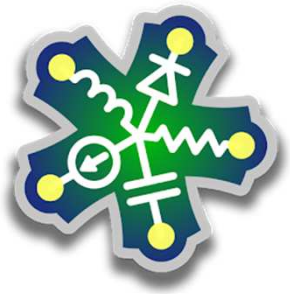
Incercarea alternatoarelor
Relee regulatoare de turatie
Scheme bloc de SAEE

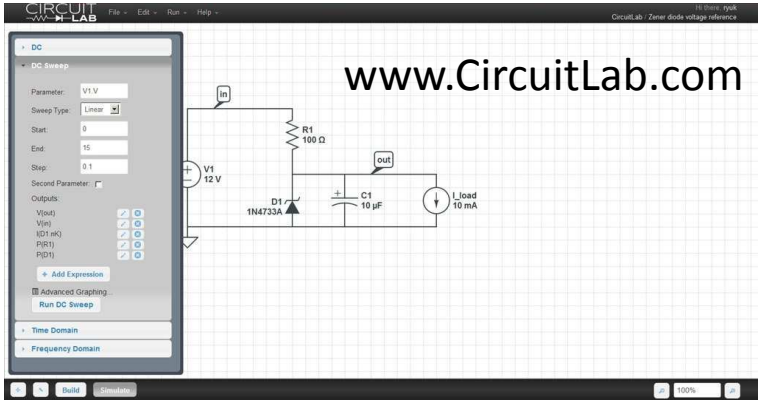
Curs 5

Google: **electrical circuits app; circuit simulator & schematic editor**

1 Electrical Technology
2 ElectroDroid
3 EveryCircuit
4 Lessons In Electric Circuits
5 DroidTesla
6 Electronics Toolkit
7 Electrical Pro
8 Electrical Engineering Pack
9 Electrical Wiring
10 Electrical calculations
11 Electrical Calculation
12 Electrical Engineering
13 PICmicro Database
14 Electrical Wiring Diagram
15 Mobile electrician
16 Electronics Calculator

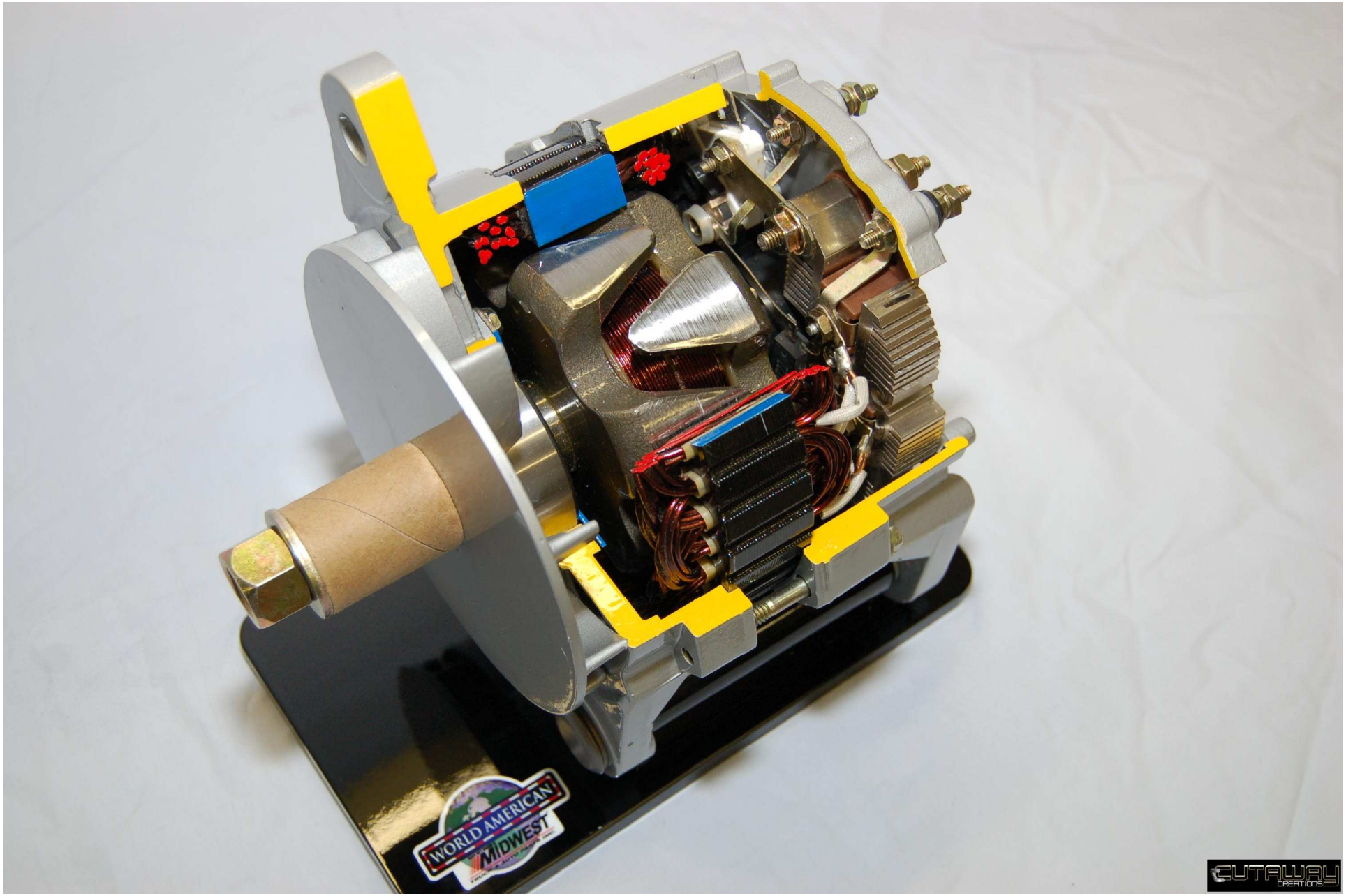








OrCAD, SPICE, MatLAB
AutomationStudio etc.


WORLD AMERICAN
MIDWEST
CUTAWAY
CREATIONS

Schema sistemului de alimentare cu energie electrică impune utilizarea alternatorului cu redresor.

În acest mod consumatorii sunt alimentați de la bornele de curent continuu.

După cum vom avea sau nu cuplată o sarcină de curent continuu, vom deosebi o funcționare în sarcină sau o funcționare în gol a generatorului (alternatorului), studiul acestor regimuri fiind cel care interesează, de fapt, la un alternator.

2.3.1. Deducerea ecuațiilor pe partea de curent continuu

Vom folosi relațiile (2.44), (2.81), (2.81'), (2.87):

$$U_f = K_1 n \phi_e - Z_f . I_f$$

$$U_g = 1{,}35 U_l$$

$U_l = U_f$ *la conexiunea in triunghi*

$U_l = \sqrt{3}\, U_f$ *la conexiunea in stea*

U_f – tensiunea de faza
K_1 – constanta
n – turatia rot.
$Ø_e$ – flux de excitatie rot.
Z_f – impedanta infas. de faza
I_f – curentul de faza

$$I_l = 0{,}81 I$$

$I_l = I_f$ *la conexiuni in stea*

$I_l = \sqrt{3}\, I_f$ *la conexiunea in* Δ

Din relațiile a II-a, a III-a și a IV-a de mai sus, obținem expresia tensiunii generatorului pe partea de curent continuu:

$$U_g = K_{fu} U_f \qquad (2.95)$$

unde:

$k_{fu} = 1{,}35$ pentru conexiunea în Δ; (2.96)

$k_{fu} = 2{,}34$ pentru conexiunea în stea. (2.97)

Din relațiile (2.87), (2.88), (2.89) obținem expresia curentului de fază în funcție de cel de linie:

$$I_f = k_{fi} . I \qquad (2.98)$$

unde: $k_{fi} = 0{,}81$ pentru conexiunea în stea;

$k_{fi} = 0{,}47$ pentru conexiunea în Δ.

Înlocuind relațiile (2.97) și (2.98) în relația (2.44) obținem expresia tensiunii alternatorului la ieșirea din redresor:

$$U_g = k_{fu} . k_1 n \phi_e - k_{fu} Z_f k_{fi} . I \qquad (2.99)$$

sau:

$$U_g = k_g . n \phi_e - Z_e . I \qquad (2.100)$$

în care:

$$k_g = k_{fu} k_1$$

$$Z_e = k_{fu} k_{fi} . Z_f$$

Relația (2.100) poate fi scrisă mai simplificat:

$$U_g = U_{g0} - Z_e . I \qquad (2.101)$$

în care U_{g0} este tensiunea de mers în gol:

$$U_{g0} = k_g . n \phi_e \qquad (2.102)$$

Tensiunea alternatorului la mers în gol U_{g0} este proporțională cu turația de antrenare și cu fluxul inductor ϕ_e (rel.2.102). La mers în sarcină (relațiile 2.100 și 2.101), tensiunea generatorului este dependentă de factorii care influențează U_{g0}, dar mai apare o cădere de tensiune pe impedanța echivalentă Z_e, proporțională cu sarcina I și cu Z_e și efectul reacției indusului.

Variabile:

n - turatia

I_e – curentul de excitatie

U_g – tensiunea generata

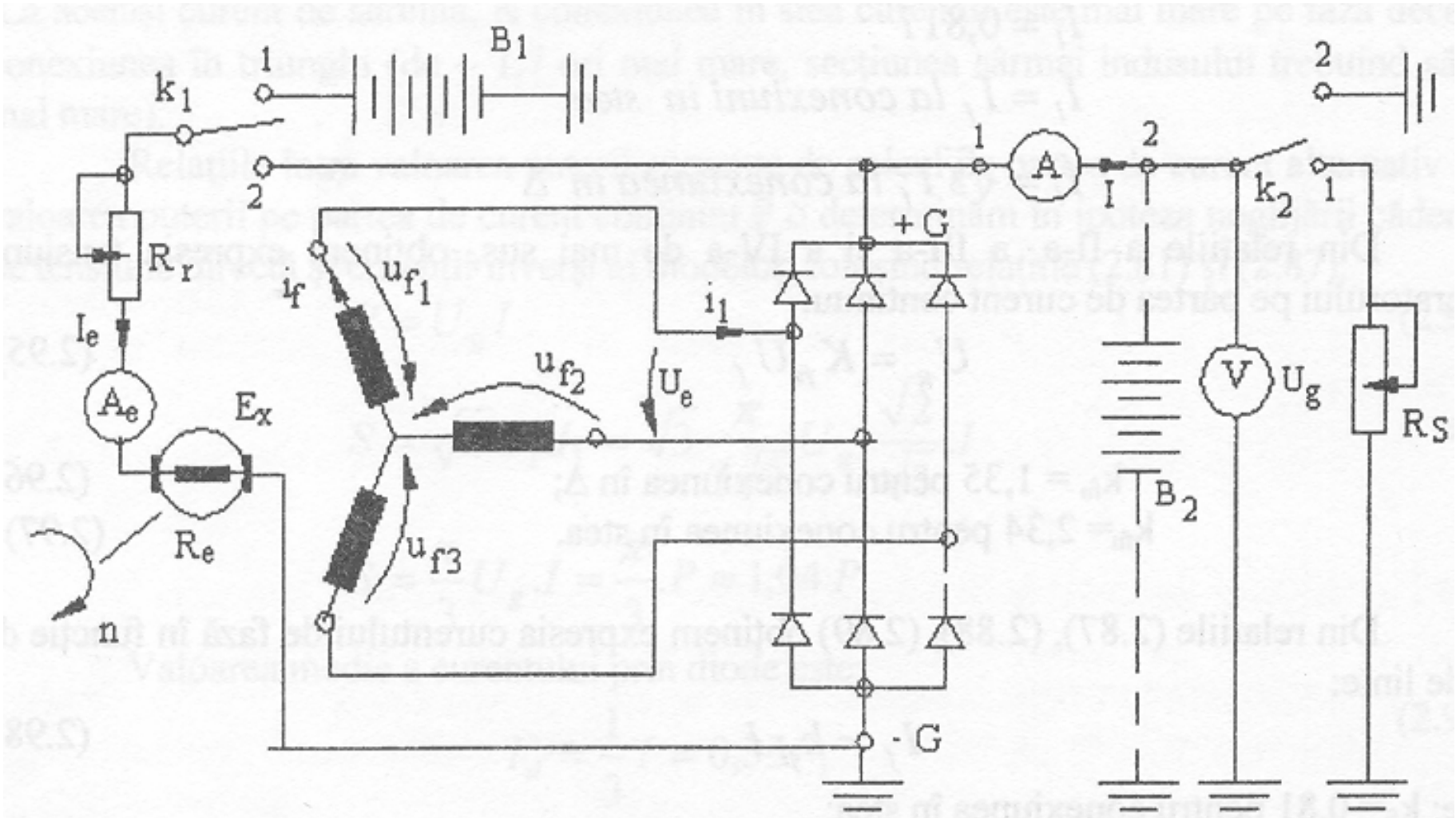


Fig. 2.39. Schema electrică pentru încercarea alternatorului.

Caracteristica de excitatie

$$U_{g0} = f(I_e),\ n = ct.,\ I = 0$$

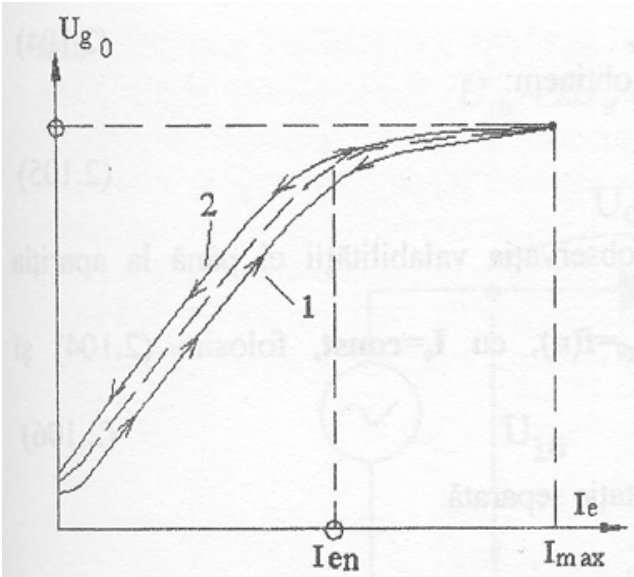


Fig 2.40. Obținerea caracteristicii de mers în gol.

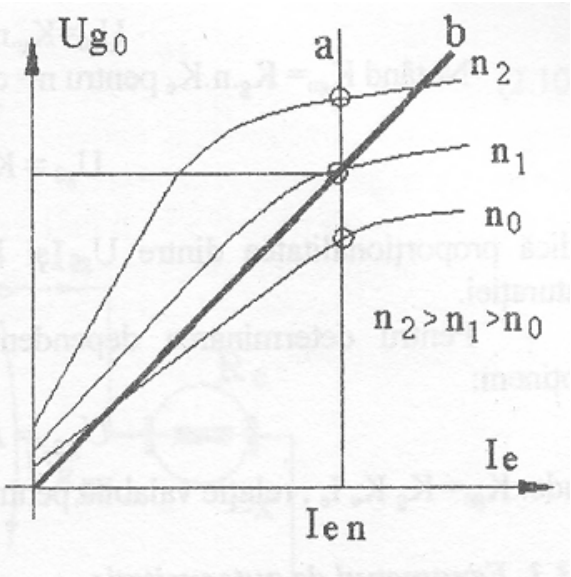


Fig. 2.41. Caracteristica de mers în gol $U_{go} = f(I_e)$, $n = ct.$

Caracteristica de mers in gol

$$U_{g0} = f(n),\ I_e = ct.,\ I = 0$$

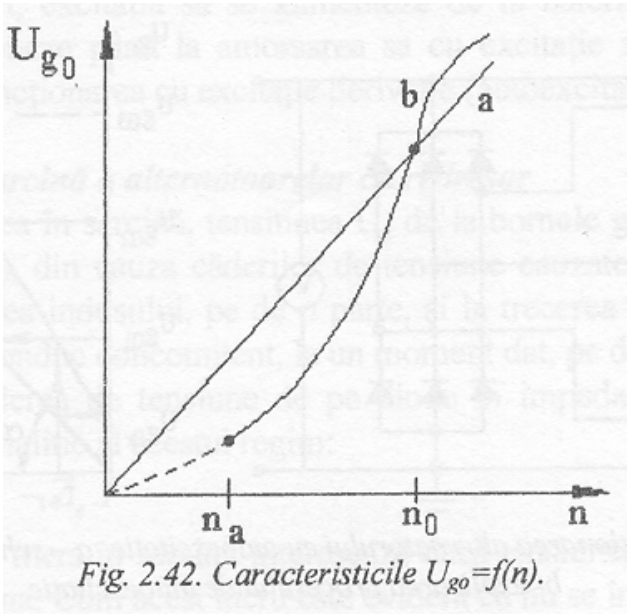


Fig. 2.42. Caracteristicile $U_{go}=f(n)$.

Caracteristica externa

$$U_g = f(I),\ n = ct.,$$
$$I_e = ct.(excit.\ indep.)$$
$$Uex=Ug\ (autoexcit.)$$

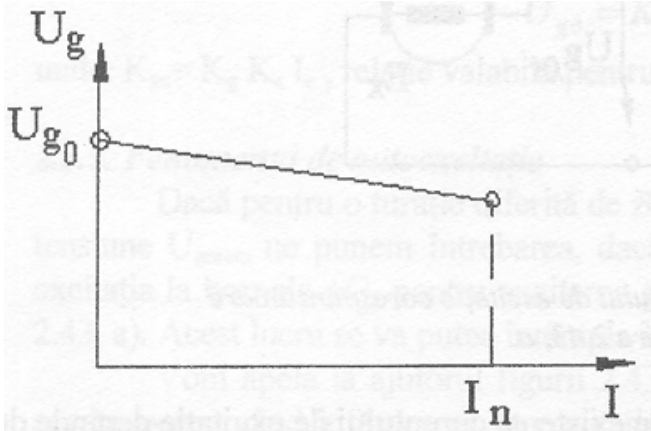


Fig. 2.45. Caracteristica externă a alternatorului.

Caracteristica de debit

$$I = f(n),\ U_g = ct.=U_{gN},\ I_e = I_{eN}$$

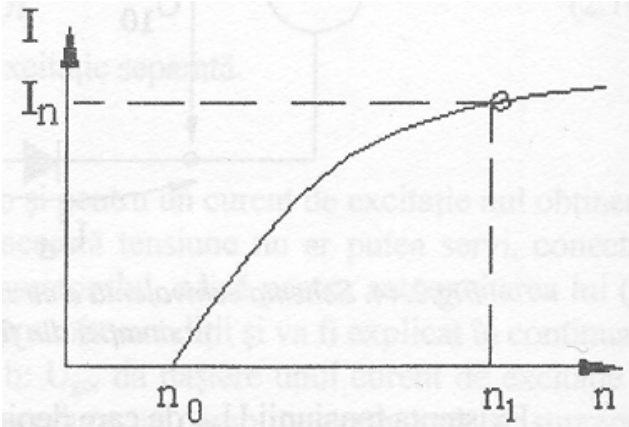


Fig.2.46. Caracteristica de debit a alternatorului.

Caracteristica de scurtcircuit

$$I_{sc} = f(n),\ U_g = 0,\ I_e = ct. < I_{eN}$$

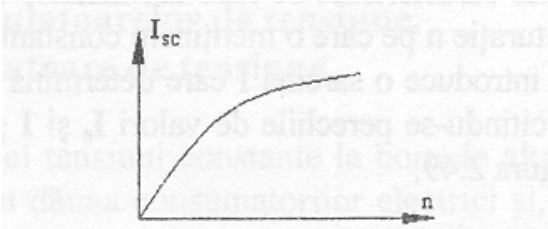


Fig. 2.47. Caracteristica de scurtcircuit.

Caracteristicile de reglaj

$$I_e = f(n),\ I = ct.,\ U_g = U_{gN} = ct.$$

$$I_e = f(I),\ n = ct.,\ U_g = U_{gN} = ct.$$

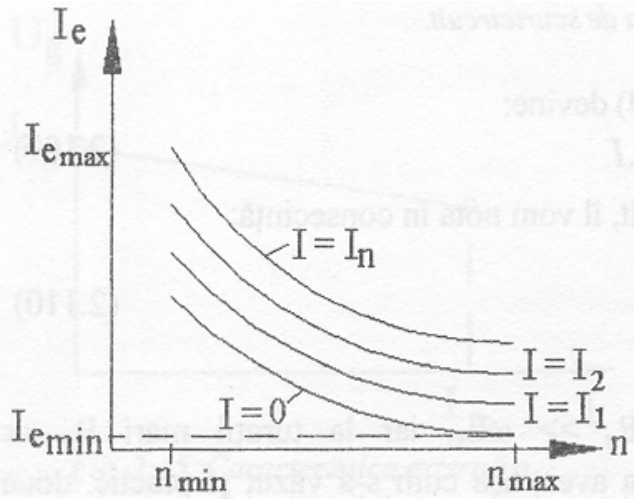


Fig. 2.48. Caracteristica de reglaj: $I_e = f(n)$, $I = ct.$

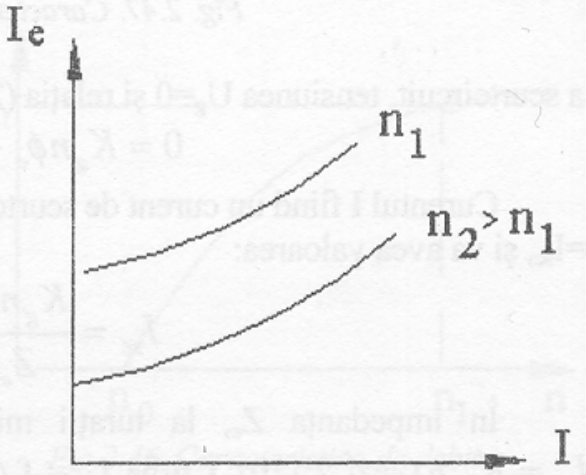


Fig. 2.49. Caracteristica de reglaj: $I_e = f(I)$, $n = ct.$

Releul Regulator de Tensiune

Rolul si necesitatea RRT

Pozitia RRT: pe ramura pozitiva
pe ramura negativa

pe excitatie
pe iesire

metoda de reglaj: liniara
in comutatie

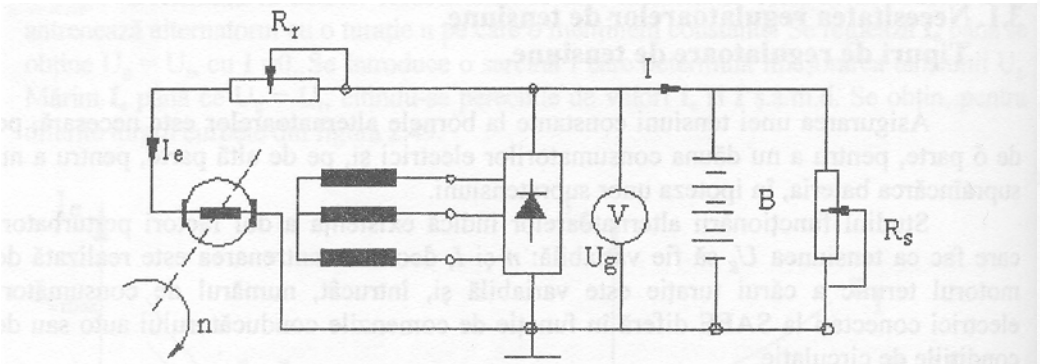


Fig.3.1. Schemă explicativă pentru reglarea normală a tensiunii alternatorului cu un reostat R_r

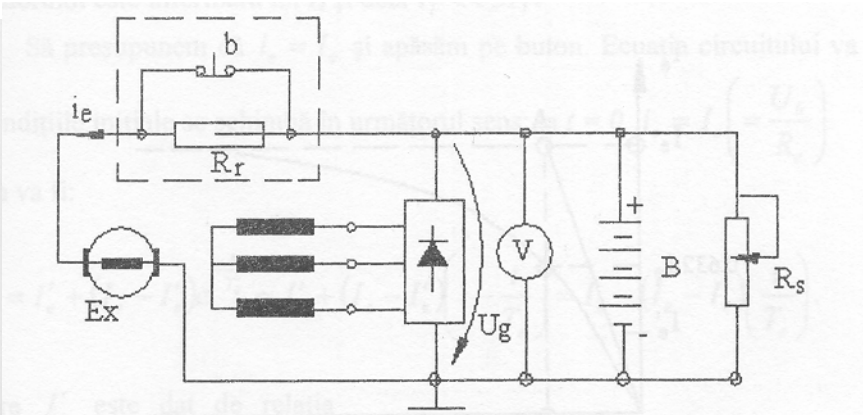


Fig.3.2. Schemă explicativă pentru reglarea normală a tensiunii alternatorului utilizând un rezistor fix.

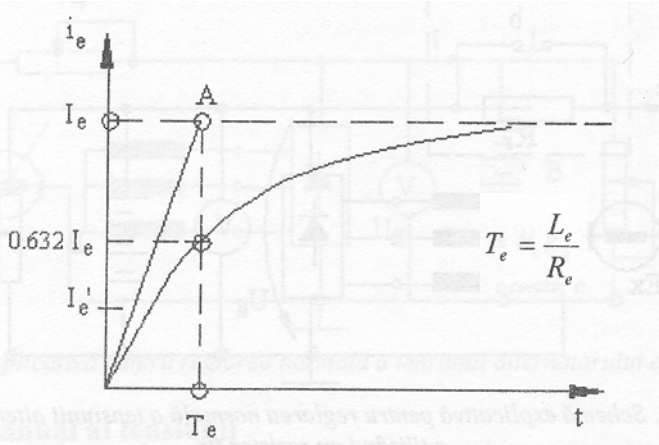


Fig. 3.3. Creşterea curentului i_e şi constanta de timp T_e

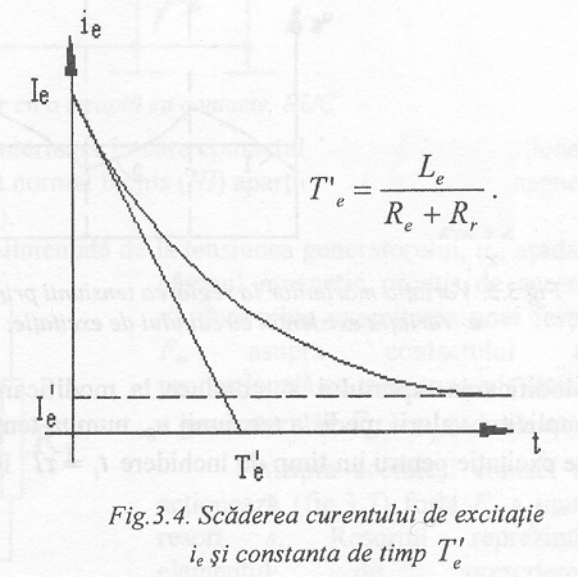


Fig.3.4. Scăderea curentului de excitaţie i_e şi constanta de timp T'_e

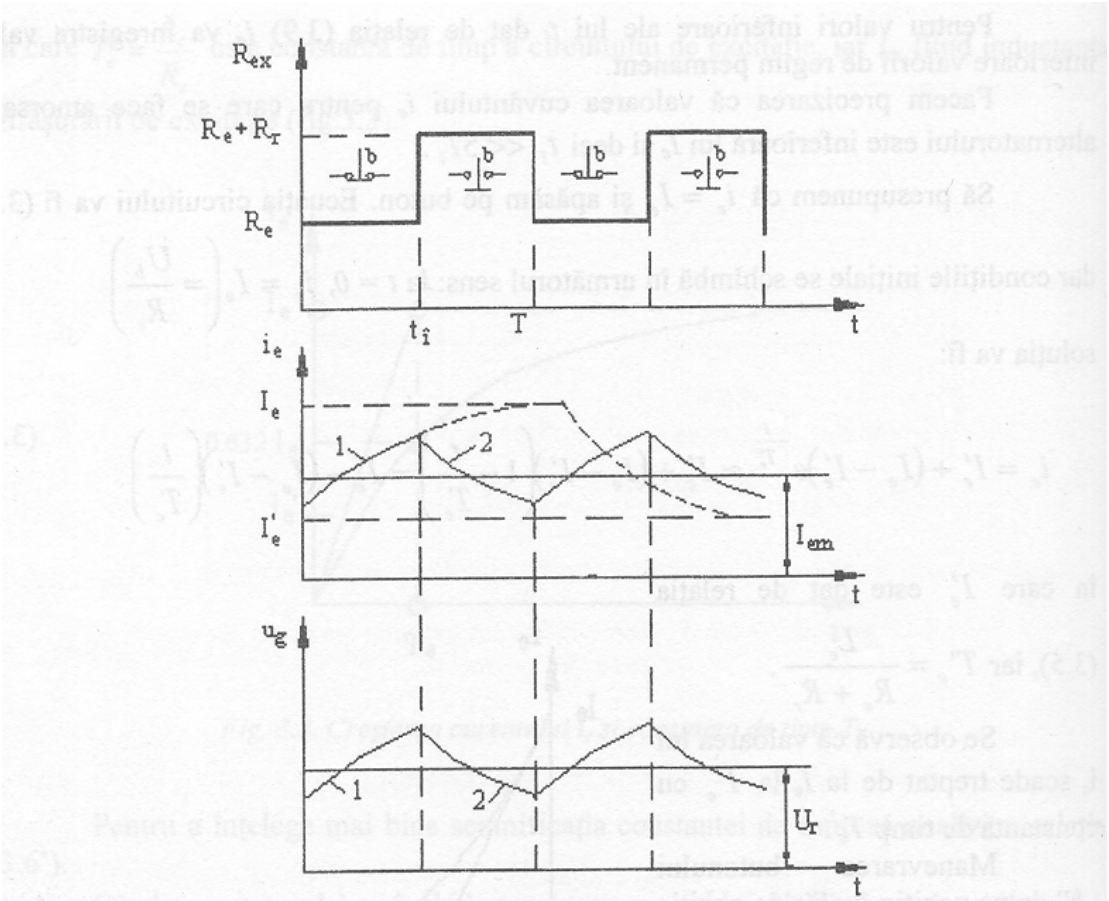


Fig.3.5. Variaţia mărimilor la reglarea tensiunii prin procedeul din schema din figura 3.4: a- variaţia existenţei circuitului de excitaţie; b- variaţia lui i_e; c- variaţia u_g

RRT cu o treapta

$I_{e\,min} = U / R_r$

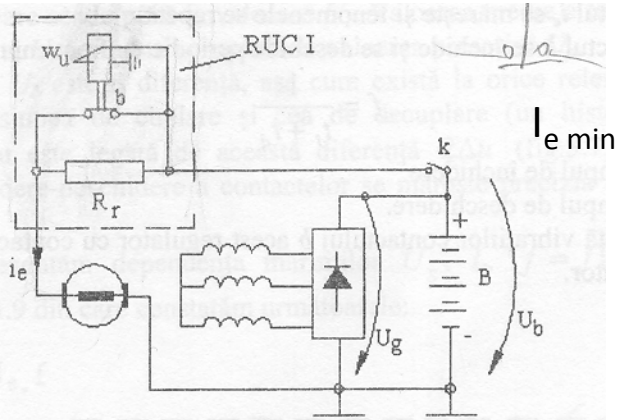


Fig.3.6. Regulator cu o treaptă cu contacte, RUC

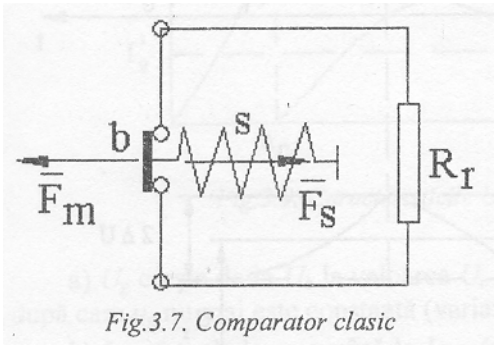


Fig.3.7. Comparator clasic

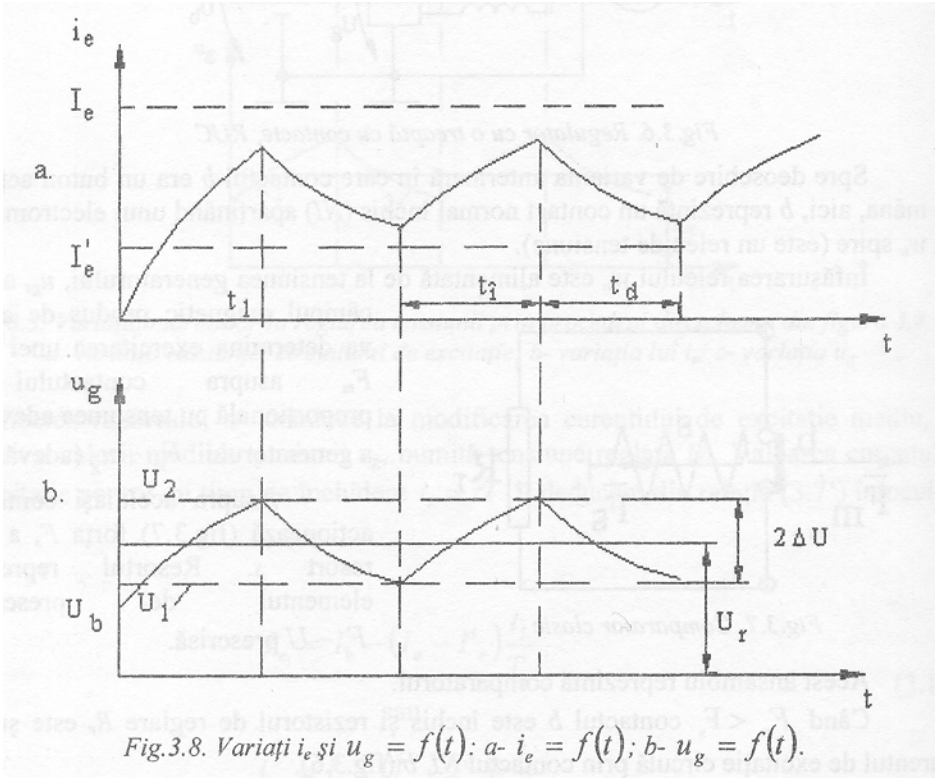


Fig.3.8. Variaţi i_e şi $u_g = f(t)$: a- $i_e = f(t)$; b- $u_g = f(t)$.

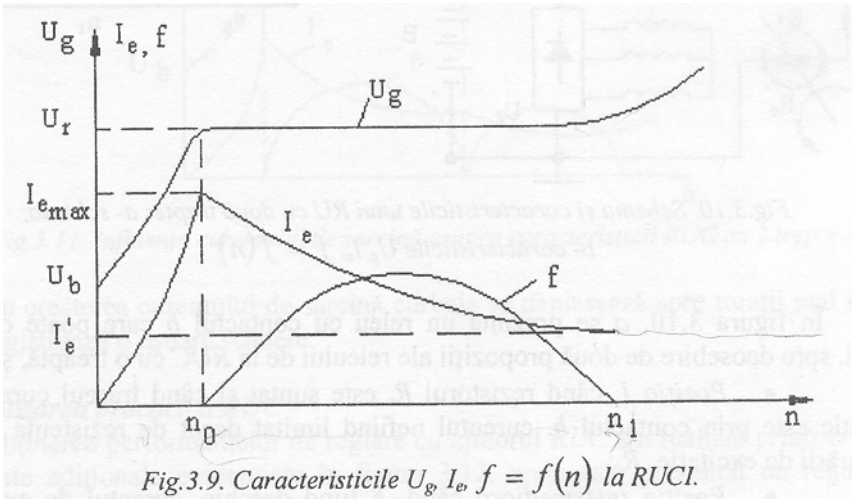


Fig.3.9. Caracteristicile U_g, I_e, $f = f(n)$ la RUCI.

RRT cu doua trepte

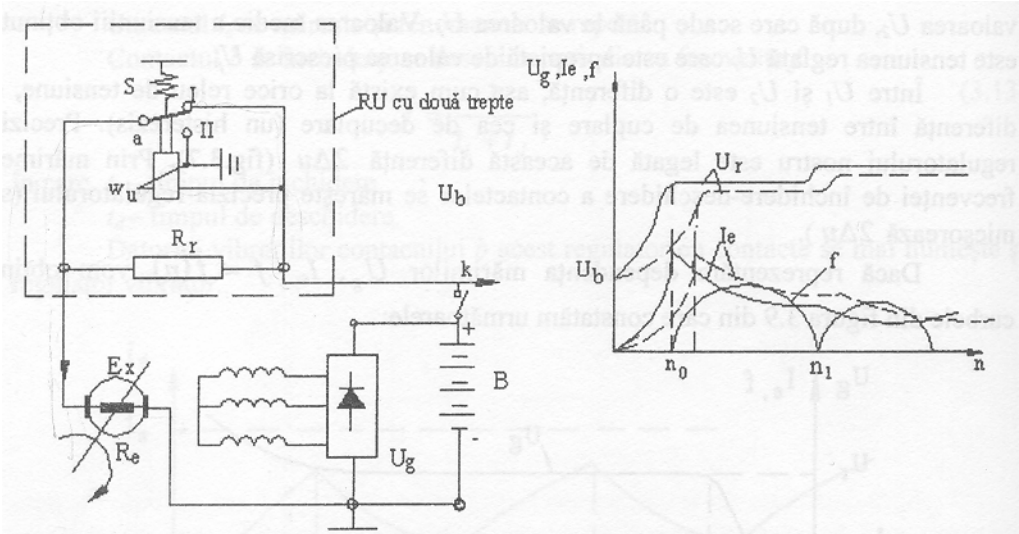


Fig.3.10. Schema şi caracteristicile unui RU cu două trepte: a- schema; b- caracteristicile $U_g, I_e, f = f(n)$

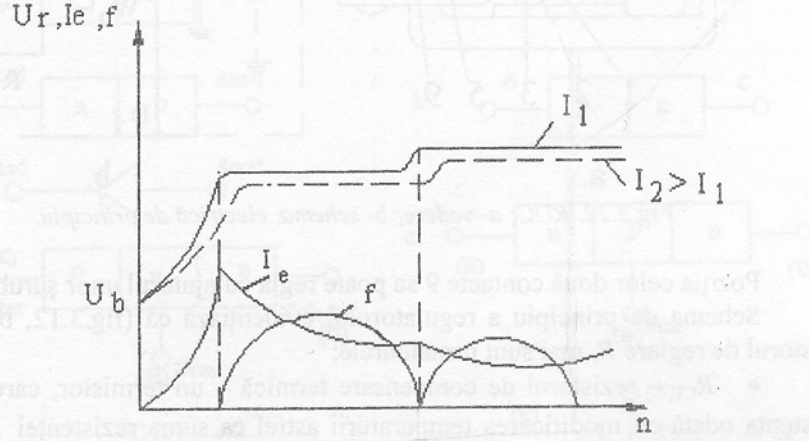


Fig.3.11. Influenţa curentului de sarcină asupra caracteristicii RUC cu 2 trepte

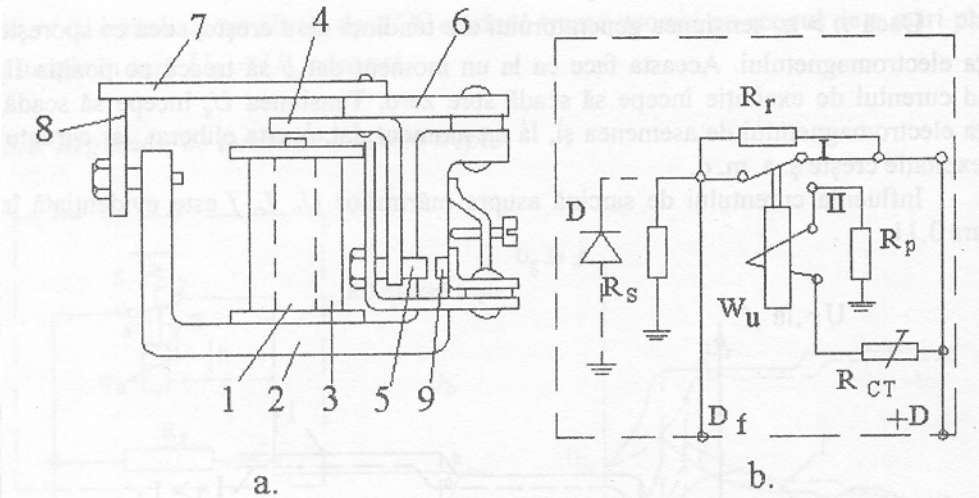
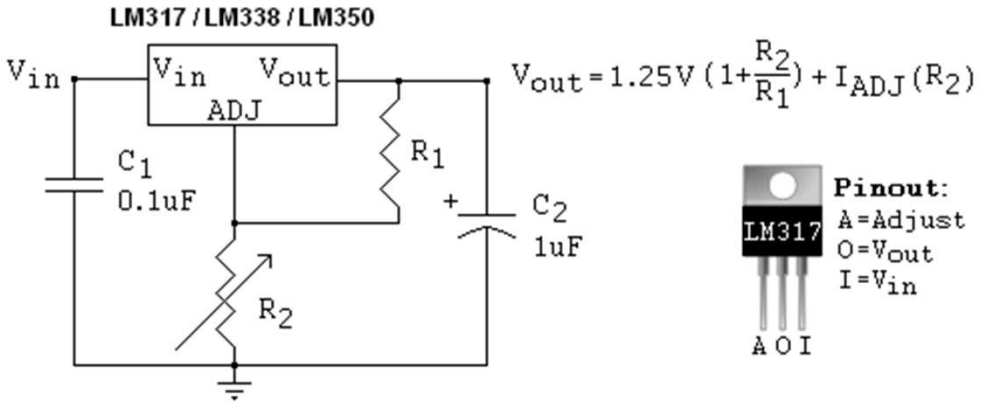
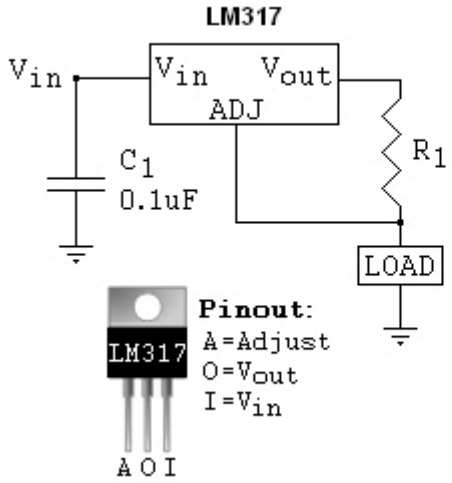


Fig.3.12. RUC: a- vedere; b- schema, electrică de principiu.

Regulator de tensiune



Regulator de curent



$$I_{OUT} = \frac{V_{REF}}{R_1}$$

V_{REF} = 1.25V for LM317

RRT electronic

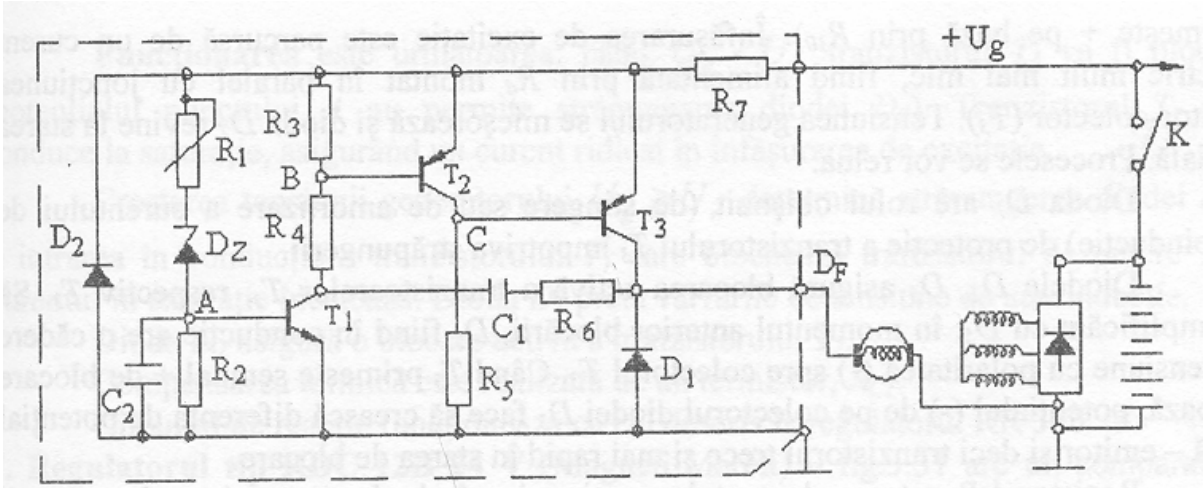


Fig.3.28. Regulator Motorola.

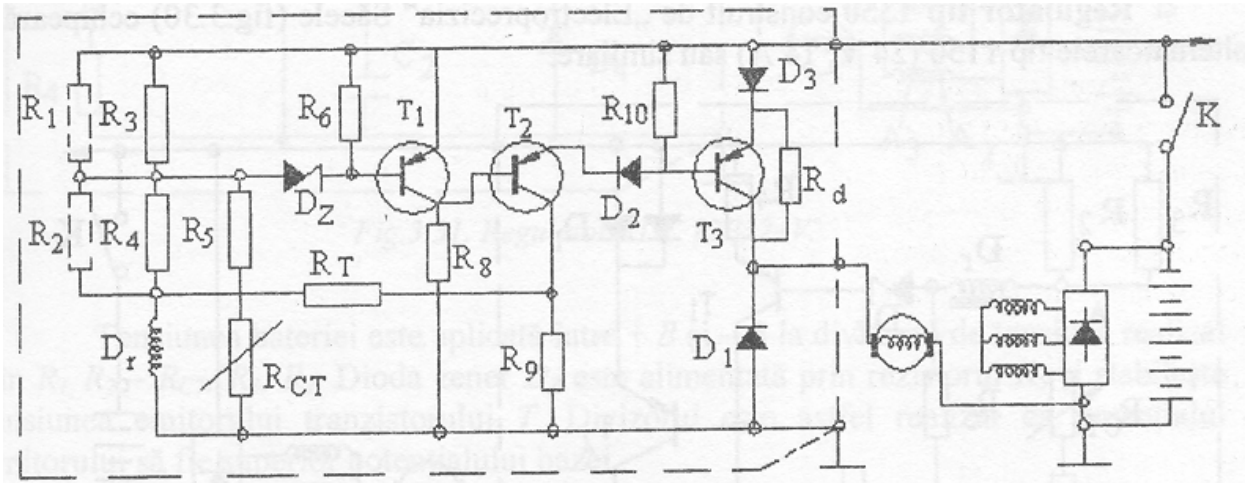


Fig.3.29. Regulator RR 350.

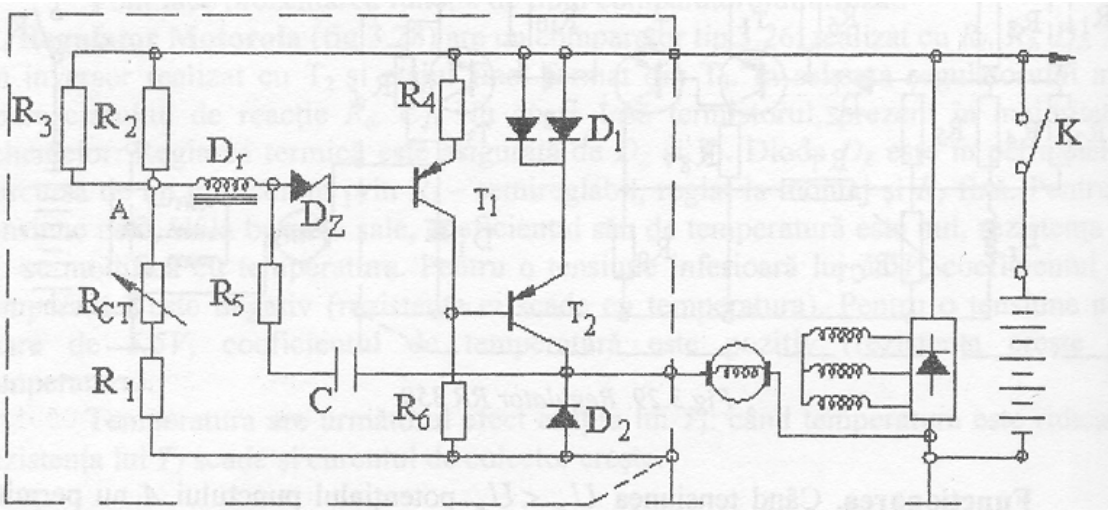


Fig.3.30. Regulator Tip 1350.

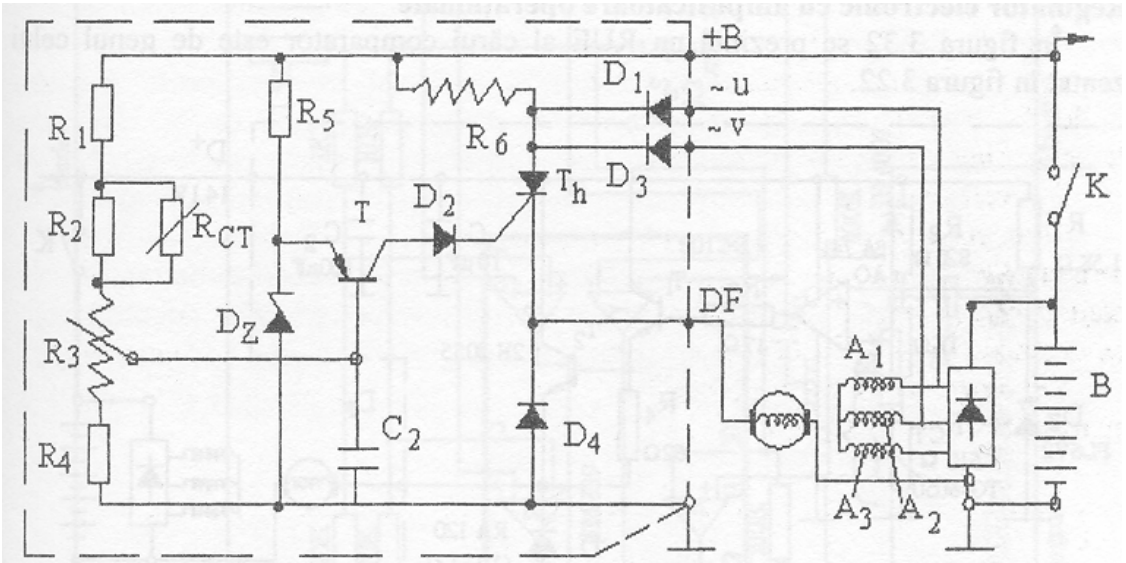


Fig.3.31. Regulator RDC 12B, 24V.

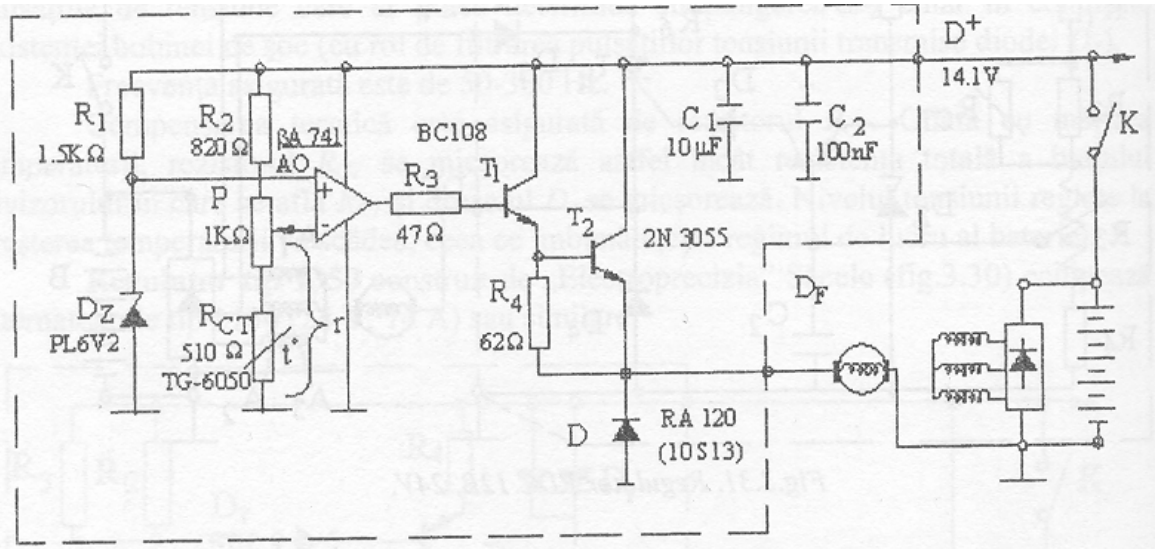


Fig.3.32. Regulator cu AO.

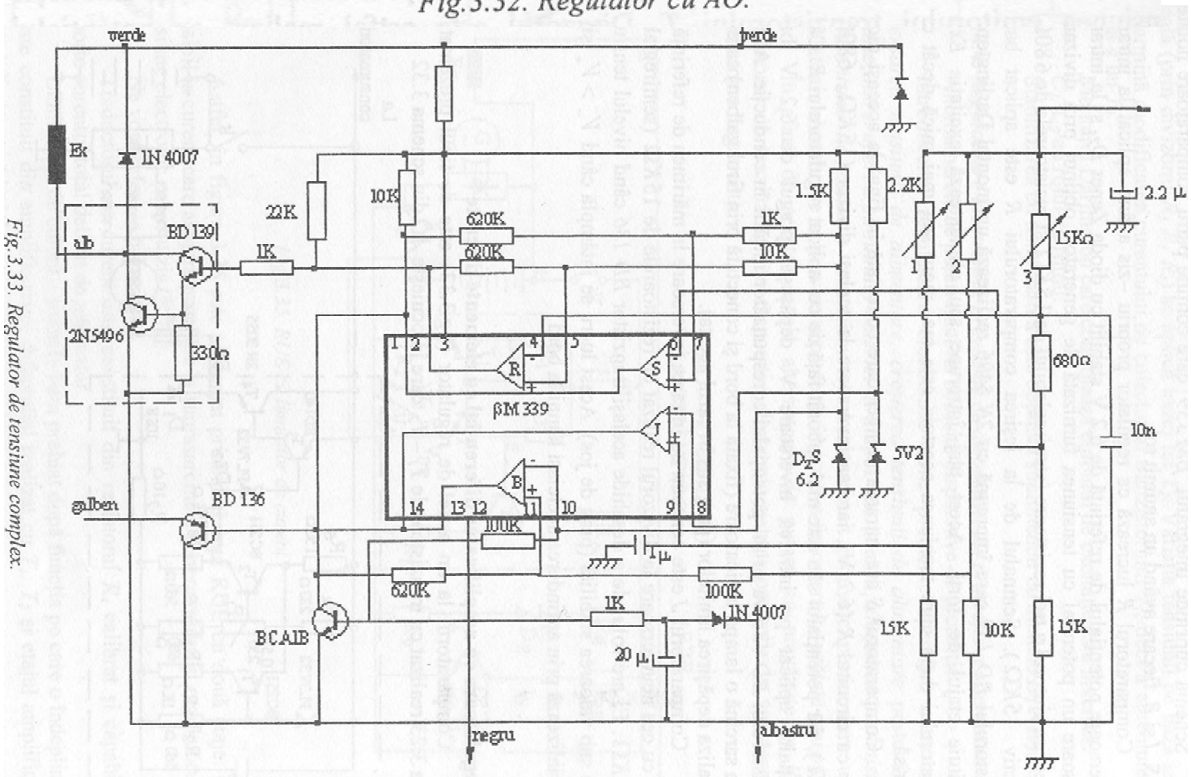


Fig.3.33. Regulator de tensiune complex.

Scheme bloc de SAEE

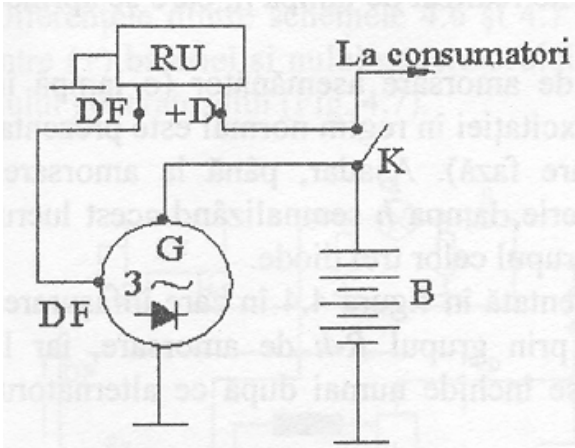


Fig.4.1. SAEE de la Dacia clasică.

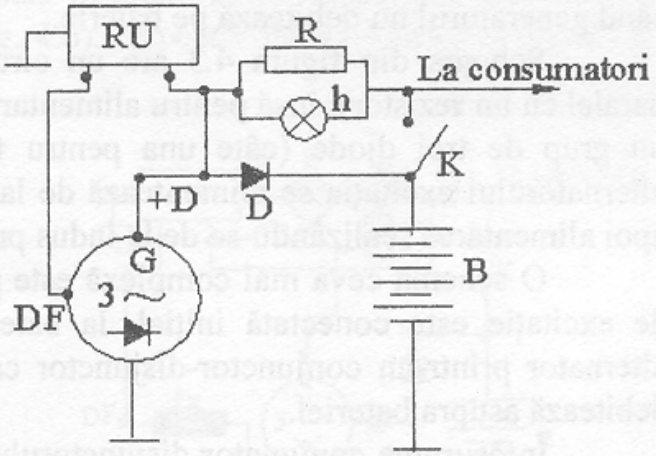


Fig. 4.2. Soluție Motorola de SAEE.

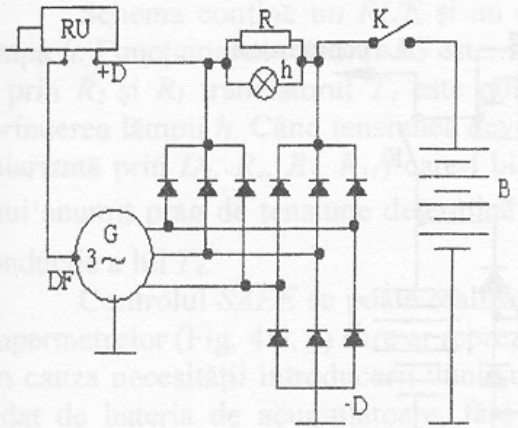


Fig.4.3 Soluție de SAEE cu redresor trifazat pentru excitație.

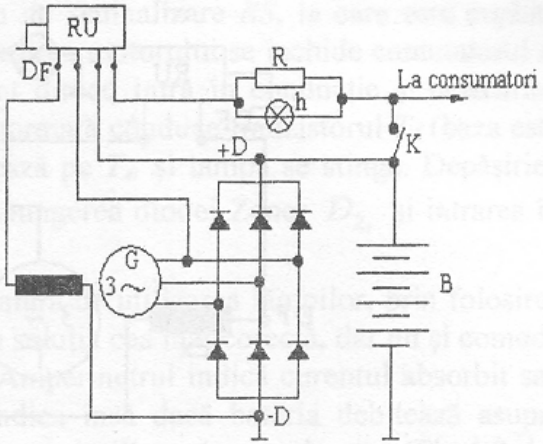


Fig. 4.4. Schemă de SAEE cu conjunctor-disjunctor pentru excitație.

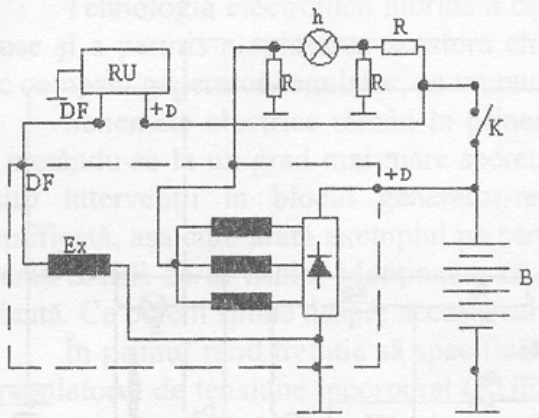


Fig. 4.5. Schemă de SAEE la un alternator în stea cu acces la nu.l

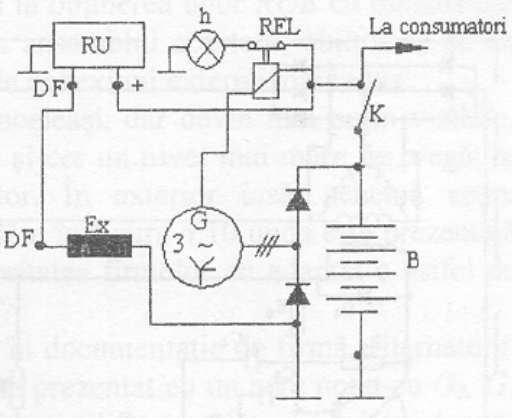


Fig. 4.6. Soluție de SAEE cu alternator în stea cu acces la nul.

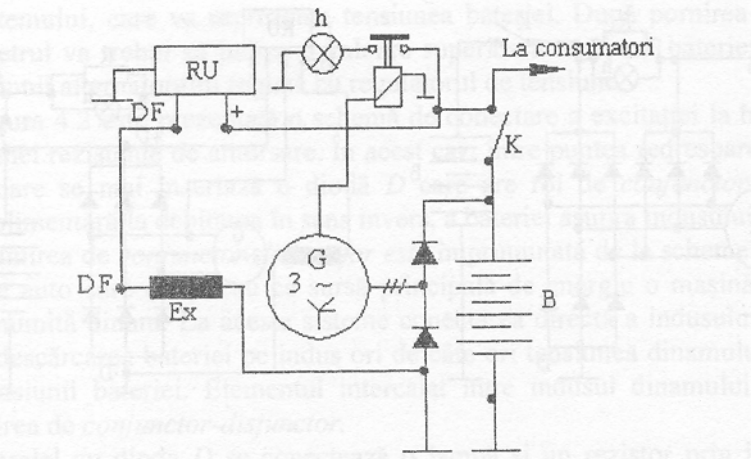


Fig. 4.7. Variantă de SAEE cu alternator în stea cu acces la nul.

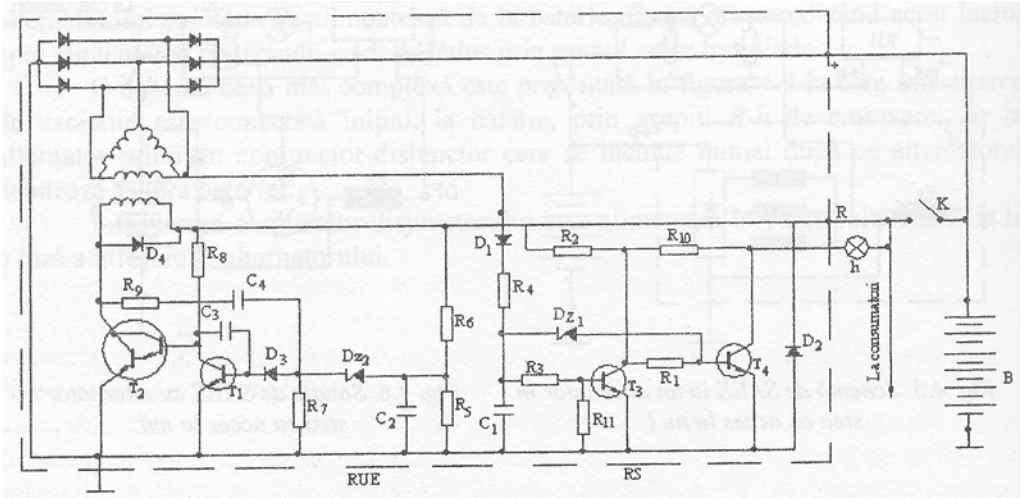


Fig. 4.8. Soluție de SAEE cu indusul conectat în triunghi.

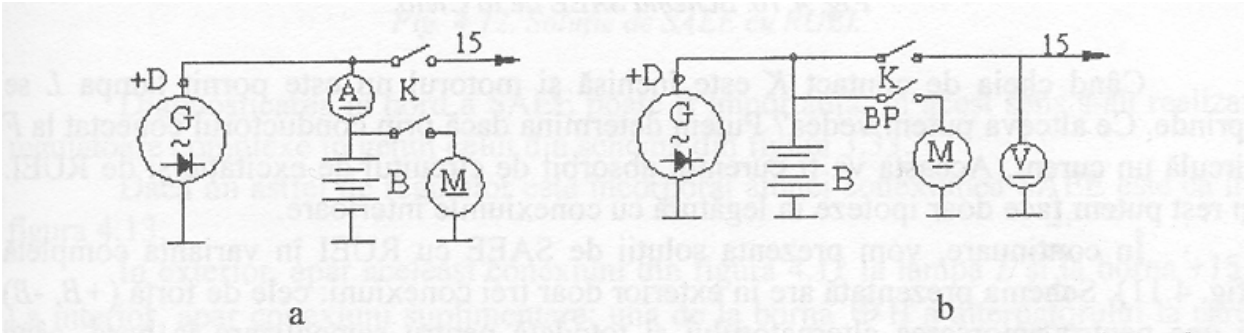


Fig. 4.9 Soluții de control a SAEE: a – utilizarea ampermetrului; b – utilizarea volmetrului.

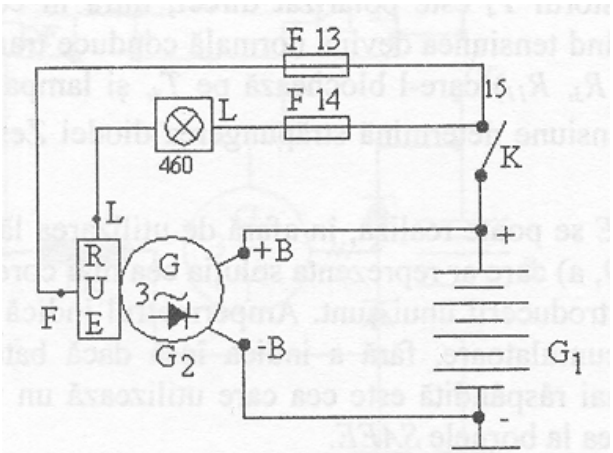


Fig. 4.10. Schema SAEE de la Cielo.

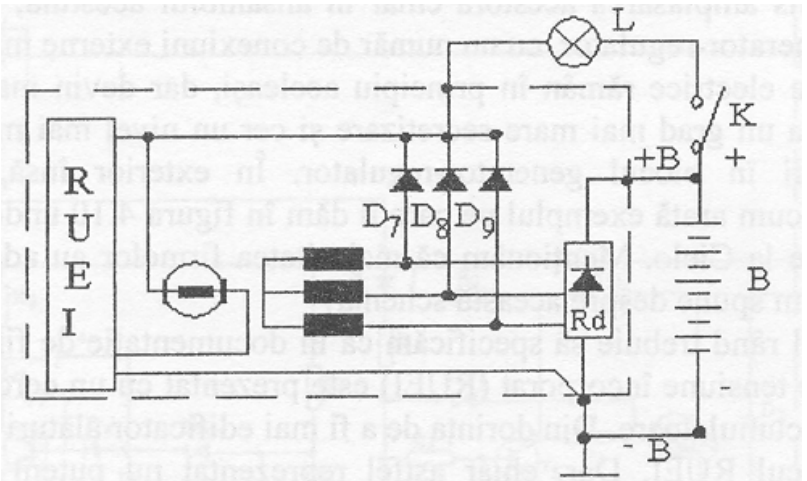


Fig. 4.11. Soluție de SAEEE cu RUEI.

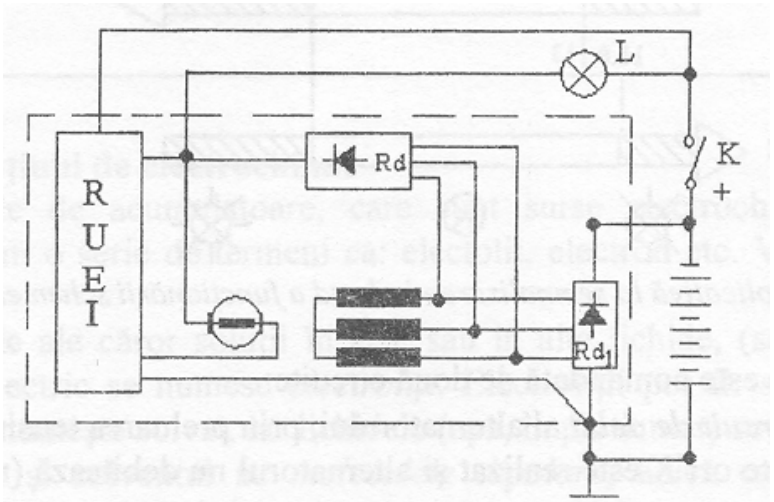


Fig. 4.12. Soluție de SAEE cu RUEI.

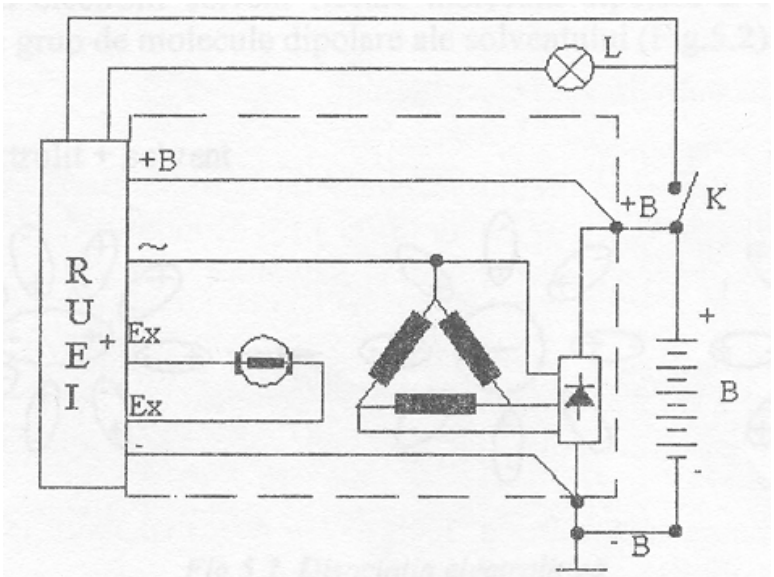


Fig. 4.13. Soluție de SAEE cu RUEI complex.