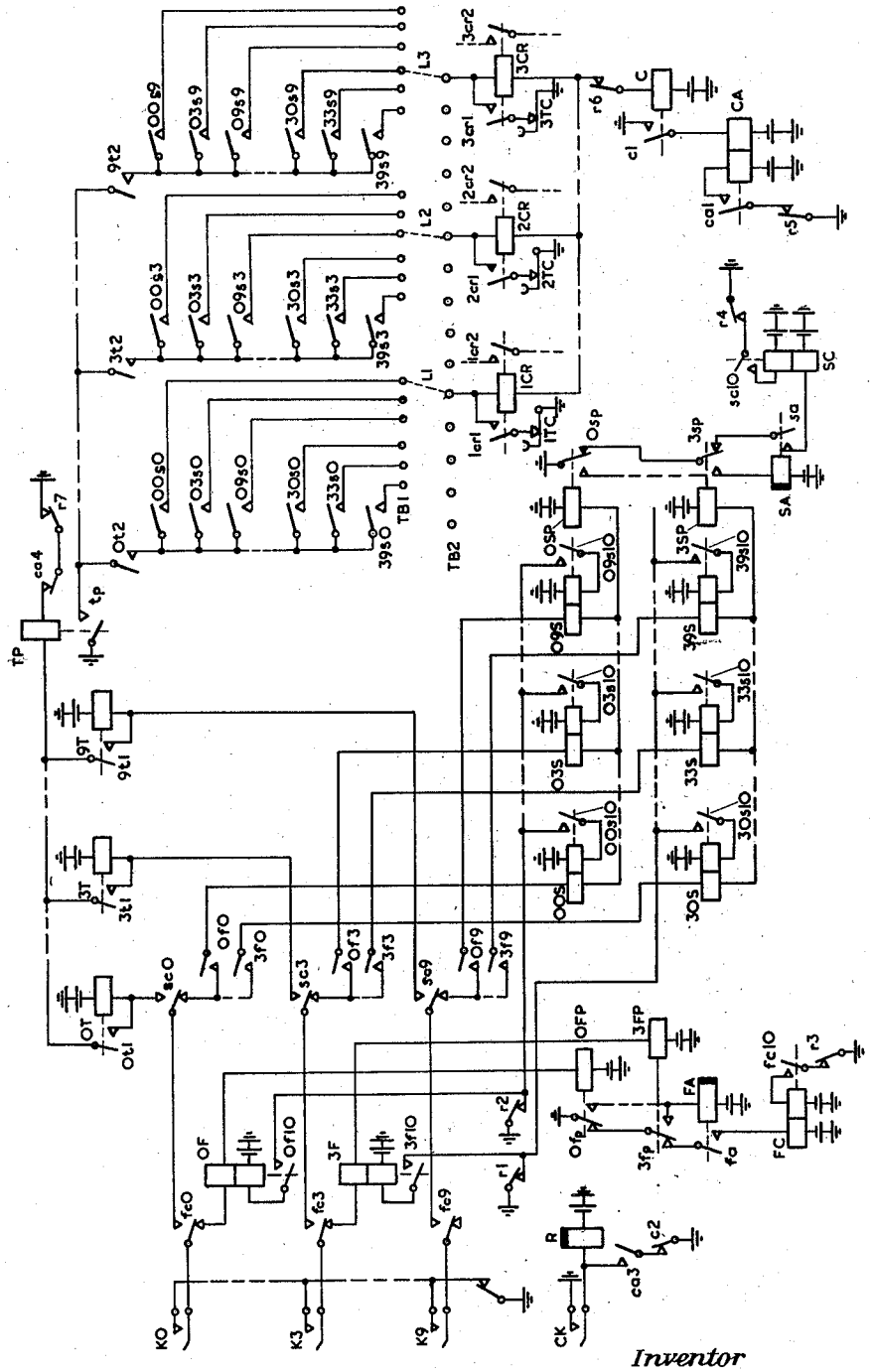
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SELECTION CIRCUITS

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SELECTION CIRCUITS

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The invention relates to selection circuits and more particularly to electrical circuits for the selective operation of any one of a plurality of devices.

Many selection circuits are known especially in the automatic telephone field which enable a selective operation of any one of a plurality of devices. In such circuit arrangements dials and rotary switches are used for selection. Although such systems are very suitable for the selective connection of individual subscribers, they have disadvantages when used for the selection of a plurality of devices from a few fixed operator's positions as for example in article dispensing systems.

In such systems articles of various kinds and/or values are stored in such a way that they can be released in quick succession by devices selectively operated from an operator's position. These systems will hardly exceed more than one thousand different items, so that three digit codes or stock numbers (000 to 999) will be sufficient to identify each kind of article.

Hitherto dial operated rotary switches have been used for this purpose, but these arrangements have the disadvantage that the operation of a dial in quick succession is very inconvenient and slow and that furthermore rotary switches are comparatively costly for such systems. Other systems are known, which make use of keyboards in which ten keys are provided for each digit to select a wanted article via a relay circuit arrangement. These systems, however, need thirty keys for the selection of one thousand different items and thus the keyboard becomes rather big and unsuitable for quick operation.

The abovementioned disadvantages are overcome according to the invention by an electrical selection circuit arrangement for the selective operation according to three-digit coded designations comprising a set of key actuated contact members, a first digit relay group, a plurality of second digit relay groups and a third digit relay group. The first digit relay group, each of the second digit relay groups and the third digit relay group includes one relay for each corresponding digit appearing in the code and one second digit relay group is provided for each first digit in this code. The selective devices are connected with corresponding contacts of relays of the second digit relay groups and operated by the joint operation of these contacts with contacts of relays of the third digit relay group.

According to a further feature of the invention ten keys are provided for the keyset corresponding to the figures 0 to 9 and accordingly each relay group includes ten relays representing the digits 0 to 9 in each group.

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It is another feature of the invention to interpose a jumpering frame between the relay contacts of the second digit relay groups and the selective devices operable thereby to facilitate changes between the selective devices and their codes for example in cases where articles to be dispensed are changed from one device to another without altering their code.

These and further features of the invention will be more clearly understood from the following description in connection with the drawing showing one example of the invention.

The selection circuit arrangement shown in the drawing is applied to an article dispensing system in which each kind of article, stored in a corresponding storage bin, is designated by a three-digit code. The relays and their contacts are shown in accordance with the detached contact method whereby the contacts are not necessarily shown next to their corresponding relays but at the place where they are used in the circuit, thus simplifying the circuit diagram. The relays are marked with capital letters and corresponding contacts are marked with the same small letters and an additional figure distinguishing the various contacts of the same relay. Where a plurality of identical relay circuits are used only some of the circuits are shown, but the relays are distinguished by an additional figure in front of the relay designation. To indicate that ten keys and ten relays in each digit relay group are used the keys and relays corresponding to the digits 0, 3 and 9 and the corresponding circuits are shown, the keys and relays for the other digits being arranged in identical manner.

In the example shown provision is made for the selection of four hundred different kinds of articles (code 000 to 399) and thus the first digit relay group consists of four relays only and four second digit relay groups are provided. It must be understood however that for the selection of one thousand items (code 000 to 999) ten relays in the first digit relay group and ten second digit relay groups would be necessary.

Before describing the operation of the circuit in detail, a general description of the functions of the various parts is given hereafter.

In the drawing the operator's position consists of a row of ten keys K0 . . . K3 . . . K9 which are used to key up the various digits of the code designating a particular kind of article.

The operator's position furthermore comprises

a "cancel" key CK which is operated whenever one of the keys K0 to K9 has been wrongly pressed or when a storage bin is empty. Key CK energizes a release relay R to restore all circuits back to normal.

The keys K0 to K3 are connected with the relay 0F to 3F, having contacts 0*f*0 . . . 0*f*10 and 3*f*0 . . . 3*f*10 respectively, of the first digit relay group. As mentioned before only four hundred items have to be selected and thus no first digit relays are provided for the keys K4 to K9. Each of the relays is operated over an individual pilot relay 0FP to 3FP (with contacts 0*fp* to 3*fp*) so that, if for example a fuse blows, only one of the first digit relays is out of order. The pilot relays operate the auxiliary slow release relay FA which over its contact *fa* prepares a circuit for the first digit changeover relay FC with contacts *fc*0 to *fc*10. This relay operates as soon as the operator has released the key pressed for the selection of the first digit of the stock number. The FC relay switches the connection from the keys K0 to K9 over to one of the second digit relay groups, in accordance with the first digit selected before. One second digit relay group corresponds with one of the first digit relays. Each of the second digit relay groups consists of ten relays and a pilot relay. Two of these relay groups (the first group and the fourth group) are shown in the drawing, the first group consisting of the ten relays 00S . . . 03S . . . 09S with contacts 00*s*0 to 00*s*10; 03*s*0 to 03*s*10; 09*s*0 to 09*s*10 respectively and the fourth group consisting of the ten relays 30S . . . 33S . . . 39S with contacts 30*s*0 to 30*s*10; 33*s*0 to 33*s*10; 39*s*0 to 39*s*10 respectively. The contacts 00*s*0 to 00*s*9; 03*s*0 to 03*s*9; 09*s*0 to 09*s*9 of the first group and the corresponding contacts of all the other second digit relay groups are connected with individual terminals TB1 of a jumpering frame, while other terminals TB2 of the jumpering frame are connected with the CR relays which initiate the release of the various articles from their respective storage bins. Three of these relays (1CR, 2CR, 3CR) are shown only, but for each storage bin one CR relay is connected with one of the terminals TB2 of the jumpering frame. By connecting the various terminals TB1 with the terminals TB2 as shown by the dotted leads L1, L2, L3 any one of the CR relays can be related to one of the coded designations thus making the code independent of the actual position of the article in the storage arrangement. In this way it is possible to rearrange the articles in the storage bins without altering their code. Furthermore coded designations can be reserved for various kinds of articles, which will be added later to the stock.

The pilot relays 0SP to 3SP with contacts 0*cp* to 3*sp* for the second digit relay groups fulfil the same functions as the pilot relays 0FP to 3FP of the first digit relay group. An auxiliary slow release relay SA operated by one of the pilot relays 0SP to 3SP prepares over its contact *sa* a circuit for changeover relay SC with its contacts *sc*0 to *sc*10.

When the operator releases its key again the relay SC switches the circuit from the keys K0 to K9 over to the third digit relay group with the relays 0T . . . 3T . . . 9T. According to the key pressed for the third digit selection one of the relays 0T . . . 3T . . . 9T is energized and closes the contacts 0*t*1, 0*t*2 . . . 3*t*1, 3*t*2 . . . 9*t*1, 9*t*2 respectively. A third digit pilot relay TP then operates its contact *tp* and thus completes a circuit over one of the closed contacts of the third digit relays and one of the contacts of a second digit relay to one of the terinals TB1 and from there over one of the leads (L1, L2, L3) and one of the terminals TB2 to one of the CR relays thus initiating over one of its contacts the release of a particular article from its storage bin.

The CR relays are energized via a control relay C which in turn operates over its contact *c1* the auxiliary relay CA. When one of the relays 1CR, 2CR, 3CR is energized it closes its contact 1*cr*2, 2*cr*2 or 3*cr*2 and operates a magnet, a clutch or any other device which releases an article from its storage bin. Over the contact 1*cr*1, 2*cr*1, 3*cr*1 respectively a locking circuit is closed for the respective CR relay over a trip contact (1TC, 2TC, 3TC) which is temporarily interrupted when an article falls out of a bin. This interruption of the circuit releases the energized CR relay and the C relay. Over the contact *c*2 and the contact *ca*3 of the energized relay CA the release relay R will operate and at its contacts *r*1 to *r*7 will break all the locking circuits for the various relays thus restoring all circuits to noral. At contact *r*5 the circuit for the CA relay is broken so that this relay in turn interrupts the circuit for relay R at contact *ca*3. The relay R is a slow release relay to ensure that all relays have been restored to normal before the relay R closes again its contacts *r*1 to *r*7.

The operation of the circuit arrangement will hereafter be described in detail in connection with the selection of an article with the coded designation 309.

The operator presses first the key K3 and thus establishes a circuit from earth over contact *ca*2, key K3, contact *fc*3, one winding of relay 3F, relay 3FP to battery. The relay 3F closes its contacts 3*f*0 to 3*f*10 and over contact 3*f*10 closes a locking circuit from battery over the second winding of relay 3F, contact 3*f*10, contact *r*1 to earth. The contacts 3*f*0 to 3*f*9 prepare circuits for the relays of the fourth second digit relay group with the relays 30S . . . 33S . . . 39S. The relay 3FP energizes the relay FA from earth over contact 0*fp*, operated contact 3*fp*, relay FA to battery and this relay prepares over contact *fa* a circuit for the relay FC.

When the operator releases key K3, the relay 3FP is deenergized and interrupts the circuit for relay FA. As this relay is a slow release relay it keeps its contact *fa* closed for a short time after relay 3FP has released and thus a circuit is completed from earth over contact 0*fp*, contact 3*fp*, contact *fa*, one winding of relay FC to battery. Relay FC closes its contact *fc*10 to establish a locking circuit over its second winding, contact *fc*10, contact *r*3 to earth. Thus relay FC remains energized when relay FA releases and opens its contact *fa*.

At contacts *fc*0 to *fc*9 the leads from the keys K0 to K9 are switched over to the contacts *sc*0 to *sc*9. When now the key K0 is pressed for the selection of the second digit a circuit is closed from earth via contact *ca*2, key K0, operated contact *fc*0, contact *sc*0, operated contact 3*f*0, relay 30S, relay 3SP to battery. Relay 30S closes its contacts 30*s*0 to 30*s*10 and over its last mentioned contact closes a locking circuit for its second winding via contact *r*1 to earth. At the contacts 30*s*0 to 30*s*9 circuits are prepared for the final selection, as described later on.

The relay 3SP closes a circuit for relay SA from earth over contact 0*sp*, operated contact 3*sp*, re-

lay SA to battery. Relay SA prepares over contact *sa* a circuit for the relay SC which is energized as soon as the operator releases key K0 and thus deenergizes relay 3SP. Relay SC, operated from earth over the contacts 0*sp*, 3*sp* and *sa*, closes a locking circuit from earth over contact *r*4, contact *sc*10, second winding of relay SC to battery, so that it remains operated when the slow release relay SA releases and opens its contact *sa*.

At the operated contact *sc*0 to *sc*9 the leads from the keys K0 to K9 are now switched over to the third digit relay group with the relays 9T . . . 3T . . . 9T. The key K9 is now operated to select the third and last digit of the code 309. This operation completes a circuit for the relay 9T from earth over contact *ca*2, key K9, operated contacts *fc*9 and *sc*9, relay 9T to battery. Relay 9T closes its contact 9*t*1 and a new circuit is thus established from earth over contact *r*7, contact *ca*4, relay TP, contact 9*t*1, relay 9T to battery, so that relay 9T remains operated when the key K9 is released again. At contact 9*t*2 a further part of the selection circuit is prepared and when relay TP closes its contact *tp* the selection circuit is completed from earth over contact *tp*, contact 9*t*2, contact 30*s*9, lead L3, relay 3CR, contact *r*6, relay C to battery. The articles released by operation of contact 3*cr*2 of relay 3CR are designated by the code 309 and thus relay 3CR is connected accordingly by the lead L3 with the corresponding terminal of the terminal block TB1.

At contact 3*cr*1 a new circuit for the relays 3CR and C is prepared via the trip contact 3TC. The relay C closes a circuit for relay CA over its contact *c*1 and opens its contact *c*2 to prohibit relay R from operating when the relay CA closes its contact *ca*3. At contact *ca*1 a locking circuit for the second winding of relay CA is completed via contact *r*5 to earth. At contact *ca*2 earth is removed from the keys K0 to K9 to make the keys inoperative until the whole circuit arrangement is restored to normal and thus ready for the next selection. At contact *ca*4 the locking circuit for relay TP and 9T is interrupted so that these relays open their contacts *tp* and 9*t*1, 9*t*2 respectively. The relays 3CR and C remain energized over trip contact 3TC, as mentioned before.

When an article is released from its storage bin the trip contact 3TC is temporarily opened either by the article itself or by the release mechanism and the relays 3CR and C are deenergized. Contact 3*cr*1 breaks the locking circuit further and contact 3*cr*2 interrupts the circuit for the release mechanism so that no more articles will be released from storage. At contact *c*1 the circuit for relay CA is interrupted but this relay remains locked over its contact *ca*1. At contact *c*2 in its unoperated position a circuit is now closed from earth over contact *c*2, operated contact *ca*3, relay R to battery. Relay R operates its contacts *r*1 to *r*7. At contact *r*1 the locking circuit for the relays 3F and 30S is interrupted. Contact *r*2 would interrupt the locking circuit for relay 0F and one of the relays in another second digit group in case another coded designation was keyed up, contact *r*3 breaks the circuit for relay FC, contact *r*4 deenergizes relay SC, contact *r*5 releases the relay CA, contact *r*6 breaks the circuit of relay C and contact *r*7 interrupts the circuit for the relays TP and 9T in case a cancellation of the selected code is required as will be described later on.

When relay CA is thus released at contact *r*5 it opens its contact *ca*3 and thus interrupts the circuit of relay R so that now the whole circuit arrangement is in its initial position ready for the next selection.

To give the operator a possibility to cancel a selected code before an article has been released a "cancel" key CK is provided which, when operated, energizes the relay R. This relay interrupts all locking circuits as mentioned above and even when no article falls out of the bin and thus the trip contact is not operated contact *r*6 breaks the circuit for the C relay. If a code was keyed up which does not correspond to any of the CR relays connected with the jumpering frame the CA relay would not operate. The TP relay is in this case released at contact *r*7.

The foregoing description shows the invention by way of example only. Modifications in the circuit arrangement can be made to adapt the selection circuit to individual requirements. Supervisory signals can be provided to indicate the various conditions in the system and additional functions, for example value indications for the selected articles can be performed together with the selection of the articles.

I claim:

1. An electrical circuit arrangement for the selective operation of a plurality of devices according to three-digit coded designations thereof, comprising: a set of contact members; a first digit relay group including one relay for each first digit of said code and selectively responsive to actuation of said contact members in accordance with said first digit; a plurality of second digit relay groups, each group including one relay for each second digit of said code and selectively responsive to actuation of said contact members in accordance with said second digit; one second digit relay group being provided for each first digit in said code; a third digit relay group, including one relay for each third digit of said code and selectively responsive to actuation of said contact members in accordance with said third digit; and a plurality of selective devices electrically connected with contacts of said digit relays of said second digit relay groups and operable by the joint operation of said digit relays in said second digit relay groups and said third digit relay group.

2. An electrical circuit arrangement for the selective operation of a plurality of devices according to three-digit coded designations thereof, comprising: a set of contact members; a first digit relay group including one relay for each first digit of said code and selectively responsive to actuation of said contact members in accordance with said first digit; a plurality of second digit relay groups, each group including one relay for each second digit of said code and selectively responsive to actuation of said contact members in accordance with said second digit; one second digit relay group being provided for each first digit in said code; a third digit relay group, including one relay for each third digit of said code and selectively responsive to actuation of said contact members in accordance with said third digit; switching means in said first digit relay group to change upon operation, the connection from the key-operated contacts to the first digit relay group over to one of the second digit relay groups; further switching means in said second digit relay groups to change upon operation the connection from the key-operated contacts to a second digit relay group over to the

third digit relay group; and a plurality of selective devices electrically connected with contacts of said digit relays of said second digit relay groups and operable by the joint operation of said digit relays in said second digit relay groups and said third digit relay group.

3. An electrical circuit arrangement for the selective operation of a plurality of devices according to three-digit coded designations thereof, comprising: a set of contact members; a first digit relay group including one relay for each first digit of said code and selectively responsive to actuation of said contact members in accordance with said first digit; a first switching relay connected and operated with any relay in said first digit relay group; a plurality of second digit relay groups, each group including one relay for each second digit of said code and selectively responsive to actuation of said contact members in accordance with said second digit, one second digit relay group being provided for each first digit in said code; a second switching relay connected and operated with any relay in any of said second digit relay groups; a plurality of selective devices electrically connected with contacts of said digit relays of said second digit relay groups; a third digit relay group, including one relay for each third digit of said code and selectively responsive to actuation of said contact members in accordance with said third digit; and a third switching relay connected and operated with any relay of said third digit group; said first switching relay transferring the connections from said key-operated contacts to one of said second digit relay groups selected by the operation of a relay in said first digit relay group; said second switching relay transferring the connections from said key-operated contacts to said third digit relay group; said third switching relay closing the circuit for one of said selective devices depending on the joint operation of one of the digit relays in one of the second digit relay groups and in the third digit relay group.

4. An electrical circuit arrangement for the selective operation of a plurality of devices according to three-digit coded designations thereof, comprising: a set of contact members; a first digit relay group including one relay for each first digit of said code and selectively responsive to actuation of said contact members in accordance with said first digit and a first pilot relay connected therewith and operated thereby; a first switching relay connected and operated with any relay in said first digit relay group; a plurality of second digit relay groups, one group being provided for each first digit in said code; a second pilot relay for each of said second digit relay groups and connected therewith and operated thereby; each of said second digit relay groups including one relay for each second digit of said code and selectively responsive to actuation of said contact members in accordance with said second digit; a second switching relay connected and operated with any relay in any of said second digit relay groups; a plurality of selective devices electrically connected with contacts of said digit relays of said second digit relay groups; a third digit relay group, including one relay for each third digit of said code and selectively responsive to actuation of said contact members in accordance with said third digit; and a third switching relay connected and operated with any relay of said third digit relay group; said first switching relay transferring the connections from said key-operated contacts under the control of

said first pilot relay to one of said second digit relay groups selected by the operation of a relay in said first digit relay group; said second switching relay transferring the connections from said key-operated contacts under the control of said second pilot relay to said third digit relay group; said third switching relay closing the circuit for one of said selective devices depending on the joint operation of one of the digit relays in one of said second digit relay groups and in said third digit relay group.

5. An electrical circuit arrangement for the selective operation of a plurality of devices according to three-digit coded designations thereof, comprising: a set of contact members; a first digit relay group including one relay for each first digit of said code and a locking circuit for said relay closed by a contact of said relay at the selective response thereof to the actuation of said contact members in accordance with said first digit; a plurality of second digit relay groups, one group being provided for each first digit in said code and including one relay for each second digit of said code and a locking circuit for said relay closed by a contact of said relay at the selective response thereof to the actuation of said contact members in accordance with said second digit; a third digit relay group, including one relay for each third digit of said code and a locking circuit for said relay closed by a contact of said relay at the selective response thereof to the actuation of said contact members in accordance with said third digit; and a plurality of selective devices electrically connected with corresponding contacts of relays of said second digit relay groups and operable by the joint operation of corresponding relays in said second digit relay groups and said third digit relay group, said selective devices being provided with contact means and operable thereby to interrupt said locking circuits and to restore said relays to their initial position.

6. An electrical circuit arrangement for the selective operation of a plurality of devices according to three-digit coded designations thereof, comprising: a set of ten key-operated contacts; a first digit relay group including one relay for each first digit of said code connected with a corresponding key-operated contact; a plurality of second digit relay groups, one group being allotted to each relay in said first digit relay group and each group including ten relays electrically connected with contacts of the corresponding relay in said first digit relay group; a third digit relay group including ten relays, one relay being allotted to each of said key-operated contacts and being electrically connectable with them; and a plurality of selective devices electrically connected with contacts of the ten relays of said second digit relay group and operable by the joint operation of said last mentioned contacts and contacts of the relays of said third digit relay group.

7. An electrical circuit arrangement for the selective operation of a plurality of devices according to three-digit coded designations thereof, comprising: a set of ten key-operated contacts; a first digit relay group including one relay for each first digit of said code connected with a corresponding key-operated contact; a plurality of second digit relay groups, one group being allotted to each relay in said first digit relay group and each group including ten relays electrically connected with contacts of the corresponding relay in said first digit relay group; a third digit relay group including ten relays, one relay being

allotted to each of said key-operated contacts and being electrically connectable with them; each relay in each of said second digit relay groups being provided with ten contacts, having two contact springs each, one contact spring of each contact being connected with a corresponding contact of one of the ten relays of said third digit relay group; a plurality of selective devices; and a jumpering frame having two groups of terminals, one group of terminals being connected with the other contact spring of said relay contacts of the second digit relay groups, the other group of terminals being connected with said selective devices, whereby the position of the selective devices may be varied without changing the code number assigned thereto.

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