

PROGRAMMABLE BLOCK FOR TIMED-STEP CONTROL OF CONVEYORS IN EXPLOSIVE MINES

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ABSTRACT

NOVELTY - The invention relates to an electronic device provided with a microcontroller for the control of a coal transport flow within explosion-prone mine works. According to the invention, the programmable block controls four conveyors (4, 5, 6 and 7) while observing starting logics and safety norms provided by the safety standards in the field and comprises a programmable automaton (1) with microcontroller, a block (2) of interface and supply circuits, an intrinsic safety barrier (3) through which controls are transmitted and confirmations are received from the switch boxes of the four conveyors (4, 5, 6 and 7), the remote control of the conveyors (4, 5, 6 and 7) being carried out by a remote control block (9), the equipment start being preceded by an acoustic signal emitted for 5 s by an acoustic installation (8) which emits an electric signal towards the block (9) to confirm the integrity of the signalling line.

KEYWORDS

Refuse collection,
 Conveyors,
 Process and machine control

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INTRODUCTION

The invention refers to an electronic device with programmable automatic intended to control the operation process of explosion-prone mining. He carries out the command of four transporters, respecting the starting logic and safety rules laid down by the security standards in the field. The device according to the invention consists of a programmable schneider-Telemecanique microcontroller machine type Twido TWDLCAE40DRF (1), a block of interface and power circuits (2), an intrinsic security barrier (3) through which commands are sent and confirmations are received from the covers of the four conveyors (4), (5), (6), (7). The remote start controls of the conveyors are given from the remote control block (9). The start-up of a machine is preceded by the emission of a preventive acoustic signal of 5 seconds by an acoustic start-up prevention system (8), which emits to the block an electrical signal confirming the integrity of the signal line.

RESULTS

Functions performed:

- local or remote control of four conveyors in the mine collection galleries at risk of explosion;
- have intrinsic security property and safety property against any defect in the control circuits or signalling circuit;
- cancel the start-up order of the machines ordered if the confirmation signal of the preventive signal confirming the integrity of the signal line is not received;
- stop the conveyors in the event of the disappearance of a confirmation of a carrier engine to avoid coal agglomeration on the stopped transporter. In this case, 30 seconds after the transmission in question has been switched off, the start order for all the transporters shall be cancelled and the system shall be blocked in this state, making it impossible to issue any starting command;
- blocks the block after 30 seconds after powering up, in case of shunting of the confirmatory circuits of the controlled enclosures (accident-generating situation used often underground miners), making it impossible to issue any start-up command;
- shows the possibility of interlocking the conveyors between them, the lack of confirmation of a enclosure during the start-up leading to the shutdown of the other conveyors and the cancellation of the start-up order if within 30 sec. this confirmation has not arrived;
- optically signals the state of the block's operating regime and damage;
- protection against accidental starts caused by defects or anomalies in the driving programme.

RESULTS

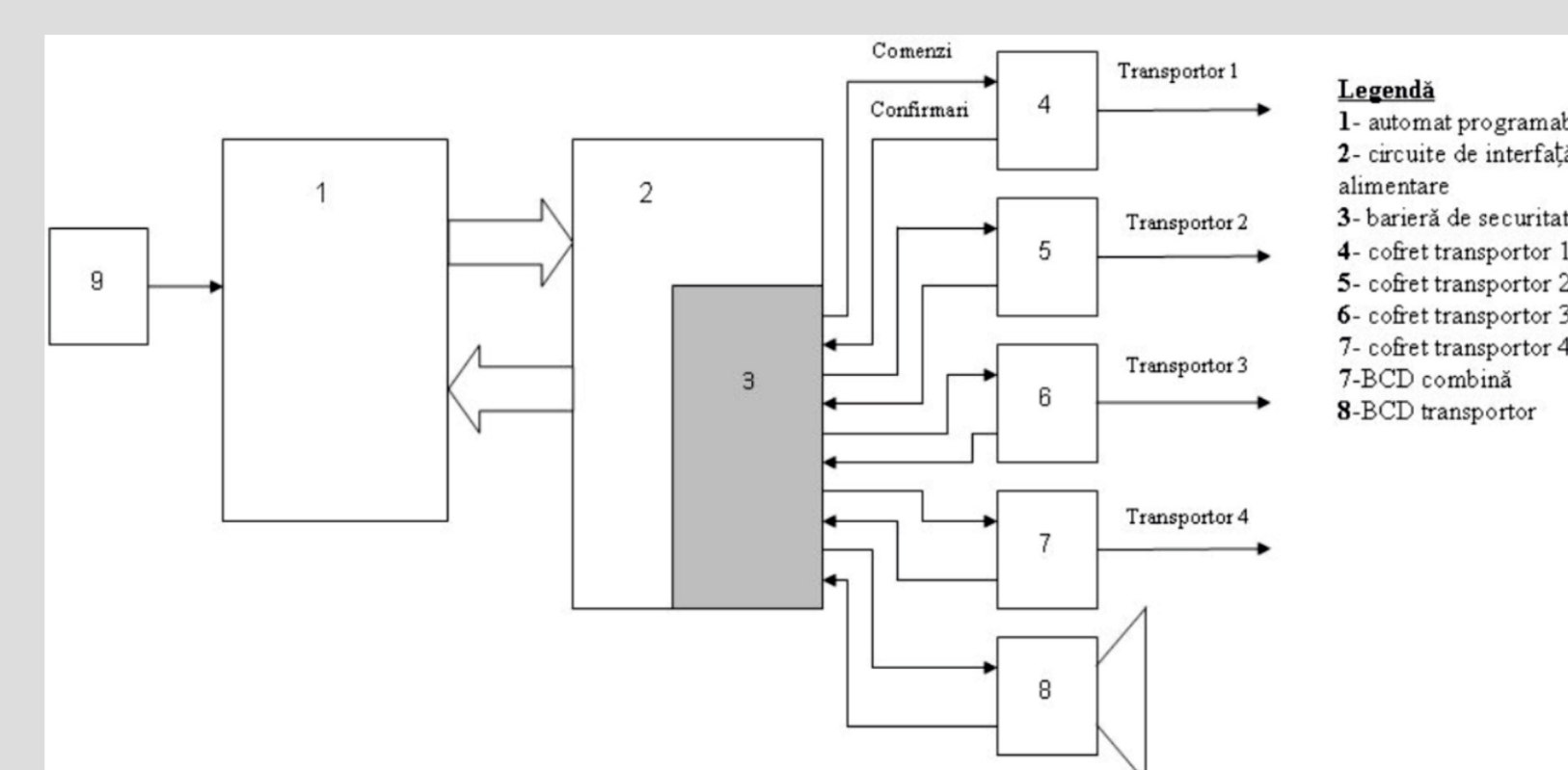


Figure 1. Block Schema

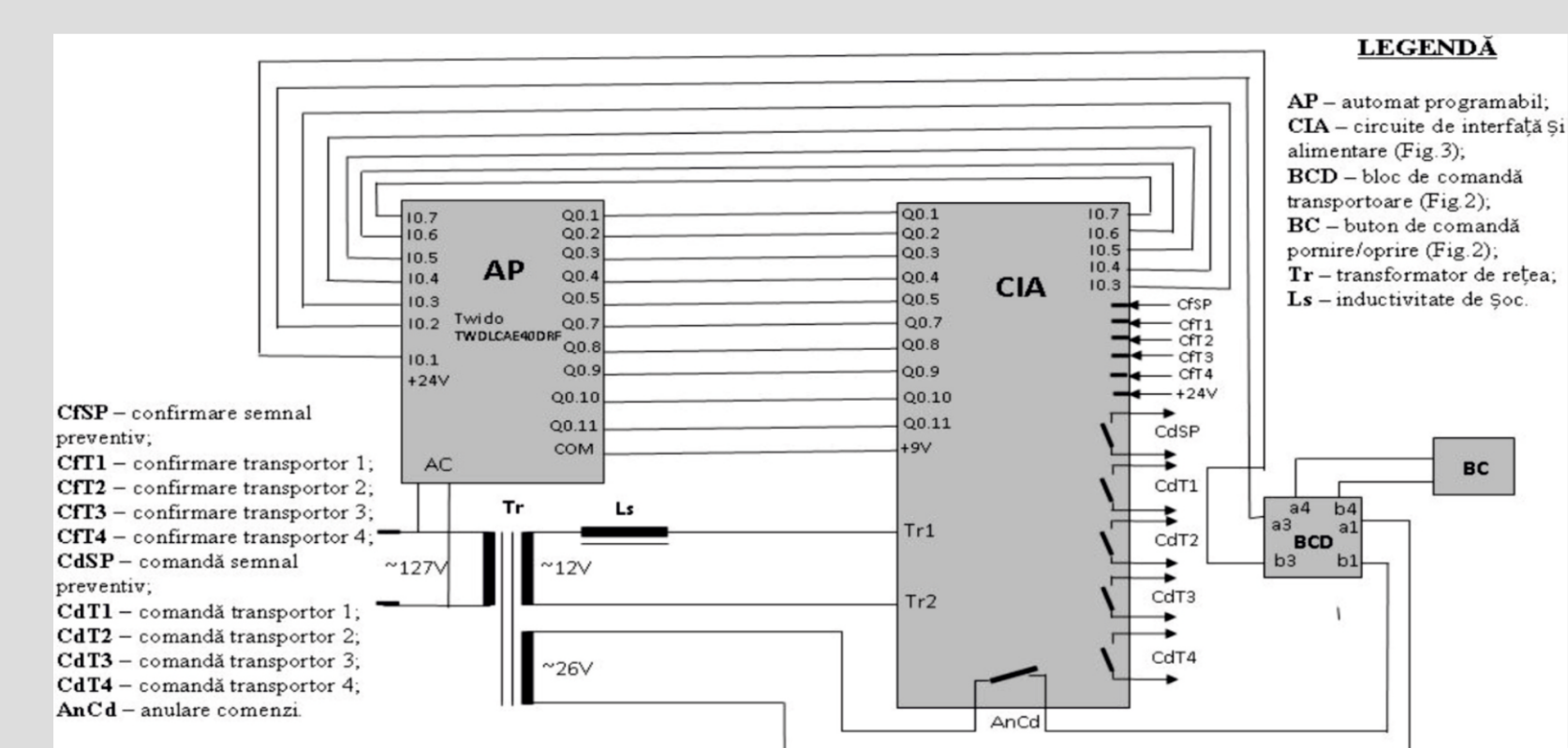


Figure 2. Wiring diagram

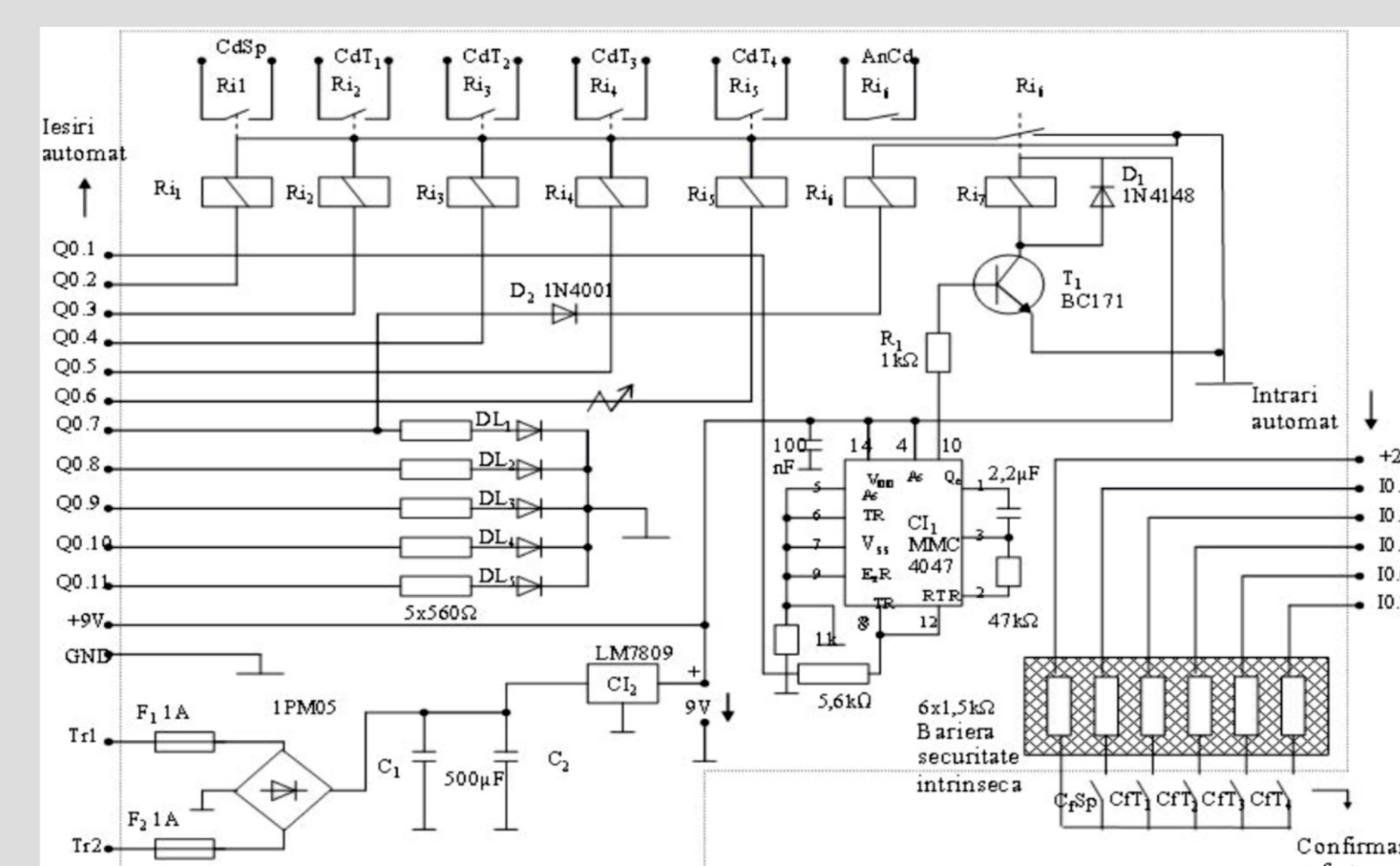


Figure 3. Interface and power circuits

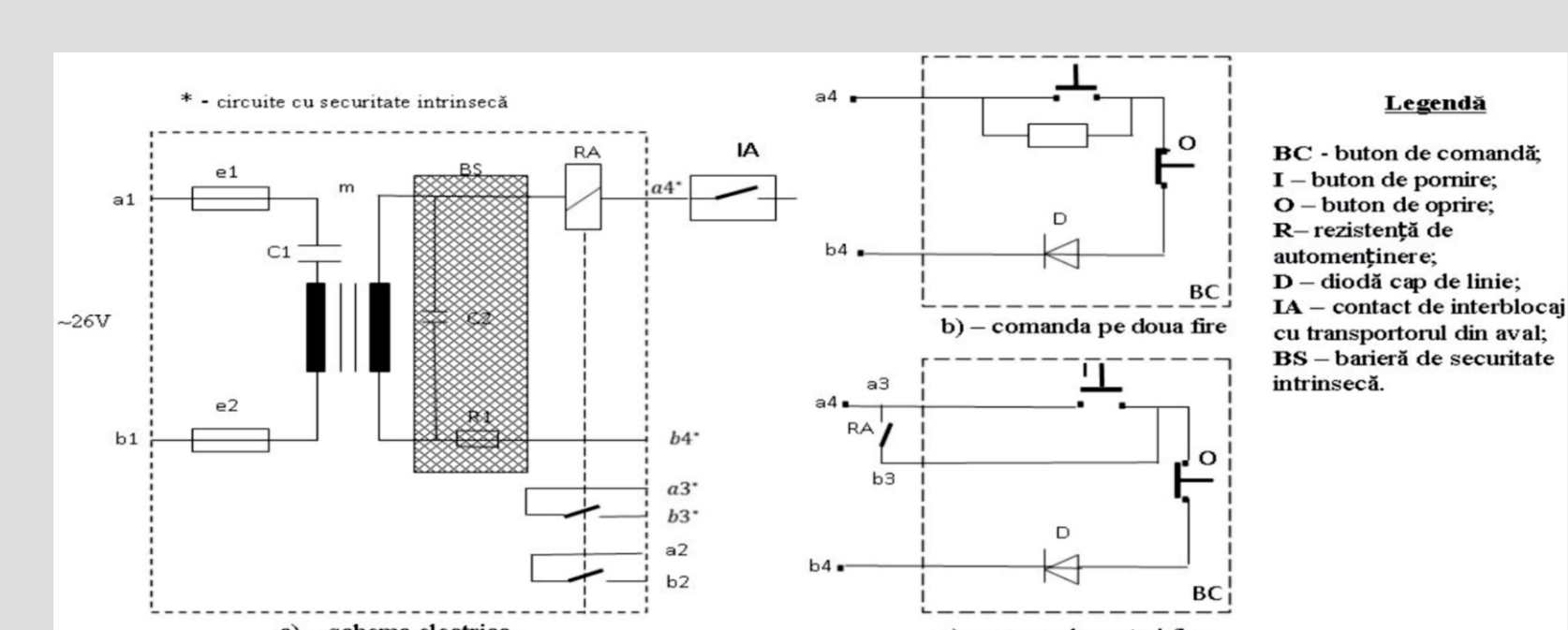


Figure 4. BCD Command Block

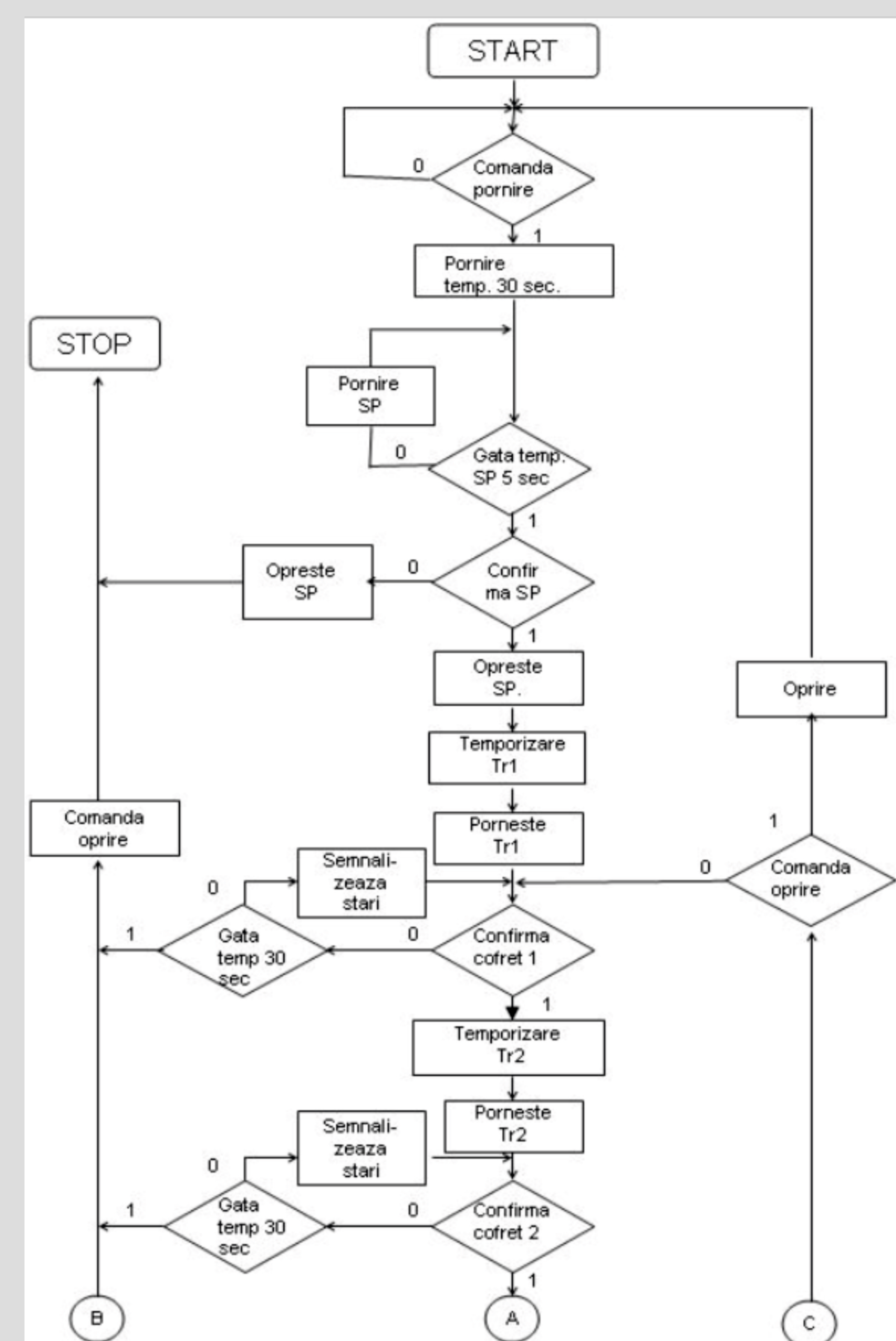


Figure 5. Algorithm