MCB Connection Troubleshooting Using Dial Switch

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Abstract

The existing Miniature Circuit Breakers (MCB) connections have no indication on where the power is supplied by the MCB as the identification provided in MCB during installation is either damaged or missing which makes the troubleshooting difficult for the user. This project aims to solve the problem by using dial switches to indicate the power source. The MCB number to which the switch is connected is identified from the dial position, thus facilitating the troubleshooting process. The dials are made up of numbers from 0 to 9. There are two dials: an outer dial and an inner dial; therefore, up to 99 MCB connections can be realized using this method.

Keywords: Dial switch, MCB identification

1. Introduction

Miniature circuit breakers (MCB) are mechanical switching devices used on the distribution side for equipment protection. They offer various features such as protection and switching function. They main advantage of MCB is that it does not need replacement after breaking function during short circuit [1]. MCB have become an important part of electrical circuit protection in recent years because it is used in very sensitive home appliances, gadgets and industrial instruments [2,3]. At normal condition MCB acts as Normally Close (NC) switch and appliances receive continuous supply, but during overload or short circuit condition the Circuit Breaker becomes Normally Open (NO) Switch and cut the current flow to appliances to protect the appliances thus helping in isolating the healthy and unhealthy part of circuit. To achieve current limitation during fault the contacts are arranged in a way such that the magnetic repulsion effect is proportional to the square of fault current [1]. Overload

protection is achieved by thermal distortion effects produced by bimetallic element. But the main problem with panel of MCB used for protection is that the data that which MCB is connected to which equipment or port is missing thus making troubleshooting difficult in case of a problem.

The figure 1 shows an MCB panels where the identification labels are missing thus the equipments which are connected to the MCB are not known. During an equipment problem all the MCB are checked to know the source before troubleshooting a problem thus leading to wastage of time and sudden turn off of other equipments connected to the MCB panel by mistake. This sudden turning off of devices due to wrong operation may cause damage to the equipments.
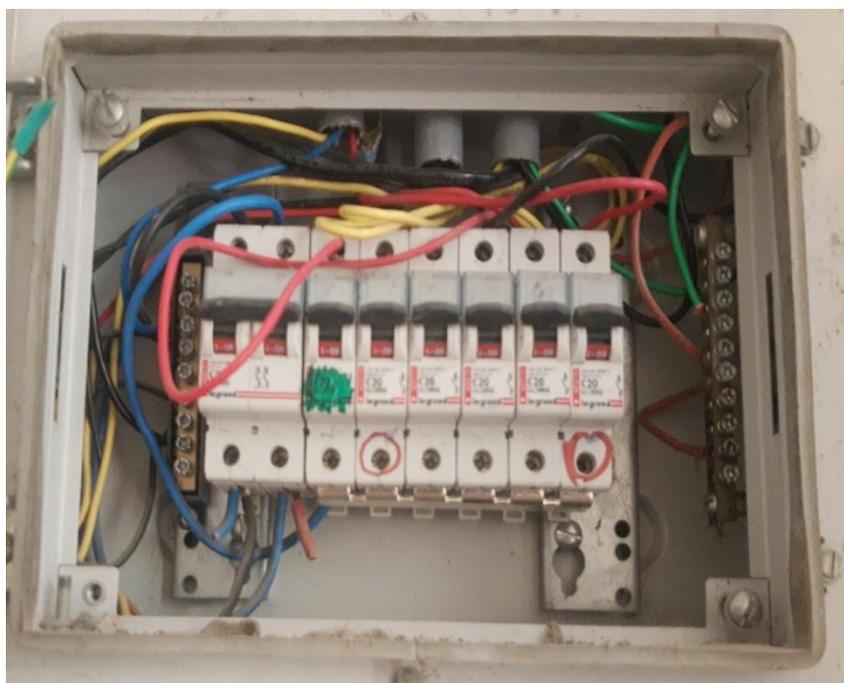

Figure 1. Panel of MCB without identification

2. Existing system

In the existing system there is no indication about which MCB is connected to which equipment or port as shown in figure 2. During an equipment problem all the MCB are checked to know the source before troubleshooting a problem thus leading to wastage of time and sudden turn off of other equipments connected to the MCB panel by mistake. This sudden turning off of devices due to wrong operation may cause damage to the equipments.
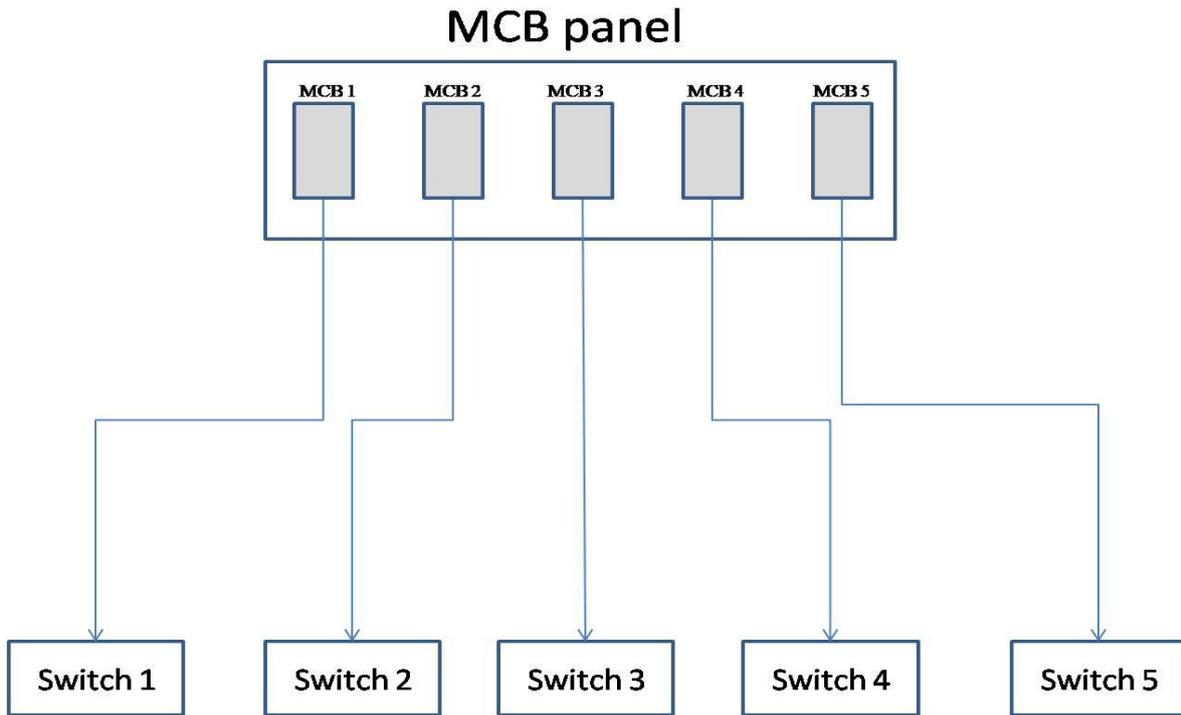
Figure 2. Block diagram of the existing system

3. Proposed system

The figure 3 shows the proposed system where the connection number of MCB is indicated by the dial placed in the switch.
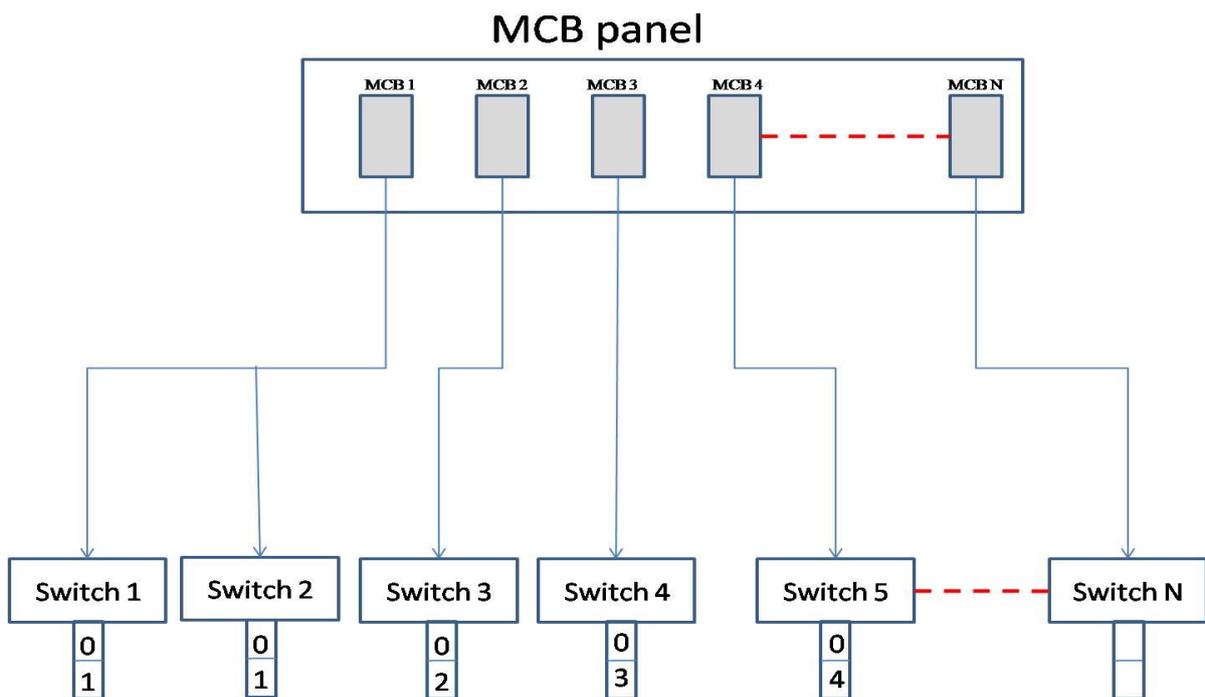

Figure 3. Block diagram of the proposed system

The MCB to which the switch is connected is locked in the switch at the time of power connection. During an equipment problem only the MCB of the problematic equipment is switched off thus preventing sudden turn off of other equipments connected to the MCB panel by mistake. Thus the reliability of the system is increased by the proposed system. The figure 4 shows the dial configuration. The indication consists of two dials an upper dial and lower dials. Each dial has numbers from 0 to 9 thus up to 99 MCB from a single panel can be locked into the switch. There is a transparent glass placed in the switch for viewing the MCB number. For free movement of dials the screw at the back is loosened. After the required number is viewed in the transparent glass the lever is placed in the required position and screw is tightened to lock the number in the switch. The arrangement for locking system is shown in figure 5.
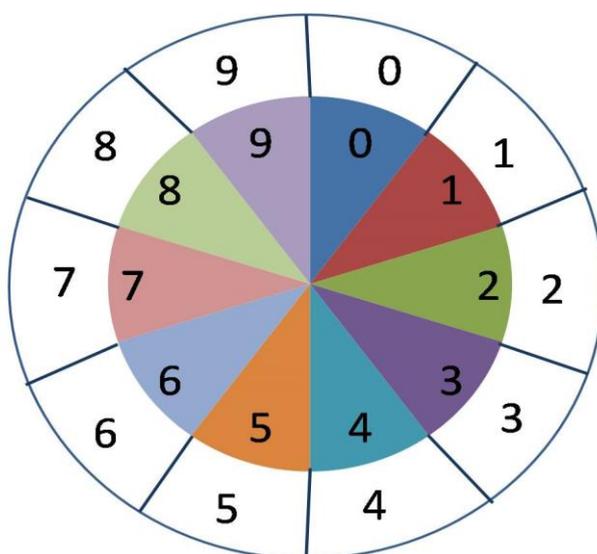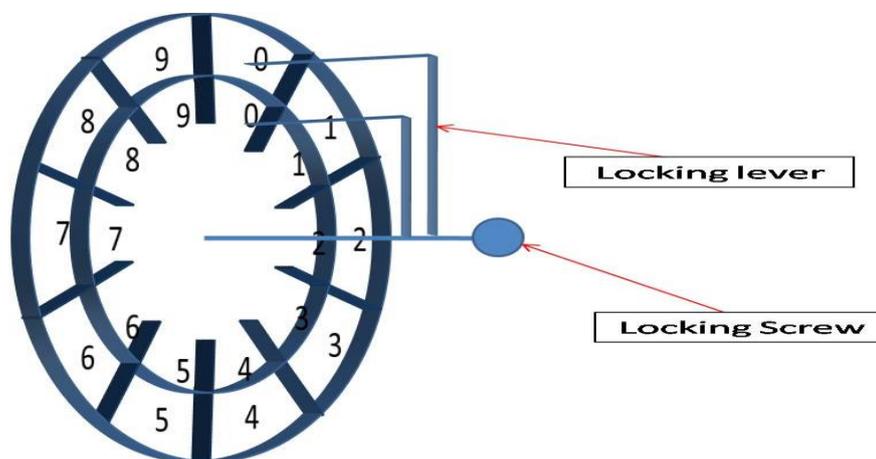

Figure 4. Dial configuration

Figure 5. Dial locking mechanism

**Table 1.** Specifications of Dial and Transparent glass

Description	Specification
Outer dial	40 mm (Diameter)
Inner dial	30 mm (Diameter)
Transparent glass	40 mm * 12.5 mm (Length *Width)

The table 1 shows the parameters of the components to be used in dial switch. The number selection is viewed through the transparent glass and the connection number of MCB is locked by rotating the dial and placing the required number at the transparent glass position locking the lever and tightening the screws at the back which locks the selected number. When the number is placed at 0 in upper and lower dials it indicates null position and that particular switch is not connected to any MCB.

4. Working

The switch consists of a transparent glass to know which numbers of the dial are selected. After the connection to the MCB is finalized, the required number is selected, and the dials are locked.

1. The MCB numbers are decided based on reading style of Boustrophedon for easy identification if there are many number of rows of MCB in the main MCB panel. The numbers are assigned to the MCB from left to right in the first line and from right to left in the second line as shown in figure 6.
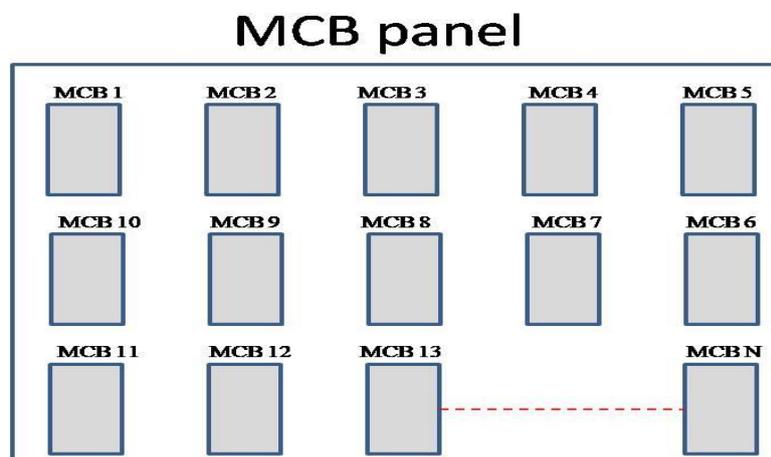
Figure 6. MCB configuration

2. After the MCB to which the switch is to be connected is decided the position of the switch is changed from null position as shown in figure 7.
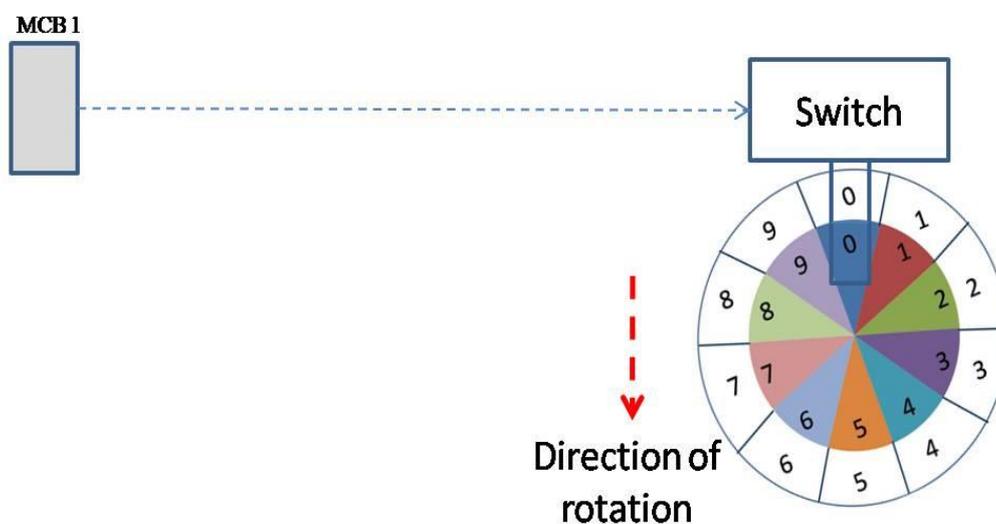

Figure 7. Position change of dial

3. The MCB number is locked by rotating the dial and placing the required number at the transparent glass position and locking the lever and tightening the screws at the back as shown in figure 8 and figure 9.
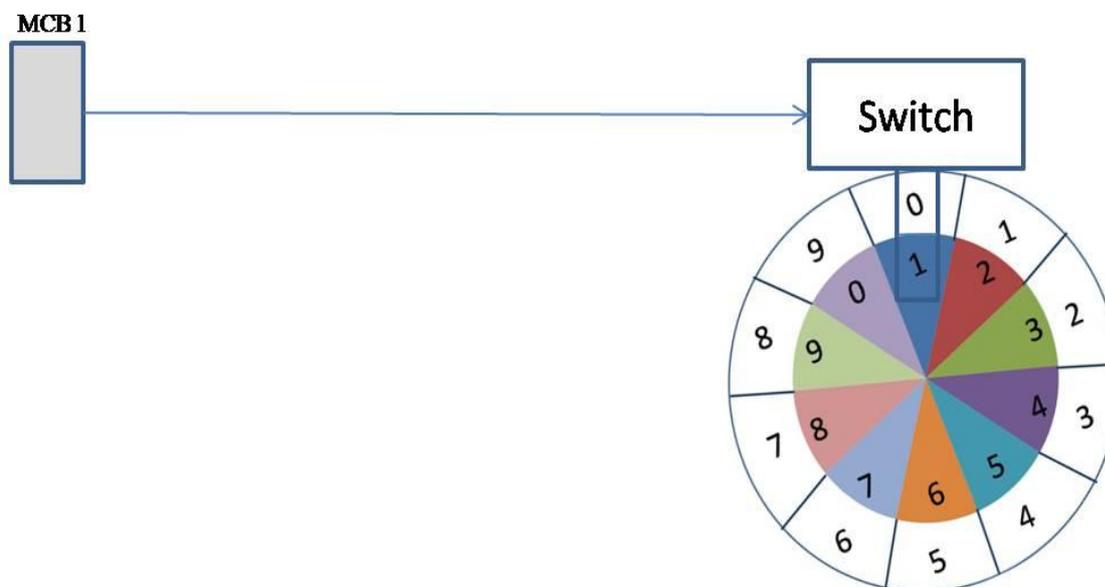

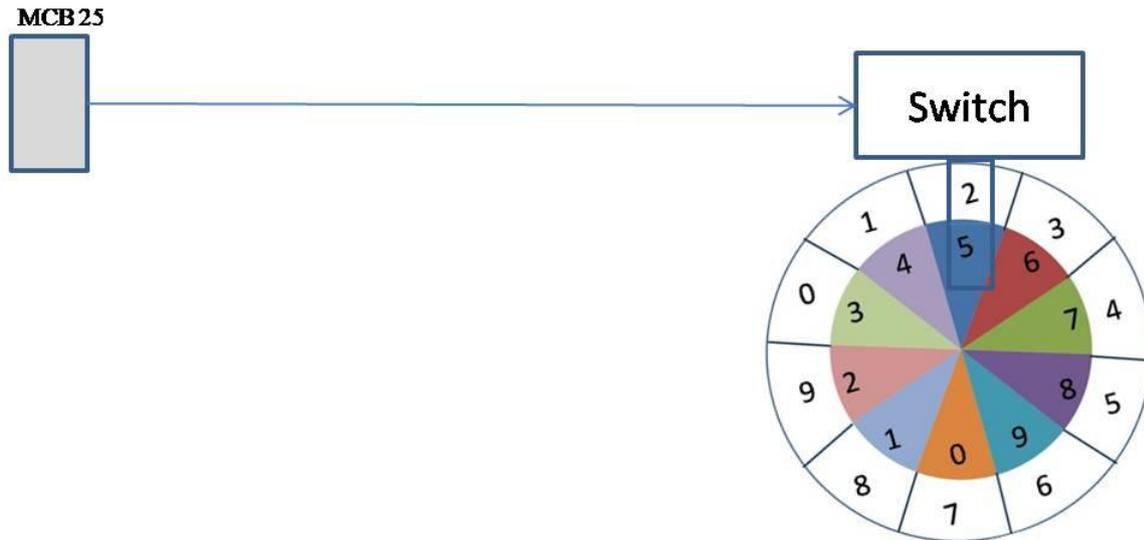**Figure 8.** Position locking based on MCB 1 connection

Figure 9. Position locking based on MCB 25 connection

5. Conclusion

This study illustrates that the dial switch can be used for identifying the MCB which is connected to it. In case of fault occurring in a particular equipment or port, the user can easily disconnect the MCB of the faulty equipment and troubleshoot the equipment without accidental switching off of other devices which are connected in the main MCB panel.

References

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