SOME ACHIEVEMENTS CONCERNING SECURITY SYSTEMS OF PREMISES

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Abstract: Securing premises against burglary has been a concern of people throughout history. The systems have evolved from simple devices to today's sophisticated, remotely controlled systems. In this paper, we present a designed and built system that ensures alarming in case of intrusion, which presents a high degree of security with low costs and low energy consumption. We also achieved a laboratory stand for the simulation of alarming when an intrusion occur in a certain space.

Key words: security, alarm, safety.

1. INTRODUCTION

A security alarm is designed to detect intrusion which is an unauthorized entry in a certain area [4], [7].

Family and property protection and security has always been important, but as technology has evolved over the last century, the function and capability of home security systems play the same role [3], [8].

From early moat and bridge security systems to today's systems that can be monitored, managed and captured with the phone in your pocket, home security has evolved greatly with technological progress and public demand for improvements.
Today's security systems are not only the product of the evolution of technology in recent years but the foundations of smart security systems have been established generations ago [5], [9].

At the end of the First World War, as the crime rate began to rise, Americans began to be increasingly open to the need for security and were eager to find new ways to protect themselves as well as their properties. In addition, several insurance companies began offering very high discounts for those installing alarm systems in their homes and company buildings. These things led to a very high demand for alarm systems [12].

Then, the owners used the services of Door Checkers, a service that consisted of checking the doors of customers by a group of night guards to ensure that they were locked. More advanced users used an installed alarm system that used electromagnetic

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contacts mounted on doors and windows that were connected to a battery and a bell. These systems were monitored by a dispatcher who sent a guard to that house when the alarm was triggered.

An intrusion detection system (IDS) is "a device or software application that monitors a network or systems for malicious activity or policy violations" [4], [10].

An alarm system consists mainly of the following components: alarm control panel; motion, vibration, shock, gas leakage, etc. sensors, an event signaling device, auxiliary components: spare accumulators, connectors, remote control. (Fig. 1).

Fig.1. Components of an alarm system

2. SOME HISTORICAL MILESTONES CONCERNING THE ALARM SYSTEMS

The history of alarm systems begins with a British inventor named Tildesley, who devised the first model for an alarm system. The system worked by connecting a series of bells to the door lock [6], [11].

The first patented alarm system was invented by Russell Augustus Pope in 1853 in Boston, Sommerville. He designed a closed electrical circuit that was based on a loop interrupted by parallel connected contacts mounted to doors and windows that were then connected to a battery and doorbell of electromagnetic type.

The Pope prototype was acquired in 1857 and further developed by Edwin Holmes who began to produce large-scale alarm systems. Because these systems at that time were very expensive, only rich people could afford their installation.

Monitoring the alarm systems was the idea of Holmes' son, Edwin T. Holmes, who managed to link security systems to existing telegraph lines in the city so he could monitor the loops of the alarm systems at night, when telegraph lines were not used. This was the beginning of today's dispatchers.

A huge leap in technology occurred in the 1970's when the first motion detectors based on ultrasonic technology were introduced, and later in the 1980's when motion detectors based on infrared technology appeared that greatly increased their ability to detect so-called positive forgeries. During the same time, alarm systems have also improved and have become cheaper and more accessible by the general public.

3. DEVELOPED OF AN ELECTRONIC SECURITY SYSTEM USING THE DSC PC585 INTRUSION CONTROL PANEL

3.1. Components

In order to achieve a closed space security system, regarding the anti-burglary security subsystem and electronic access control, we used the following equipment [1], [2], [3]:

a) Burglary control plant (DSC PC585);

b) LED Smart Keyboard (DSC PC1555 RK);

c) Magnetic contact (CM) - an active sensor consisting of a fixed REED relay and a rigidly mounted mobile magnet on the movable side of the door;

d) PIR Microwave Detector (Paradox Vision 525D) - combines passive infrared detection with microwave detection to detect people even behind glazed surfaces;

e) Shock/vibration detector DS (VIBRO) - has built-in piezoelectric type transducer;

f) Broken glass detector DGS (Crow GBD Plus) - it works on the principle of spectral analysis of the sound produced by the shattering of the glass surface (spectrum between 1 and 5 Khz);

g) Panic button with BP retention (Seco-Larm SS-077);

h) Burglary siren with flash SE (LD-95);

i) Battery (SP5A 12V, 5Ah);

j) Transformer 220V/16V, 20VA;

k) Electromagnetic lock Fail-SafeM

l) Auxiliary power supply 12V, 2A;

m) Relay 12V d.c.

The diagram of the system we have developed for securing closed premises is shown in fig.2.

3.2. Working principle

The system is supplied by the power grid through the transformer providing the specific voltage of16 V required by control panel.

When starting, the system self-diagnoses inputs and outputs to signal their states, through the smart keyboard, after which it is in the standby state - disarmed. The system was configured to monitor inputs with double end resistors (DEOL - that is, a 5.6 kΩ resistor in series with the detector and a 5.6 kΩ resistor in parallel).

The sensors were connected to the terminals of the alarm relays by the DEOL method.

It should be noted that if the resistors are not mounted in the detector housing, (they are protected with tamper contact when opening the housing), and they will be mounted at the terminals of the plant then security is compromised because it can sabotage the alarm signal right on the cable route.
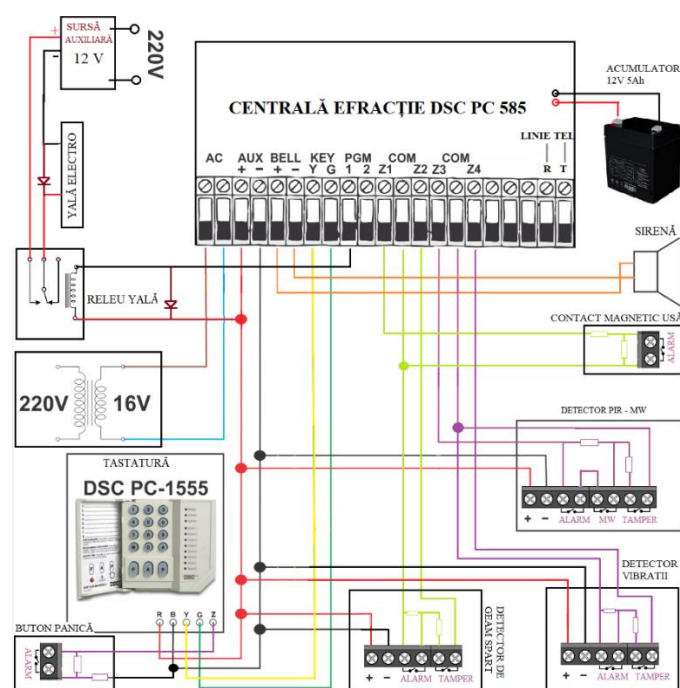
Fig. 2 Scheme of the system designed for securing premises

Inputs were programmed as follows:

- The input Z1 was programmed as Delay-type zone - timed input that gives the user the time (preset) it takes to enter the code. Not entering a valid code over the given time generates an alarm.

- Input Z2 was programmed as an Instant zone - activation of the input when the alarm system is armed causes the system to generate an alarm in the system, and, to feed, through the terminals Bell+ and Bell -, the inside siren and to open the communication relay for transmitting to the dispatcher the automatic alarm codes that distinguish the account and the type of alarm.

- Input Z3 has been programmed as an Inner zone - activation of the input when the alarm system is armed proceeds exactly like the Instant zone, less in the situations when there is a Delay-type zone that triggers before, tracking the input time. Here, the PIR-MW dual-tech detector was connected.

- Input Z4 was programmed as a 24H Seismic zone - activation of the input in any state of the system, (armed or disarmed), generates an audible alarm that sends to the dispatcher a seismic alarm signal. In this zone the VIBRO vibration detector was connected. This type of detector is mounted on each wall of the premises, including the ceiling and floor, as well as on the cash register.

- Keyboard input (Z5) has been programmed as a 24H Hold-up Panic zone - enabling input in any system state (armed or disarmed), it generates an alarm that can be silent or audible (as needed) and sends a panic signal to the dispatcher. On this zone the panic button with restraint SS-077 was connected.

✓ Scenario 1: If you try to penetrate the premises by forcing the door, then the input 1 is triggered by the magnetic contact, the control plant reads the resistance of 11.2 kΩ, and triggers the start of the input time after which, when it is over, not entering the code, the system will feed the siren and at the same time sends the alarm signal.

✓ Scenario 2: If you try to penetrate the premises by drilling the door or walls, the PIR-MW dual-tech motion detector will detect the movement and generate alarm on the 2nd input.

✓ Scenario 3: If you try to penetrate the premises by breaking a glazed surface, the broken glass detector will detect it and generate alarm on the 3rd input.

✓ Scenario 4: If attempting to break through any wall, floor or ceiling, seismic detectors detect the vibrations and trigger alarm on input 4.

✓ Scenario 5: If you attempt to rob staff in the premises, they have the silent panic button SS-077 for sending the panic signal to the dispatcher activating input 4, without the siren creating panic among the attackers.

4. LABORATORY STAND FOR THE SIMULATION OF AN ANTI-BURGLARY SECURITY SYSTEM

We have designed and achieved a laboratory stand for simulating an intrusion alarm in a space using an integrated circuit 4093 as well as magnetic and IR sensors.

Fig 3 shows the laboratory stand, also the electric diagram.

The scheme features the alarm system built on an integrated four-gate YES-NO circuit with Trigger Schmitt. In the circuit there are timing elements: resistors and capacitors, as well as an alarm siren.
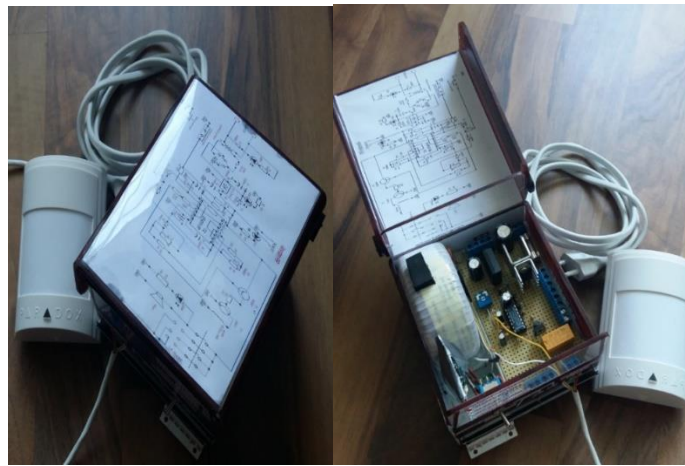

Fig.3. Laboratory stand for simulating an intrusion alarm

5. CONCLUSIONS

A burglary and access control detection and alarm system can be used in homes, commercial premises, industrial premises, etc., for the monitoring and detection of thieves, vandals and the protection of personnel against criminals.

The developed system can be part of a larger security project to which a video monitoring system can be added for increased efficiency.

The law obliges all small or large economic operators to install, by authorized personnel, a system of detection and warning of burglary as long as cash is used.

New generation security systems can be controlled using the phone or other equipment that allows interconnection with them. Using a local renewable energy source could give the system extra security.

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