Feb. 11, 1958 A. H. FAULKNER 2,822,982

CODE TRANSLATING SYSTEM

Filed June 21, 1954 3 Sheets-Sheet 1

FIG. 1

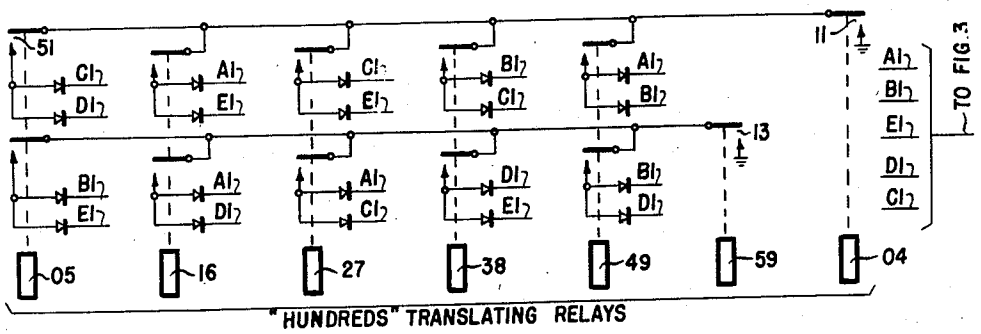
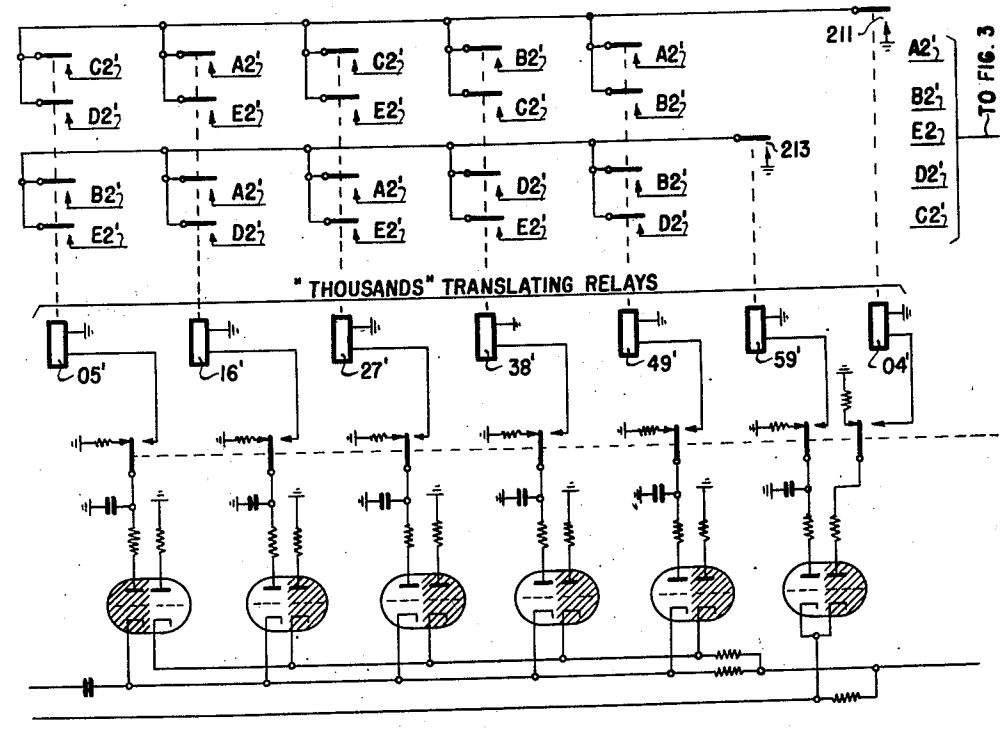


FIG. 2



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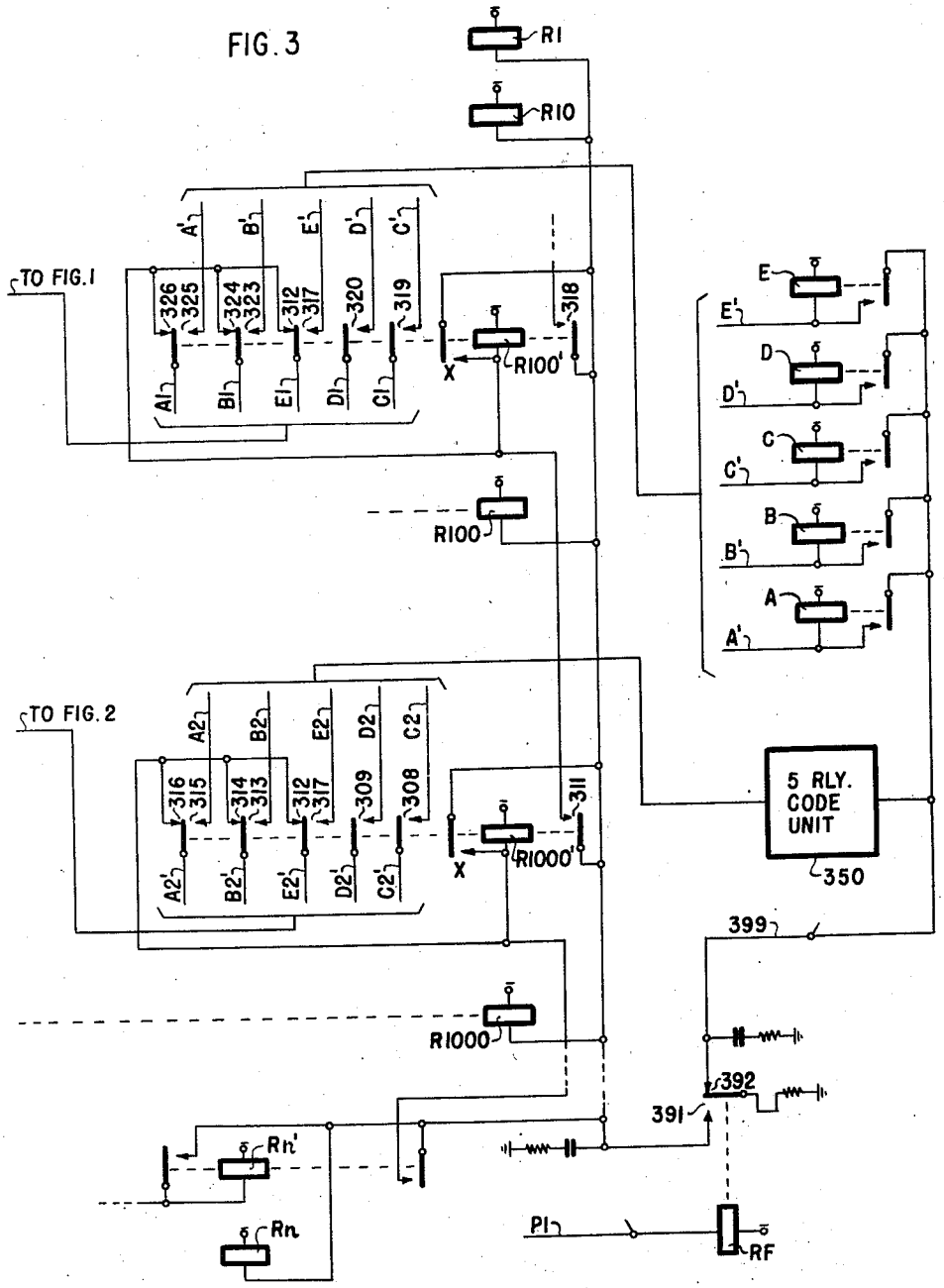
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FIG. 3



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FIG. 3A

DIGIT	RELAYS A	B	C	D	E	LAMPS LIST 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
1	X				X			X				X				X				X				X				X	
2			X		X		X	X		X			X			X			X			X				X	X	X
3		X	X				X	X	X					X		X					X	X				X	X	X	
4	X	X						X		X		X		X		X		X			X	X		X		X		X	
5		X			X		X	X	X		X				X	X					X	X				X	X	X	
6	X			X			X	X		X	X			X	X	X					X	X				X	X	X	
7			X	X				X	X	X						X			X										
8			X		X		X	X		X			X	X	X	X		X			X	X				X	X	X	
9		X		X				X	X	X	X			X	X			X			X								
0			X	X			X	X			X			X		X	X				X	X					X	X	

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2,822,982

CODE TRANSLATING SYSTEM

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Application June 21, 1954, Serial No. 438,099

9 Claims. (Cl. 235—92)

The present invention relates in general to a code translating system and more particularly to a code translating system wherein a count registered in an electronic counter is translated by first operating relays corresponding to the count registered in the counter and in turn using these operated relays to control a group of display panel control relays of a standard arrangement, such as disclosed in Patent No. 2,121,164, issued to Robinson on June 21, 1938, for controlling lamps in a display panel to form a readable digit configuration corresponding to the count registered in said counter.

One well-known place where display panels are utilized is at race tracks where the values involved must be indicated by numerical or digit configurations. The display panels are generally composed of lights controlled by a corresponding number of standard groups of five code relays. The lights of each panel are lighted in accordance with what particular two relays of each group of five code relays are operated and each group of five code relays and a panel of twenty-four lights individually associated therewith are used for indicating one digit. Such an arrangement is disclosed in the aforementioned patent wherein each group of five code relays is in turn controlled from electrical switching and counting apparatus used for initially registering the values involved.

Electronic arrangements of the type disclosed in my co-pending application, Serial No. 425,070, filed April 23, 1954, proposed for supplanting electrical switching and counting apparatus provide some of the problems which the present invention is designed to overcome. The problems arise because the electronic counting circuits are not very adaptable to directly operate such a five relay code combination nor can a readable digit configuration be easily formed directly from relays immediately associated with the plate circuits of the tubes of the electronic counting apparatus as a large number of contacts must necessarily be closed by these relays to translate the value registered in the counting apparatus into a readable digit configuration in a light panel. The latter provision requires relays using a comparatively large amount of power in conjunction with the tubes, which is not a desirable condition.

Therefore the present invention has as its objective the provision of a simplified arrangement for the translation of values registered in an electronic counter into the proper code for registering said values in the standard five relay code arrangement such as shown in the aforementioned patent. Thus as electronic counters for totalling values based on a decimal system using the number ten, usually comprise a number of scale of five counters and a number of scale of two counters, each counting circuit comprising a combination of one scale of five counter and one scale of two counter for registering values between 0–10, 10–100, etc., respectively, a total of seven relays

must be provided for each scale of five and scale of two counter combination, any certain two of which are operated to form different digit configurations. An arrangement of the described type is shown in the aforementioned Faulkner application. In that application a light panel of twenty-four lights is associated with each group of seven relays and each digit is formed in its respective light panel by lighting appropriate lights. As the configurations must be changed from time to time, the counting circuits are periodically rendered ineffective to register values while the already registered values are transferred to the light panels. If zero is registered in a particular scale of five and scale of two counter combination, no lights are lighted in the associated display panel unless any one of the higher valued combinations has some value other than zero registered therein. The described arrangement of course requires a large number of contacts to be operated by each plate circuit relay to form a digit in its associated light panel.

In the present invention each group of seven plate circuit or translating relays, instead of controlling the lights of its associated panel directly, control circuits for operating the desired relays of a standard group of five code relays associated therewith for the purpose of controlling the lights of an associated panel in the manner described in said patent.

One embodiment of the present invention and one modification thereof are discussed herein but for the purposes of brevity the two will be described together as cooperating with an electronic counter comprising a number of counting circuits of the type described. The embodiment discussed in conjunction with the hundreds counting circuit utilizes only two contacts per each translating relay and unidirectional circuits for controlling its associated five relay group while the modification thereof described in conjunction with the thousands counting circuit utilizes four contacts per translating relay to control its associated five relay group. The first arrangement permits of the use of only 150 ampere turns per translating relay as only two contacts at most per relay are operated while the second permits of the use of only 200 ampere turns per translating relay as only four contacts at most per relay are operated. By limiting the number of contacts operated per relay a comparatively low impedance 150 or 200 ampere turn relay may be used in the respective plate circuits of the counting tubes. The term, ampere turns, is used as a convenient designation of power, and specifically refers to the number of turns or windings multiplied by the amperage of the current passing through the turns. Either arrangement may of course be used in conjunction with all the counting circuits. The present invention also enables a simple control arrangement to be provided for controlling the display both for direct translation of values to the display panel and in the case where zero is registered in one counting circuit and another value is registered in a higher valued counting circuit.

Fig. 1 is an embodiment of the present invention showing a group of seven plate circuit relays of the hundreds counting circuit and the circuits to be controlled thereby.

Fig. 2 is a modification of the present invention shown in conjunction with the thousands counting circuit.

Fig. 3 shows the control relays associated with each counting circuit for the different order of digits and the relays for operating the lights of one light panel to form the digits.

Fig. 3*a* is a code chart showing the various lights operated by different combinations of relays of the five relay code and the various relays of the five operated for forming each digit.

In the instant invention only one relay is necessary to initiate the transfer of values registered in the counting circuits to the light panels and it is operated at 90 second intervals by a ground pulse over lead **P1** in any well-known manner. Also each counting circuit has a pair of control relays associated therewith and one control relay of each pair is operated on operation of the first operated relay. At the same time the first relay removes ground from the locking circuits of the five code relays to enable them to release and extinguish any digit configurations in the light panels.

For example, in Fig. 3 relays R*l*—R*n* are operated when relay RF closes contact **391** on arrival of the ground pulse at the end of a 90 second period. One control relay associated with each counting circuit, such as **R1**, **R10**, **R100**, **R1000**, etc., are operated and each transfers the left anodes of all of the tubes and the right anode of the last tube of its associated counting circuit from resistance ground to ground through the translating relays as shown in Fig. 2. In Fig. 2, only, I have shown the tubes of the counting circuit of said prior application in order to illustrate the circuits of the relays in the plate circuits thereof. These tubes are omitted in Fig. 1 but are understood to control the relays in the same manner as in Fig. 2. Assume that a particular two of the translating relays of each counting circuit are now operated, in accordance with the code described in the aforementioned application, from the associated conductive triodes of the counting circuit. If translating relays **04** and **05** (Fig. 1), associated with the hundreds counting circuit, are operated the count in that circuit is equal to zero and ground is applied from contacts **11** through contacts **51**, through rectifiers associated therewith over leads **D1** and **C1** respectively to the open contacts **320** and **319** respectively of control relay **R100'**. If the translating relays, associated with the thousands counting circuit, which are operated when the plate circuits were transferred to ground through the relays do not correspond to zero, ground is applied from leads **A2'**, **B2'** or **E2'** and contacts **316**, **314** or **312** respectively to energize relays **R1000'** sufficiently for it to close its X contacts to complete a circuit for fully energizing itself over contacts **391**. Contacts **311** are closed to complete a circuit for relay **R100'**, which locks up over its X contacts and contacts **391**. It closes contacts **320** and **319** to forward ground over leads **D'** and **C'** respectively to operate the relays D and C of the aforementioned five code relay which will give a digit configuration in the light panel associated therewith for indicating zero in the hundreds display panel. Also **R100'** closes a circuit at contacts **318** for a corresponding relay **R10'** (not shown) so that if its associated counting circuit has registered a zero, it may be indicated in its display panel. Relay **R10'** also performs the same function for relay **R1'** (not shown) and the units display panel if zero is registered in the units counting circuit. Higher valued counting circuits are arranged to operate **R1000'** in the same manner as just described for operating lower valued similar relays so that a zero configuration is formed in the associated light panel. It will be noted that if the thousands counting circuit has zero registered therein only relays **05'** and **04'** are operated and relay **R1000'** cannot be operated to in turn operate relay **R100'** except by the corresponding control relays of higher valued circuits. Therefore, only if a registration has been made in a higher valued circuit does the light panel associated with a lower valued counting circuit having a zero registration display a zero.

In accordance with the code described in the aforementioned application, the translating relays are operated as shown in the following chart and the corresponding leads which are grounded in both the embodiment and the modification thereof are indicated therein. As corresponding translating relays are operated for all counting circuits for any particular digit only the hundreds

counting circuit translating relays are indicated in the chart.

Digits	Relays	Fig. 1	Fig. 2
0	05 and 04	C1 and D1	C2' and D2'
1	16 and 04	A1 and E1	A2' and E2'
2	27 and 04	C1 and E1	C2' and E2'
3	38 and 04	B1 and C1	B2' and C2'
4	49 and 04	A1 and B1	A2' and B2'
5	05 and 59	B1 and E1	B2' and E2'
6	16 and 59	A1 and D1	A2' and D2'
7	27 and 59	A1 and C1	A2' and C2'
8	38 and 59	D1 and E1	D2' and E2'
9	49 and 59	B1 and D1	B2' and D2'

Assuming now that relay **R100** operates as before described and the count registered in the associated counting circuit is other than zero. Two certain translating relays other than **05** and **04** are operated together to forward ground from contacts **11** or **13**, the contacts of the other operated translating relay and its associated rectifiers to the contacts of relay **R100'**. Thus ground is forwarded over contacts **326**, **324** or **322** to energize relay **R100'** sufficiently to operate its X contacts and close a circuit for fully energizing itself over contacts **391**. Contacts **325**, **323**, **321**, **320**, **319** and **318** are closed. Contacts **318** on closing complete a circuit for relay **R10'** (not shown) for a purpose already described, although relay **R10'** may already be operated in a manner similar to relay **R100'**.

Ground is now forwarded from the particular grounded leads in the embodiment shown in Fig. 1, their respective contacts of relay **R100'**, and their respective leads A', B', C', D' and E' to operate two of the five code relays A, B, C, D and E in accordance with the chart shown in Fig. 3*a* to light corresponding lamps for displaying the proper digit indication in the light panel (not shown).

At the end of the ground pulse on lead **P1**, relay RF releases and contacts **391** open to restore all the control relays, which in turn open all their contacts to release the translating relays and also open the original operating circuits for the code relays. When relay RF releases, ground is applied to locking lead **399** at contacts **392** and a locking circuit is completed for the code relays, before their original operating circuits are opened, over their respective locking contacts to maintain the proper lamps lighted. As the actual time interval between the opening of contacts **391** and the closing of contacts **392** is extremely short none of the operated relays of the five relay code unit falls back during the interval. In addition it may be noted that the control relays such as **R1000** and **R1000'** must restore to enable the restoration of the translating relays before any relay in the five relay code unit can even begin to restore. Therefore practically no opportunity exists for enabling the relays of the code unit to restore, and if the situation requires, the code unit relays can be made slightly slow-to-release to ensure their being held operated during the interval between the opening of contacts **391** and the closing of contacts **392**.

A count registered in the thousands counting circuit is translated on operation of relay **R1000'** in the same manner with the exception that rectifiers are not provided in the circuits to the five code relays and therefore the translating relays **05'**, **16'**, **27'**, **38'** and **49'** must each operate four make contacts to transfer ground from either contacts **211** or **213**, through two of the make contacts of the operated translating relay to a particular two of leads **A2'**, **B2'**, **C2'**, **D2'** or **E2'**, the respective contacts of relay **R1000'** (operated in a manner similar to that previously described), and the respective leads **A2**, **B2**, **C2**, **D2** and **E2** to relays corresponding to A, B, C and D in the five relay code unit **350** for operating them in accordance with the chart shown in Fig. 3*a* so that the proper digit configuration is displayed in the associated display panel. The operated code relays are held op-

erated and the control relays released as previously described at the end of the ground pulse to relay RF.

Thus having described my invention I am appending hereto claims to the subject matter I consider patentable.

What is claimed is:

1. A code translating system for operating an indicating means in accordance with a value registered in an electronic counting circuit having a plurality of electronic valves, comprising means individually associated with certain of said valves and operated by its associated valve if its associated valve is conditioned in accordance with the value registered in said circuit, a group of five relays, certain of which relays correspond to the value registered in said counting circuit, said certain relays operated by said operated means for operating said indicating means to indicate a value corresponding to that registered in said circuit.

2. A system such as claimed in claim 1, in which a pair of control relays are associated with said counting circuit, means operated at a predetermined time for activating one relay of said pair of control relays to associate the valve operated means of said counting circuit with the other control relay, the other control relay operated thereafter by an associated valve operated means if a predetermined value is registered in its associated counting circuit to thereby enable the operation of the corresponding relays of said group of five relays, said other control relay unoperated by an associated valve operated means if another predetermined value is registered in its associated circuit.

3. In a system such as claimed in claim 2, means associated with another counting circuit and operated by an associated other control relay if a predetermined value is registered in said other counting circuit for operating said other control relay associated with the first counting circuit if said other predetermined value is registered in its associated counting circuit to thereby enable the operation of the corresponding relays of said group of five relays.

4. A code translating system for an electronic counting circuit including electronic valves and having indicating means associated therewith to indicate a count corresponding to that registered in said counting circuit comprising, translating means individually associated with certain of said valves and operated by the associated valves when conditioned in accordance with a count in said circuit, a group of relays arranged so that different ones thereof correspond to each different count registered in said circuit, circuits completed by operated ones of said translating means to the different ones of said relays that correspond to the count in said counting circuit, the different ones of said relays operated by said completed circuits to operate said indicating means for indicating said count.

5. A code translating system for an electronic counting circuit including electronic valves and having indicating means associated therewith to indicate a count corresponding to that registered in said counting circuit, comprising a first group of relays individually associated with certain of said valves, a different combination of said relays operated by the associated valves of said circuit for each different count registered in said counting circuit, a group of five relays, and individually corresponding circuits completed by each different operated combination of said first relays for operating an individual corresponding combination of several of said five relays to thereby operate said indicating means to indicate a count corresponding to that registered in said counting circuit.

6. In a system such as claimed in claim 5, means operable at predetermined times for controlling the valves of said counting circuit to operate a combination of said first group of relays, and means associated with said counting circuit and operated by said combination of said first group of relays if a predetermined count is registered in said counting circuit for enabling said relays to complete said individually corresponding circuits and unoperated by said relays if another predetermined count is registered in said circuit to thereby prevent completion of the corresponding circuits.

7. A code translating system for an electronic counting circuit including a scale of five counter and a scale of two counter and having an indicating means associated therewith to indicate a count corresponding to that registered in said counting circuit, a group of five relays associated with said scale of five counter, a group of two relays associated with said scale of two counter, a particular one of said first group and a particular one of said second group operated by its associated counter dependent on the count registered in said counting circuit, a third group of relays, and circuits completed by said operated relays for operating a particular combination of relays of said last group dependent on which particular ones of the first two groups of relays are operated to thereby operate said indicating means to indicate a count corresponding to the count registered in said counting circuit.

8. In a code translating system having a plurality of electronic counting circuits each having an indicating means individually associated therewith for indicating the value registered in its associated counting circuit, a plurality of relays associated with each circuit, means operable at a predetermined time for operating one of said relays, and control means associated with each circuit for operating another of said associated relays only if any one of a plurality of predetermined values is registered in its associated circuit to enable said control means to operate the indicating means individually associated with the counting circuit to indicate the value registered in its associated counting circuit.

9. A system such as claimed in claim 8, in which the other relay associated with one counting circuit is unoperated by said associated means if another predetermined value is registered in said circuit to prevent operation of said indicating means, and means associated with the other relay of another counting circuit and operated thereby if a predetermined value is registered in said other counting circuit for operating said other relay associated with said one counting circuit to enable said control means to operate said indicating means to indicate said other predetermined value.

References Cited in the file of this patent

UNITED STATES PATENTS

2,121,164	Robinson	June 21, 1938
2,528,394	Sharpless et al.	Oct. 31, 1950
2,563,102	Crosman et al.	Aug. 7, 1951