

Methods and Means for Charging and Control of Accumulating Batteries for Mobile Phones

Stoyan S. Gishin¹, Dimitar I. Dimitrov², Sava Savov³

Abstract - In the report are examined contemporary methods for optimal charging and testing of hermetic accumulating batteries. These batteries are used as a charging module of contemporary mobile communication devices (for example GSM devices). Direct application of the above-described methods is charging and control of the supplying module such as nickel-metal hybrid hermetic accumulating batteries. The examinations for charging and testing are based on the process of management and control of the sources of impulse current. The continuance of the positive current impulses is automatically regulated by microprocessor system. It controls the dynamic situation of the electrical-chemical system. Impulse current' sources are programmable. They are used to maintain the computer control and process management. Methods and means (apparatuses) are realized as laboratory models in order to be used for education of students from the Communication technique and technology faculty, Computer systems and management, Electronic technique and technology, where students study electro-chemical current sources, which is a part of the University curricula for the above-mentioned faculties.

I. INTRODUCTION

In the past years electrochemical current sources (ECHCS) found a great practical application in telecommunications, mobile phones, video cameras and etc. The basic requirement for ECHCS is to be hermetically-sealed, which allows the usage in different geometric position. The hermetic accumulators were created thanks to the following technical and technological solutions:

- a. jelly-formed electrolyte from sulphur acid;
- b. lead alloys are used without any content of for cast (mould) of positive and negative current-conducting bars for accumulators.
- c. methods were developed for the charging of the accumulators, without gas-emissions with microprocessor control and process management.

d. optimal ratio between active mass and effective additions, leading to the minimum gas-emissions through the charge with the speed of the self-discharge

e. constructions are developed of the accumulators and batteries, excluding emission of steam and drops of electrolyte through re-combination of ions.

Practically through the production of hermetic lead accumulators the great appliance is found in the lead-calcium alloy, containing 0,1-0,2 % calcium and minimum quantity of added tin.

I. Leading company in production of capsulated, hermetic starter accumulators is EXIDE – USA, that sells its production through out the world, incl. in Bulgaria through CENTRA – EXIDE EUROPE Company. The basic advantages of these accumulators are that they have more than 20 % higher start current compared to accumulators with the same nominal capacity, but produced from other accumulator's companies. The hermetic accumulating batteries that are wide spread in mobile GSM apparatuses are lead, nickel-metal hydride, li-ion and etc.

During the conducting of experimental researches and tests is used the hypothetic scheme shown on Fig. 1

Typical for the scheme for realization of the impulse current with computer control and process management is that it allows the usage of currents with different shapes, shown on Fig. 2 and Fig. 3.

Theoretical calculations and practical researches show that in the beginning and in the end of the charging of the CHECHCS resistance of the electro-chemical system is the biggest and respectfully the electrochemical processes are the most often met. This shows that electrolysis processes for separation and respectfully fulfillment of CHECHCS with oxygen and hydrogen are the most common in the beginning and in the end of the electrochemical processes during charging.

Considerable improvement of electrical and exploitation characteristics of chemical current sources, as well as economy of electro energy are obtained through usage of basic electro technological processes of DC current with periodically changing polarity. The continuity of the positive current impulses is bigger that the continuity of the negative current impulses, that are constant during the processe

¹Stoyan S. Gishin. Associate Professor of Electrical technology Department of El. Apparatuses Fac. Electrical Technique, Technical University of Sofia, Bulgaria, e-mail: mytreo@mail.bg

²Dimitar I. Dimitrov is with the Faculty of Communications and Communications Technologies, Technical University of Sofia, Bulgaria, 8 Kliment Ohridski Str., 1000 Sofia, Bulgaria, e-mail: ddim@tu-sofia.bg

³Sava Dimitrov Savov, Associate Prof. Physics, Physics Faculty, "St. Kliment Ohridski" Sofia University, Sofia, Bulgaria

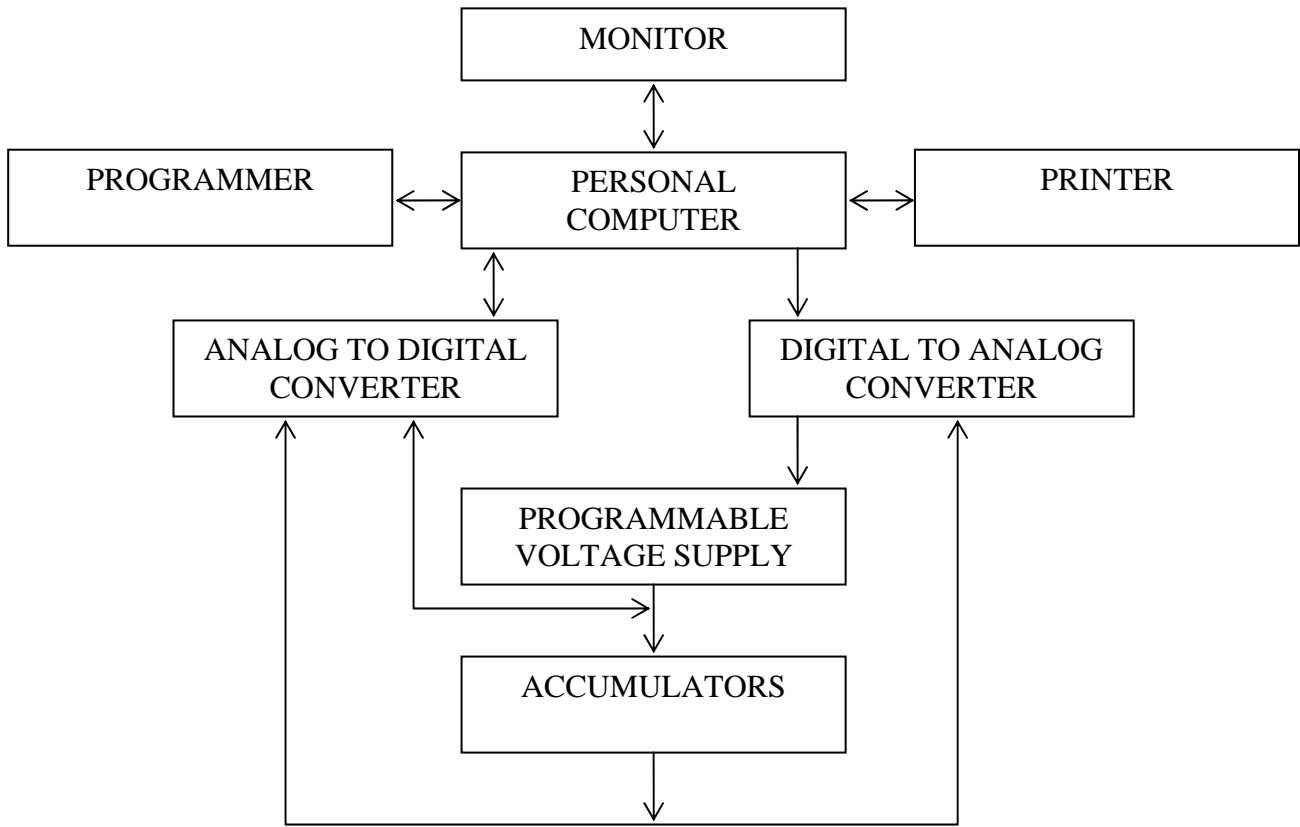


Fig. 1.

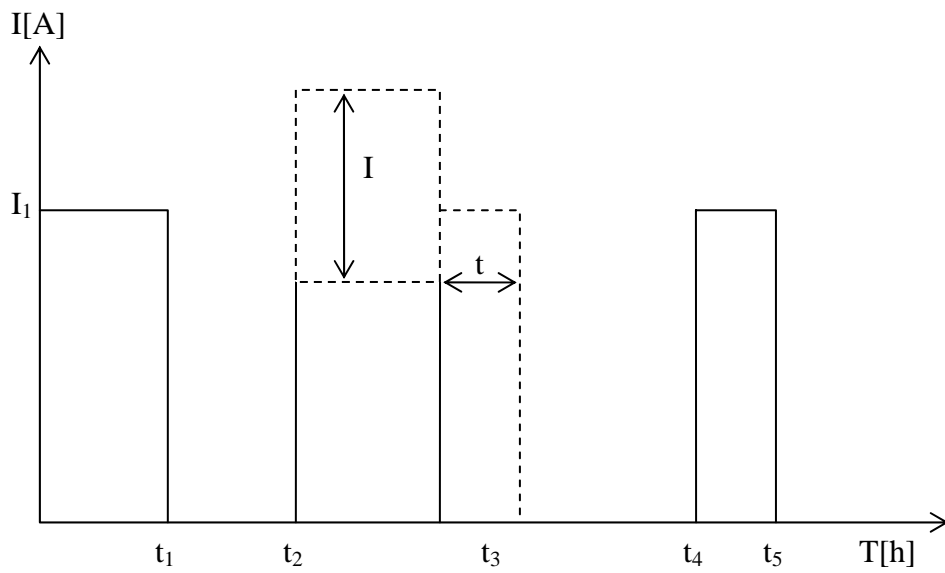


Fig. 2.

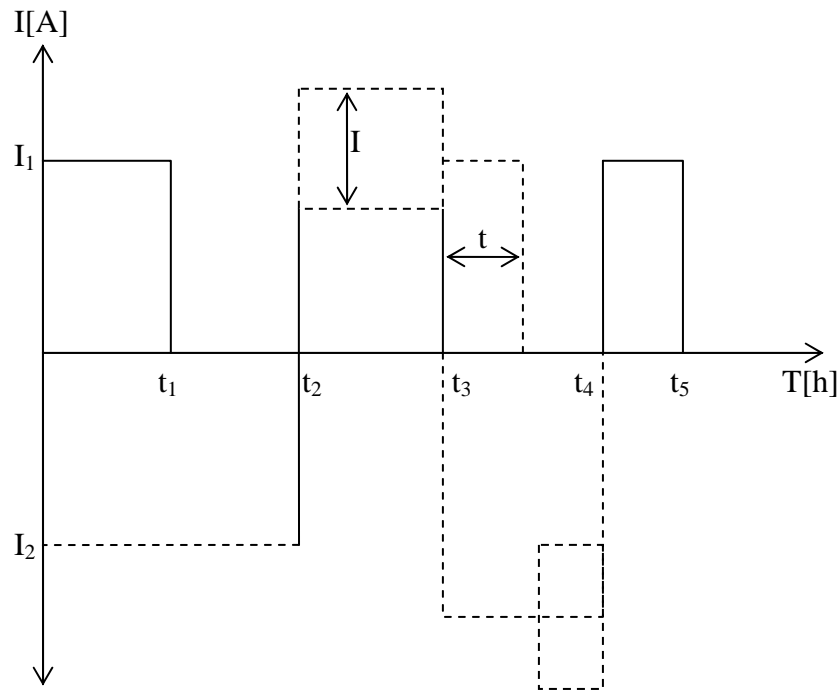


Fig. 3.

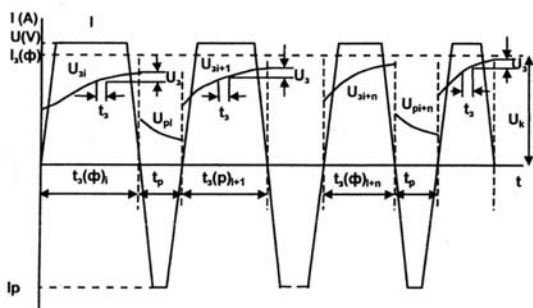


Fig. 4.

In the Sofia Technical University is developed a method for block electro forming and charging of accumulators and batteries with usage of impulse current. The main point of this method, which is registered as a patent, consist in the fact that the continuity of the positive current impulses is calculated automatically, as with microprocessor system is followed the dynamic situation of the electrochemical system – Fig. 4.

Following the dynamic situation of the accumulator is a process that consists of periodical (10-30 sec.) measurement of the change in the electric voltage ΔU and when this growth is less that preliminary given value is changes the polarity of the charged current impulse and discharged impulse is passed to the accumulators.

Some of the GSM devices producers recommend to discharge fully the used accumulating batteries and after that to charge them for a definite time. We consider that this is not right for the ECHCS from the exploitation point of view.

In accumulating batteries for mobile GSM devices it is correct to maintain full charging of the accumulating batteries that would lead to the reduction of the conducting of the

prejudicial electrochemical processes. All this leads to reduction of the flow of the out of side processes and respectively the gas emission that fills the accumulating batteries and thus increasing the inner resistance of the accumulating batteries. The internal ohm resistance is increasing considerably and when the accumulating batteries are deeply discharged. There is considerable growth in the internal resistance of the hermetic batteries in the end of the charge and especially during recharging. In the end of the charge of the batteries if they are not switched off, irrespectfully of the fact that the market and used charging devices reduce the value of the current, the temperature of the electrochemical system is rising. This temperature growth automatically changes the internal ohm resistance of the batteries, which allows changing the dynamic state of the electrochemical system and the current value doesn't decrease. This leads to the continuation of the charging process in not-optimal state of the electrochemical system and thus reducing the exploitation life of the batteries.

According to the conducted experimental and theoretical researches two main conclusions can be derived:

1. Not to allow deep discharge and recharge of the batteries, that leads to the reduction of their exploitation life.
2. It is preferable to regularly optimally fully charge the batteries that would increase their exploitation life.

REFERENCE

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