has to be transmitted and, consequently, also to be checked.

In this case it would be necessary to provide several of the conventional bridge circuits and, if so required, a switching-over would have to be carried out from the one to the other bridge circuit. Besides the costly arrangement, the switching-over would be entailed by considerable difficulties, because the codes, as a rule, are often changed arbitrarily.

It therefore, is the object of the present invention to provide a bridge circuit which is capable of selectively checking all of the employed codes. Furthermore the bridge circuit is supposed to be capable of being automatically switched over from one to another code.

The present invention relates to a circuit arrangement for checking the fautless transmission of different kinds of codes, especially when employed in the data processing field, in which as a checking element there is used a Wheatstone bridge circuit, in the one branch of which there is arranged a step-by-step resistance, the number of steps of which depends upon the number of code elements, and the steps of which are capable of being bridged by contacts actuated by the perforating needles or any other coding devices. This bridge circuit being employed in such a way that to the one diagonal thereof there is applied a constant voltage U_1, and from the second diagonal of which there may be taken a testing voltage for the controlling of alarm systems, and which testing voltage will be produced, i.e., will only be produced in the case when more of less steps are bridged than correspond to the code employed.

According to the invention there is provided in a second branch of the said bridge circuit a resistance which, in dependency upon the employed code, is variable in a step-by-step manner and which permits the selective checking of different codes in the same bridge circuit.

The switching-over may be effected by means of a switch actuated in accordance with the employed code. The controlling of the switch may be effected by the transmitting machine itself when provisions are made that the characters associated with one code will arrive from one certain machine, respectively from one certain part of a machine. In the case of data processing machines there may be fundamentally distinguished between three parts from which the characters to be transmitted will arrive, namely, firstly from the figure keyboard or the printing mechanism, secondly from the programming bar determining the carriage positions, and thirdly from different other parts of the machine adapted to transmit some sorts of functional characters.

According to a further embodiment of the invention, therefore, in such kinds of machines the symbols to be transmitted are assembled to groups of symbols for figures, carriage positions, and other functions, and to each group of symbols there are assigned groups of teleprinter signals of the self-checking type. Then the transmitting part of the machine may be used as a switch-over indication or criterion for the variable resistance.

The controlling of the switch may also be accomplished by means of special function signals which are inserted between the different groups of symbols.

In the following the invention will now be described by way of example with reference to the copending drawing. As an example there is chosen a data processing machine which is equipped with a perforating attachment

and the informations of which are supported to be checked with respect to the proper perforation.

In the drawing there is shown a Wheatstone bridge circuit. The resistors R_1 through R_5, which are capable of being bridged, constitute the first branch of the bridge circuit, R_6 the second branch R_7 the third branch, while voltage divider R_8 is associated with the fourth branch. To the one diagonal of the bridge circuit there is applied the constant voltage U_1. Whenever the bridge circuit is not in the state of equilibrium a voltage U_2 will appear at the other diagonal over the rectifier G_1. The voltage U_2 is always supposed to appear when of the five contacts k_1–k_5 attached to the perforating needles of the perforator there are closed either less or more contacts than corresponds to the code employed. Accordingly, in the case of figures for which, in accordance with one feature of the invention, the "2 out of 5" code signals are supposed to be used for the transmission, there is supposed to appear a voltage U_2 whenever either less or more than two contacts are closed. However, if two contacts are closed then the bridge will be in the state of equilibrium. In order to achieve this behaviour there is provided in the first branch of the bridge circuit a step-by-step resistance with the identical resistors R_1 through R_5, which are respectively capable of being bridged by one of the make contacts k_1–k_5. If the voltage divider R_8 has a fixed value then the bridge circuit is only suitable for checking one code, e.g. the "2 out of 5" code. According to the invention, however, this voltage divider R_8 is split into equal bridgeable partial resistances, which are capable of being bridged at will by the switch S. These partial resistances R_{81} . . . R_{84} have the same resistance values as the resistances R_1 . . . R_5.

For transmitting the character perforations of the "2 out of 5" code the switch S will have to be brought into the position

$$\binom{5}{2}$$

so that the partial resistance R_{81} will be bridged. Upon actuation of the perforating needles always two of the contacts k_1–k_5 will be closed. During the time of closure of these contacts there is actuated the test key P*k*, causing the telegraph relay TR to be applied to the output voltage of the rectifier G*l*. This telegraph relay TR serves the actuation of some sort of alarm system, for example, the data processing machine may be blocked until the perforation has been corrected. Instead of the telegraph relay there may also be connected another kind of trigger arrangement, such as a flip-flop or thyratron.

Whenever the code is changed, because e.g. instead of the figures in the "2 out of 5" code, letters are supposed to be transmitted as function characters in the "3 out of 5" code then the switch S will have to be brought into the position

$$\binom{5}{3}$$

In this case, at a proper transmission, always three of the contacts k_1 . . . k_5 have to be closed. The actuation of the switch, respectively the setting of the switch S is effected automatically by the data processing machine. As a switching criterion there may be used e.g. the different origin of the characters from the data processing machine. Thus, the figures represented in the "2 out of 5" code originated e.g. with the part A of the machine, whereas the function characters represented in the "3 out of 5" code can only come from the part B. Accordingly, if part B is put into operation and the code is changed correspondingly then this may be utilized as a switching criterion for the switch S.

On the other hand, of course, it is also possible to insert at the changing of the code a special function character adapted to cause the corresponding switchover. The latter possibility will e.g. be necessary when the characters are transmitted over a relatively long one-way channel and when it is impossible to distinguish at the receiving station with that part of the transmitting machine the characters originate.

The employment of a bridge circuit for this checking purpose is in no way bound to a five-unit code but, when correspondingly modified, the bridge circuit may also be used e.g. for a "3 out of 7" code. Furthermore the inventive circuit arrangement is not only suitable for employment in cases where the tapes are perforated by business machines, but in the general teleprinting field, as far as only characters or respectively groups of characters are employed which are capable of being tested.

While we have described above the principles of our invention in connection with specific apparatus, it is to be clearly understood that this description is made only by way of example and not as a limitation to the scope of our invention as set forth in the objects thereof and in the accompanying claims.

What is claimed is:

1. In a circuit arrangement for checking the accuracy of transmission of teleprinter code signal combinations, a constant voltage power source and first and second parallel circuit branches connected thereacross, the first circuit branch including a plurality of first impedance elements connected in series with a first equalizing impedance and the second circuit branch including a plurality of second impedance elements connected in series with a second equalizing impedance, means for shunting respective ones of said first impedance elements, said first impedance elements and associated shunting means corresponding respectively to the signals in a teleprinter code signal combination, code selecting means, means for operating said code-selecting means to shunt any predetermined number of said second impedance elements to provide a predetermined impedance in said second branch, means responsive to the transmission of any said code signal combination for operating the respectively corresponding first-element shunting means to provide a corresponding reduced impedance in said first branch, and detector means connected between the junction of the first impedance elements and the equalizing impedance of the first branch and the junction of the second impedance elements and the equalizing impedance of the second branch for providing an output indication responsive to the reduced impedance of the first branch being different than the predetermined impedance of the second branch.

2. A circuit arrangement according to claim 1 wherein the plurality of said first impedancce elements are connected in series relationship in said first branch and wherein the said plurality of second impedance elements are connected in series relationship in said second branch.

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