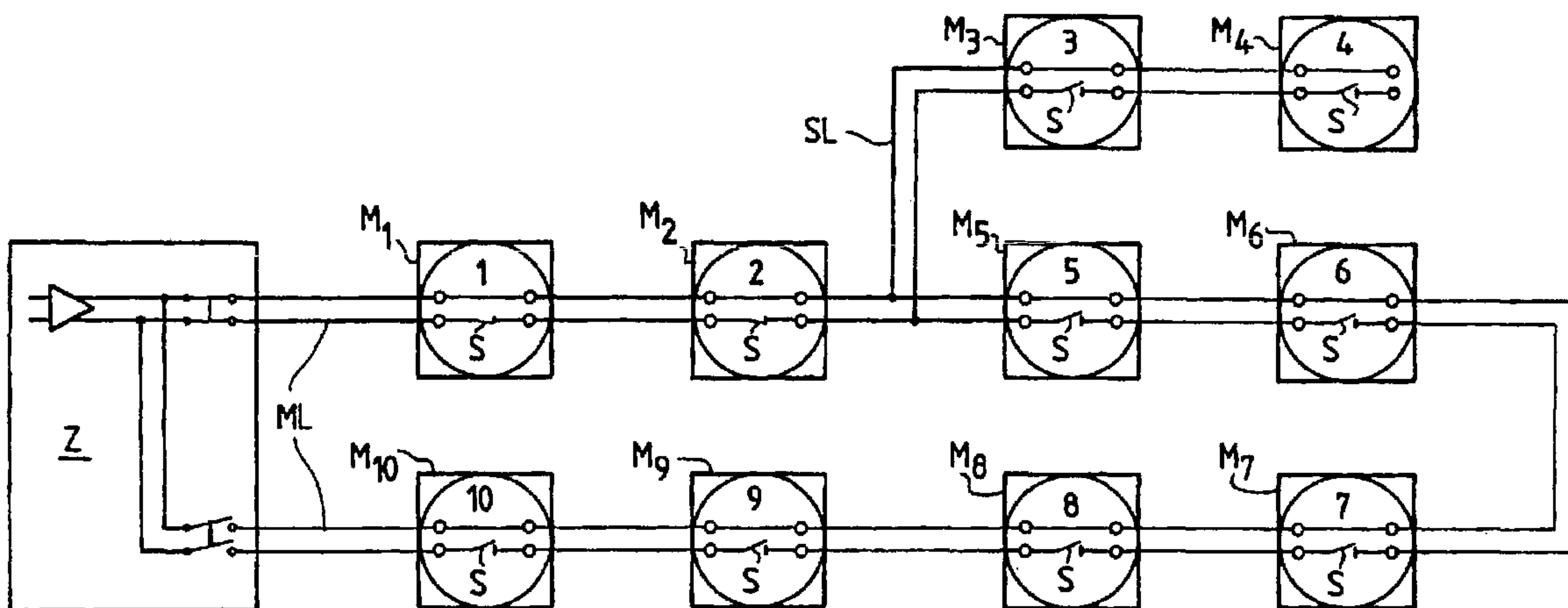




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(54) Titre : PROCEDE POUR DETERMINER LA CONFIGURATION D'UNE INSTALLATION INDIQUANT UN DANGER ET  
INSTALLATION INDIQUANT UN DANGER  
 (54) Title: METHOD FOR DETERMINING THE CONFIGURATION OF A DANGER WARNING SYSTEM, AND DANGER  
WARNING SYSTEM



(57) **Abrégé/Abstract:**

The invention relates to a danger warning system comprising a central station (Z) and appliances ( $M_n$ ) which are connected thereto by means of a monitoring line (ML). Each appliance ( $M_n$ ) comprises an insulator switch (S), an unequivocal identification number, and a communication address. In order to determine the configuration of the danger warning system, the appliances ( $M_n$ ) that can be decoupled by means of the insulator switch (S) are sequentially started and announced to the central station (Z). In the event of simultaneous announcements of more than one appliance ( $M_n$ ), only the announcement of one of said appliances ( $M_n$ ) is accepted. During the announcement of appliances ( $M_n$ ) at the central station (Z) with the communication addresses thereof, when appliances ( $M_n$ ) with different communication addresses are simultaneous announced, the communication addresses are differed according to an arbitration method, and the two different communication addresses are sequentially registered. When appliances ( $M_n$ ) with the same communication addresses are simultaneously announced, the collision of said same communication addresses is identified and resolved.

## Abstract

The invention relates to a danger warning system comprising a central station (Z) and appliances ( $M_n$ ) which are connected thereto by means of a monitoring line (ML). Each appliance ( $M_n$ ) comprises an insulator switch (S), an unequivocal identification number, and a communication address. In order to determine the configuration of the danger warning system, the appliances ( $M_n$ ) that can be decoupled by means of the insulator switch (S) are sequentially started and announced to the central station (Z). In the event of simultaneous announcements of more than one appliance ( $M_n$ ), only the announcement of one of said appliances ( $M_n$ ) is accepted. During the announcement of appliances ( $M_n$ ) at the central station (Z) with the communication addresses thereof, when appliances ( $M_n$ ) with different communication addresses are simultaneously announced, the communication addresses are differed according to an arbitration method, and the two different communication addresses are sequentially registered. When appliances ( $M_n$ ) with the same communication addresses are simultaneously announced, the collision of said same communication addresses is identified and resolved.

(DE) Eine Gefahrenmeldeanlage

Method for determining the configuration of a danger warning system, and danger warning system

#### Description

The present invention relates to a method for determining the configuration of a danger warning system comprising a central station and appliances connected thereto via a signal line, in which danger warning system each appliance has an isolator switch, a unique identification number and a communication address, and the appliances, disconnectable via the isolator switches, can be started sequentially.

In this context "appliances" should be understood to mean, in particular, hazard detectors, but they may also be actuators, such as optical or acoustic alarm transmitters, relays, alarm displays, transmission appliances for transmitting alarms and the like. When "detectors" are referred to in the following description, this should not, in any case, be understood in a restrictive manner.

Such methods, known by the terms chain synchronization or daisy chain, have long been used for determining the arrangement of detectors purely on a stub line or purely on a ring line. In EP-A-0 093 872 a method of this type is described in which, upon activation of the system, all the detectors are disconnected by a change in voltage of the signal line and then are reconnected to the signal line in a time-staggered manner by the switches in such a manner that each detector additionally reconnects a subsequent detector to the line voltage after a predetermined time delay. The detectors contain address memories which are loaded in a predetermined sequence by the central station with the

communication addresses of the individual detectors.

In the method described in EP-A-0 093 872 the treatment of branches can be problematic because, after the isolator switch located before a branch has been closed, two detectors or, in the case of multiple branches, more than two detectors suddenly start simultaneously, especially if they do not yet have a unique communication address. Here, it must be assumed that in exchanges of detectors between different signal lines double communication addresses are possible even for pre-addressed detectors.

EP-A-0 485 878 describes a method for determining the configuration of detectors of a danger warning system in which, prior to allocating the communication address to the detectors, the central station must perform a large number of steps, which demands a relatively large amount of time. Determination of the position of a newly-installed detector by restarting the whole system is time-consuming, especially with relatively large networks, and certainly is not efficient. Apart from that, this method does not function with symmetrical branches.

EP-A-0 880 117 describes a method for automatically locating detectors in which the detectors are equipped with means for communicating with neighboring detectors. To locate a detector, all the detectors open their disconnectors and the detector to be located transmits a corresponding message which is received only by its neighbors. The disconnectors are then closed and it is determined which detectors these neighbors are, enabling unambiguous determination of the position of the detector which is to be located. This method is relatively fast, but requires all detectors to be equipped with the

communication means mentioned.

It is the object of the invention to specify a method for determining the configuration of a danger warning system which, even in the case of branched topologies, enables the configuration of the line network to be determined and which functions more quickly and more simply than the known methods.

This object is achieved according to the invention in that, upon starting, the appliances log on sequentially to the central station and, in the event of simultaneous logging-on of more than one appliance, only the logging-on of one of these appliances is accepted.

A first preferred embodiment is characterized in that the appliances log on to the central station with their communication address, and in that, in the event of simultaneous logging-on by appliances with different communication addresses, the communication addresses are distinguished by means of an arbitration method and the two different communication addresses are sequentially registered.

A second preferred embodiment of the method according to the invention is characterized in that the appliances log on to the central station with their communication address, and in that, in the event of simultaneous logging-on by appliances with identical communication addresses, the collision of these identical communication addresses is identified and resolved.

A third preferred embodiment of the method according to the invention is characterized in that the appliances log on to the central station with their identification numbers, and in that sequential logging-on is ensured by means of an

arbitration procedure via the identification number and a unique communication address is allocated to the appliances via the identification number.

A first alternative method of achieving the object is characterized in that, upon starting, the communication addresses of all appliances are polled by the central station and newly-added communication addresses are thereby identified, and in that, in the event of multiple occupancy of communication addresses, the collision of these identical communication addresses is identified and resolved.

A second alternative method of achieving the object is characterized in that, upon starting, the identification numbers of the newly-started appliances are polled by the central station and a unique communication address is allocated to each appliance found.

The invention further relates to a danger warning system with a program-controlled central station to which a plurality of appliances are connected in parallel via a signal line, each of which appliances includes at least a sensor, an isolator switch, evaluation electronics with at least a memory and an individual and unalterable serial number allocated by the manufacturer. The danger warning system according to the invention is characterized in that the central station includes means for executing the process steps mentioned.

A preferred embodiment of the danger warning system according to the invention is characterized in that the appliances mentioned are formed by hazard detectors and/or actuators, such as optical or acoustic alarm transmitters, and/or relays and/or alarm displays and/or transmission appliances for

transmitting alarms.

The invention is explained in more detail below with reference to an exemplary embodiment and to the drawings, in which:

Fig. 1 is a schematic representation of a danger warning system, and

Fig. 2 is a flow chart to clarify the determination of the configuration of a line network.

The danger warning system represented in Fig. 1 consists of a central station Z, a ring-shaped signal line ML starting from said central station Z with detectors  $M_1$ ,  $M_2$  and  $M_5$  to  $M_{10}$  connected to said signal line ML, and a stub line SL branching from the signal line ML with detectors  $M_3$  and  $M_4$  connected thereto. Let the detector  $M_1$  have the communication address 1, the detector  $M_2$  have the communication address 2, and so on. Each of the detectors  $M_n$  includes at least one sensor for a hazard criterion, such as smoke, temperature or a flammable gas, evaluation electronics (both not shown) and an isolator switch S.

In the case of the danger warning system illustrated it is assumed that each detector  $M_n$  has a communication address and a unique identification number. The latter has been allocated to the respective detector by the manufacturer; it is unalterable and occurs precisely once.

As already mentioned in the introduction to the description, a detector M should be understood to mean not only a hazard detector but quite generally an addressable appliance installed in a signal line. Apart from a hazard detector, this

may be an actuator, such as an optical or acoustic alarm transmitter, a relay, an alarm display, a transmission appliance for transmitting alarms, and the like.

In order to determine the configuration of the detectors  $M_n$  on the network formed by the signal line ML and the stub line SL, the detectors  $M_n$ , which are disconnectable via the isolator switches S, are started sequentially by the central station Z, a unique communication address being optionally allocated to the detectors. In addition, information from the detectors  $M_n$ , if present, such as detector type, an identification number such as a serial number or an existing communication address, can be read into the central station Z for complete determination of the configuration of the detectors on the network. Whenever a detector  $M_n$  has closed an isolator switch S and logged on, the next successive detector closes its isolator switch upon a command from the central station Z. After each closing of an isolator switch S the central station Z waits until no more detectors  $M_n$  log on, and then also knows how many detectors are connected directly behind the one which last closed its isolator switch S. If only one detector has logged on after the last closing of an isolator switch S, no branch is present; if two detectors have logged on there is a single branch, and so on.

The treatment of branches is especially problematic if the detectors at a branch do not already have a unique communication address. In addition, it must be assumed that, through exchange of detectors between different lines, double communication addresses are possible even in the case of pre-addressed detectors, which must be prevented under all circumstances. To master a situation of this kind, therefore, the system must be able to identify that a branch is present,

that is, that a plurality of detectors have been started. For this purpose the following methods are proposed:

1. The detectors transmit their communication addresses to the central station Z, which, upon receiving two or more communication addresses simultaneously, prevents the simultaneous logging-on of a plurality of detectors with different communication addresses by means of an arbitration procedure. In the arbitration procedure the addresses are compared bitwise and the detector which has one bit set, for example, is preferred. This detector then receives a command from the central station Z and closes its isolator switch. Then the communication address of the detector not preferred in the arbitration is read into the central station Z; the detector receives a command from the central station Z and closes its isolator switch S. Then the next detector logs on, and so on.
2. The detectors transmit their communication addresses to the central station Z, which identifies the simultaneous arrival of two identical communication addresses as a collision and resolves the collision. The resolution is effected in that the central station Z allocates an invalid communication address to all the detectors involved in the collision, whereupon the detectors with an invalid communication address log on again according to variant 3 (Fig. 2).
3. The detectors log on to the central station Z with their identification number. Sequential logging-on is ensured by an arbitration procedure of the type described and unique communication addresses are allocated to the detectors via the identification numbers.

4. The communication addresses of all detectors are polled by the central station Z, whereby newly-added detectors are identified. Multiple occupancy of communication addresses is identified as a collision and the collision is resolved in the manner already described.

5. The identification numbers of the newly-started detectors are polled by the central station Z (in practice not all possible identification numbers can be polled, because the time required for a large number of multidigit identification numbers would be too long), a method based on a binary search tree being appropriate. A unique communication address is then allocated to each detector found.

By using one of the methods described, all detectors directly connected to branch origins are known and starting of each branch can be continued sequentially, so that finally the topology of the whole network can be recorded.

When the danger warning system illustrated in Fig. 1 is started, the isolator switches S of all the detectors  $M_n$  are opened. The detector  $M_1$ , for example, then logs on to the central station Z with its communication address 1, the central station sends the detector  $M_1$  a command to close its isolator switch S and waits for the next detector  $M_2$  to log on, which logging-on takes place analogously. After the detector  $M_2$  has logged on, the two detectors  $M_3$  and  $M_5$  send their respective communication addresses 3 and 5 to the central station Z. The central station registers that a branch must be present and also registers that two detectors with different communication addresses are logging on simultaneously, and applies the arbitration procedure described under point 1, in

which the detector  $M_3$ , for example, is preferred.

Once the detector  $M_3$  has logged on, the detector  $M_4$  logs on to the central station  $Z$ , then the detector  $M_5$ , etc. When the detector  $M_{10}$  has logged on, no further detectors log on and the central station  $Z$  now knows the configuration of the network of the fire danger warning system. If, for example, because of an exchange of a detector during maintenance/revision work, the detector  $M_8$  had the communication address 3, the central station  $Z$  would identify when that detector logged on that the communication address 3 was already allocated to the detector  $M_3$ , and would readdress the detector  $M_8$  with a free communication address.

As already mentioned, multiple branching can also be identified with the method described; self-evidently, a limb of a branch may itself contain a branch.

## Claims

1. A method for determining the configuration of a danger warning system comprising a central station (Z) and appliances ( $M_n$ ) connected thereto via a signal line (ML), in which danger warning system each appliance ( $M_n$ ) has an isolator switch (S), a unique identification number and a communication address, and the appliances ( $M_n$ ), disconnectable via the isolator switches (S), are started sequentially, characterized in that upon starting, the appliances ( $M_n$ ) log on sequentially to the central station (Z) and, in the event of simultaneous logging-on of more than one appliance ( $M_n$ ), only the logging-on of one of these appliances ( $M_n$ ) is accepted.

2. The method as claimed in claim 1, characterized in that the appliances ( $M_n$ ) log on to the central station (Z) with their communication address and in that, in the event of simultaneous logging-on by appliances ( $M_n$ ) with different communication addresses, the communication addresses are distinguished by means of an arbitration procedure and the two different communication addresses are registered sequentially.

3. The method as claimed in claim 1, characterized in that the appliances ( $M_n$ ) log on to the central station (Z) with their communication address, and in that, in the event of simultaneous logging-on of appliances ( $M_n$ ) with identical communication addresses, the collision of these identical communication addresses is identified and resolved.

4. The method as claimed in to claim 1,

characterized in that the appliances ( $M_n$ ) log on to the central station (Z) with their identification number and in that sequential logging-on is ensured by means of an arbitration procedure via the identification numbers and a unique communication address is allocated to the appliances ( $M_n$ ) via the identification number.

5. A method for determining the configuration of a danger warning system comprising a central station (Z) and appliances ( $M_n$ ) connected thereto via a signal line (ML), in which danger warning system each appliance ( $M_n$ ) has an isolator switch (S), a unique identification number and a communication address, and the appliances ( $M_n$ ), disconnectable via the isolator switches (S), are started sequentially,

characterized in that upon starting the central station (Z) the communication addresses of all appliances ( $M_n$ ) are polled and as a result newly added communication addresses are identified, and that in the event of multiple occupancy of communication addresses the collision of these identical communication addresses is identified and resolved.

6. A method for determining the configuration of a danger warning system comprising a central station (Z) and appliances ( $M_n$ ) connected thereto via a signal line (ML), in which danger warning system each appliance ( $M_n$ ) has an isolator switch (S), a unique identification number and a communication address, and the appliances ( $M_n$ ), disconnectable via the isolator switches (S), are started sequentially,

characterized in that upon starting the central station (Z) the identification numbers of the newly started appliances ( $M_n$ ) are polled and a unique communication address is allocated to each appliance ( $M_n$ ) found.

7. The method as claimed in claim 3 or 5, characterized in that the collision is resolved in that an invalid communication address is allocated to all the appliances ( $M_n$ ) involved in the collision and the appliances ( $M_n$ ) then log on, sequential logging-on being ensured by an arbitration procedure via the identification number, and in that a unique communication address is allocated to the appliances ( $M_n$ ) via the identification number.

8. The method as claimed in either of claims 2, 4 or 7, characterized in that the arbitration procedure is carried out by a bitwise comparison of the communication addresses or the identification numbers, the appliance ( $M_n$ ) being preferred which has one bit set.

9. A danger warning system as claimed in any one of claims 1 to 8, comprising a program-controlled central station (Z) to which a plurality of appliances ( $M_n$ ) are connected in parallel via a signal line (ML), each of which appliances ( $M_n$ ) includes at least a sensor, an isolator switch (S), evaluation electronics with at least a memory and an individual and unalterable serial number allocated by the manufacturer, characterized in that the central station (Z) includes means for carrying out the process steps mentioned.

10. The danger warning system as claimed in claim 9, characterized in that the appliances ( $M_n$ ) mentioned are formed by hazard detectors and/or actuators, such as optical or acoustic alarm transmitters, and/or relays and/or alarm displays and/or transmission appliances for transmitting alarms.

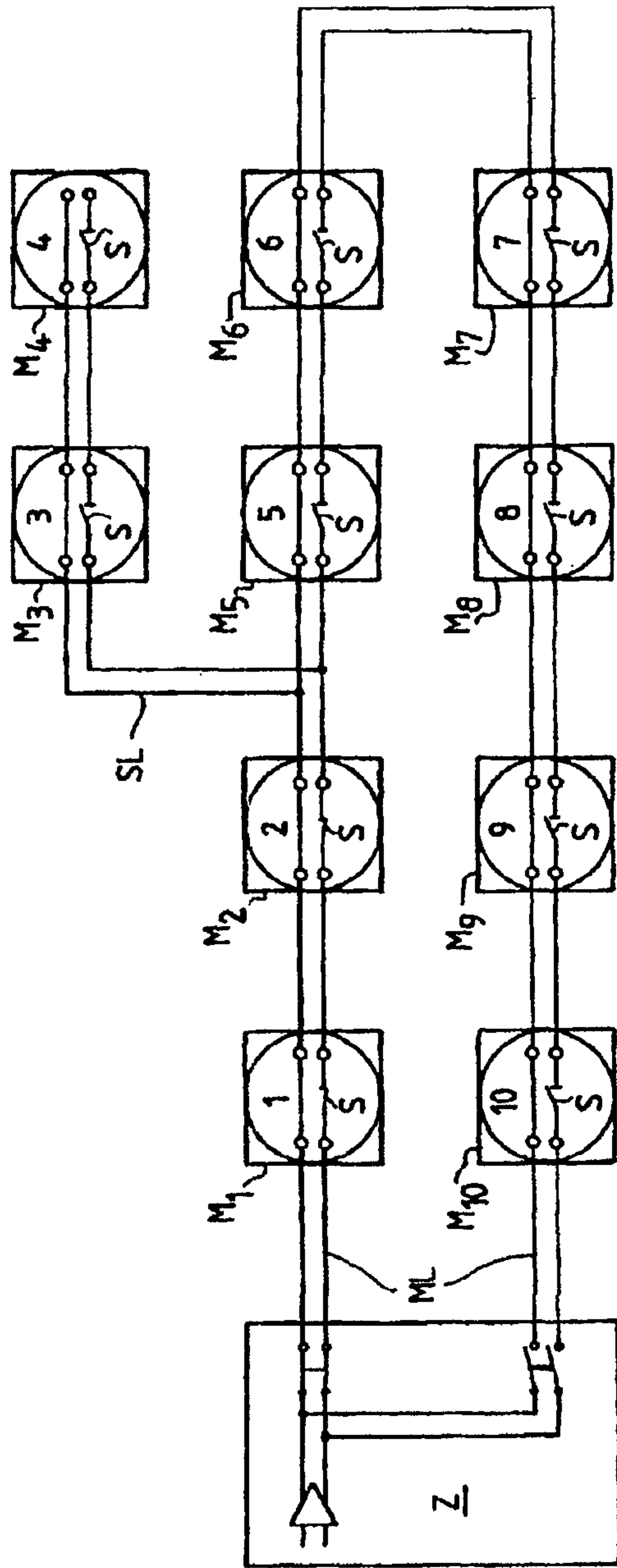
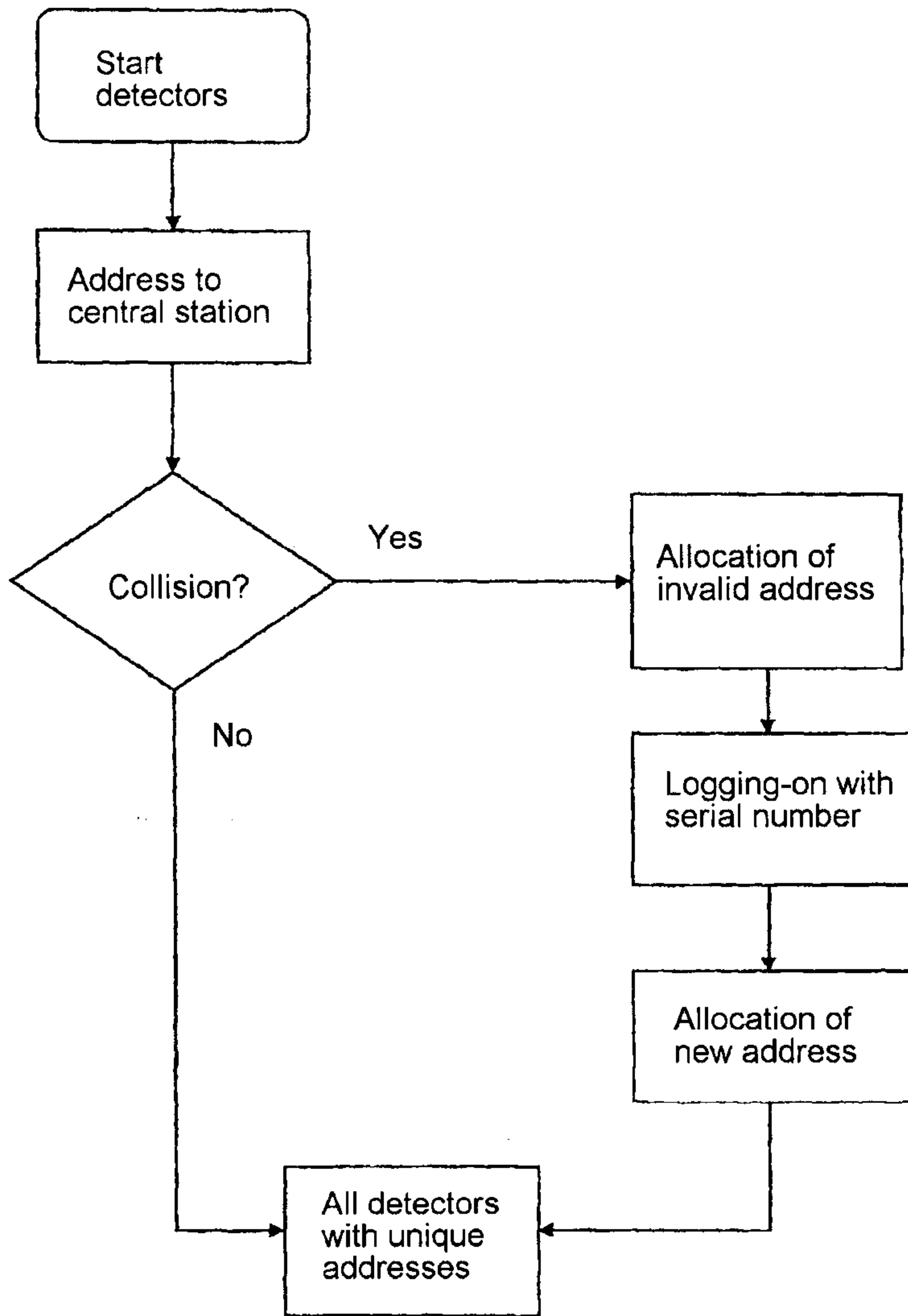


FIG.1



**FIG. 2**

