# Máquinas Eléctricas

## Tema 4. Motor de Inducción

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DPTO. DE INGENIERÍA ELÉCTRICA Y ENERGÉTICA

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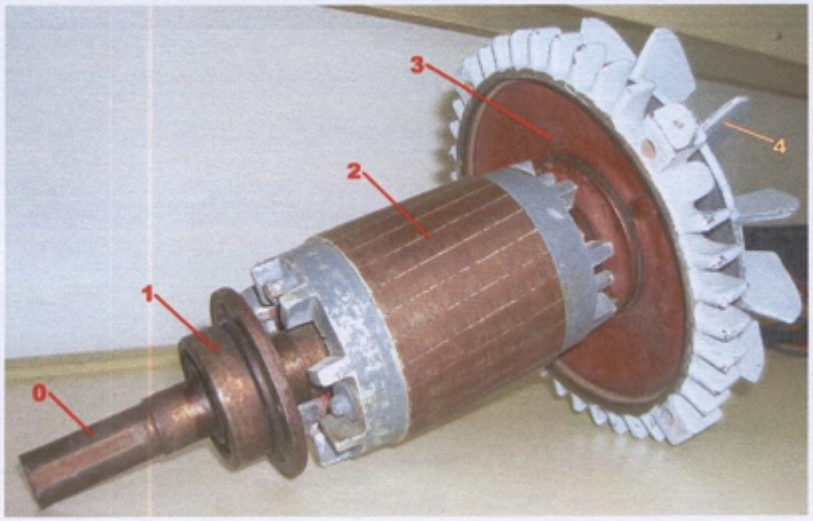
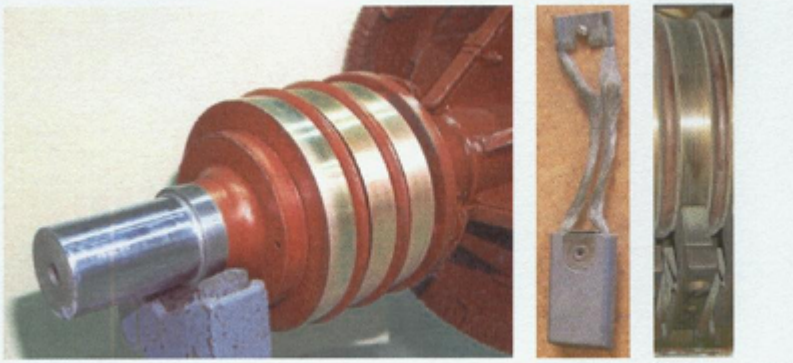



*Fig. 3: Eje (0), Cojinete (1), rotor de jaula de ardilla (2), tapa lateral de la carcasa (3) y ventilador (4)*

*Fig. 4: Aletas en un rotor de jaula de ardilla*

*Fig. 5: Rotor bobinado o con anillos*



a) b) c)

Fig. 6: a) Colector de 3 anillos; b) Escobilla; c) Anillo con escobilla

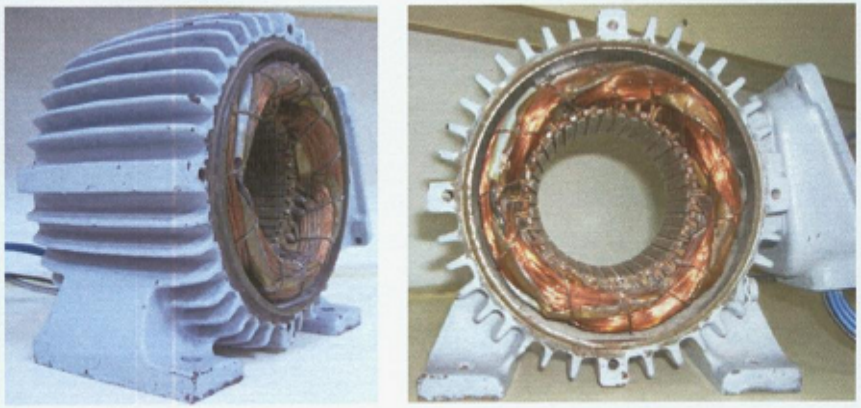


Fig. 7: Estator y carcasa

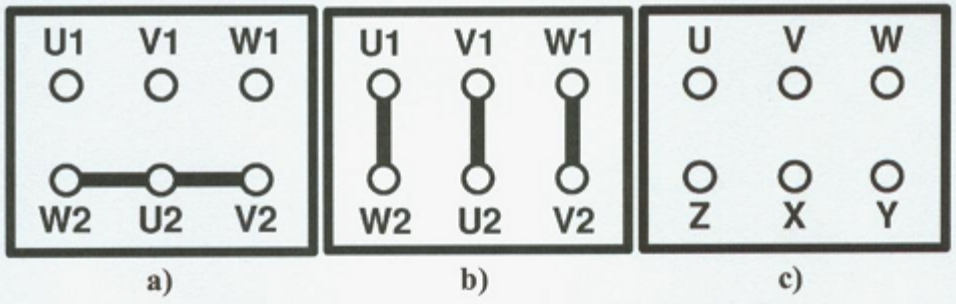



Fig. 8: Caja de bornes de una máquina asíncrona trifásica de jaula de ardilla:
a) Conexión estrella; b) Conexión triángulo
(En ambos casos los terminales U1, V1 y W1 son los que se conectan a las fases de la red)
c) Antiguamente se utilizaban las letras U, V y W en lugar de U1, V1 y W1 y X, Y y Z en lugar de U2, V2 y W2.

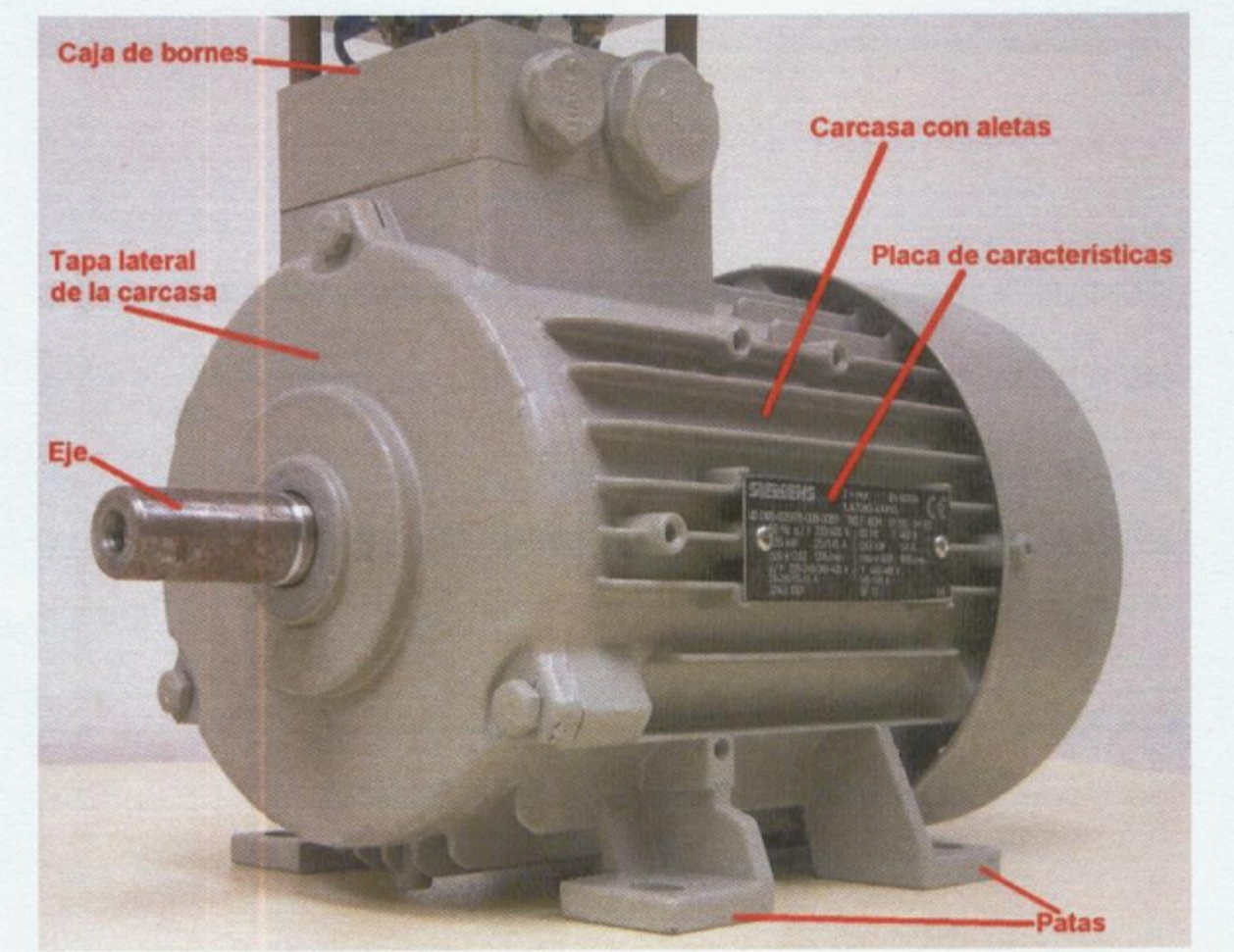



*Fig. 1: Máquina asíncrona*

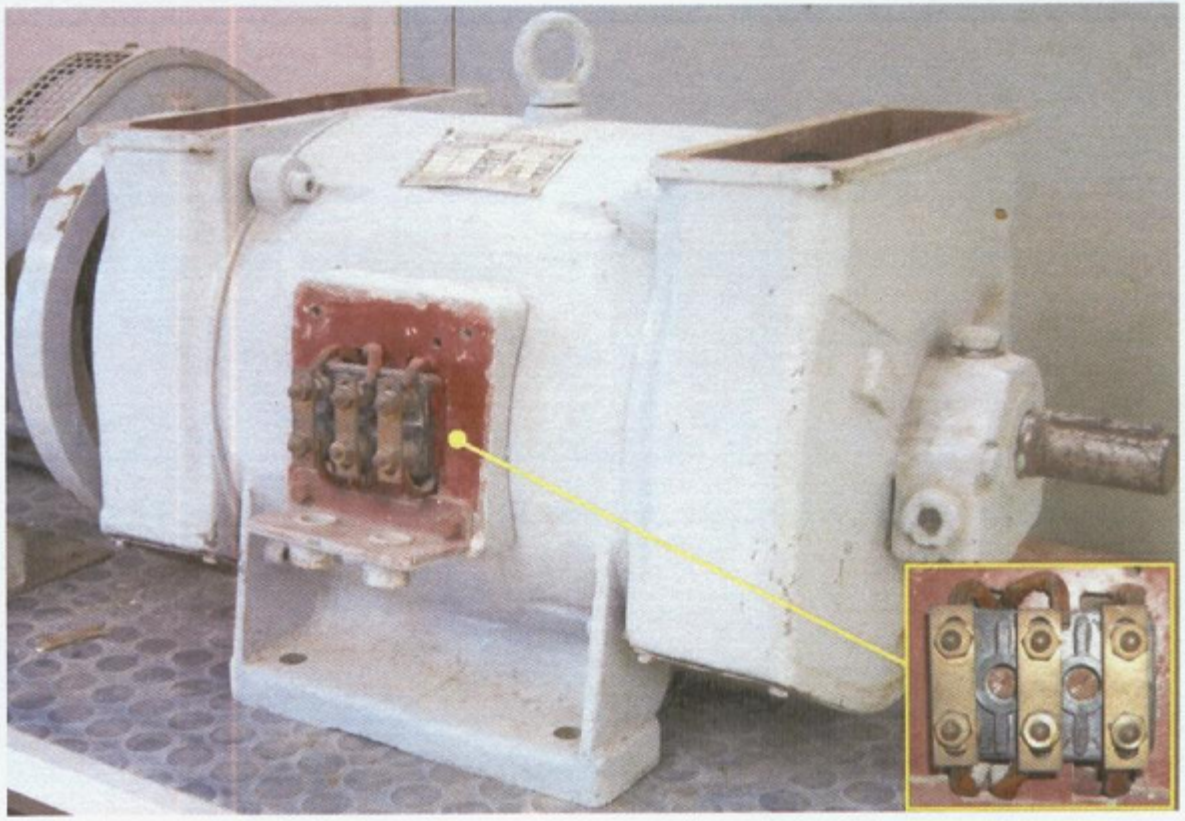


*Fig. 2: Máquina asíncrona. Se ha ampliado la caja de bornes, a la cual se le ha quitado la tapa, para mostrar la conexión triángulo del estator (ver la Fig. 8)*

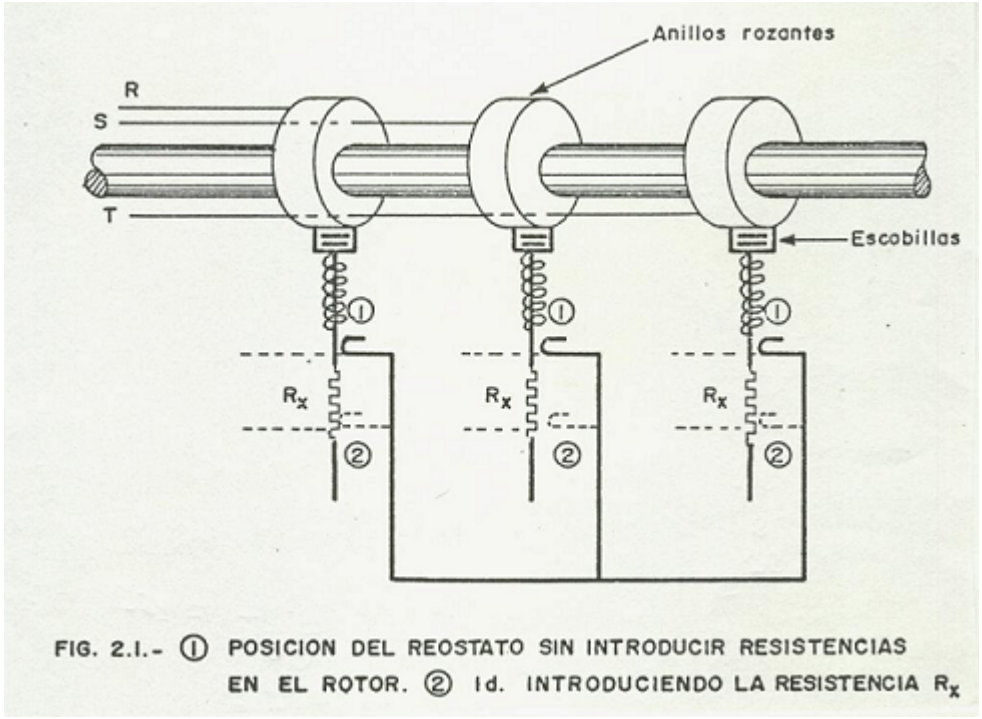



FIG. 2.1.- ① POSICION DEL REOSTATO SIN INTRODUCIR RESISTENCIAS EN EL ROTOR. ② Id. INTRODUCIENDO LA RESISTENCIA $R_x$

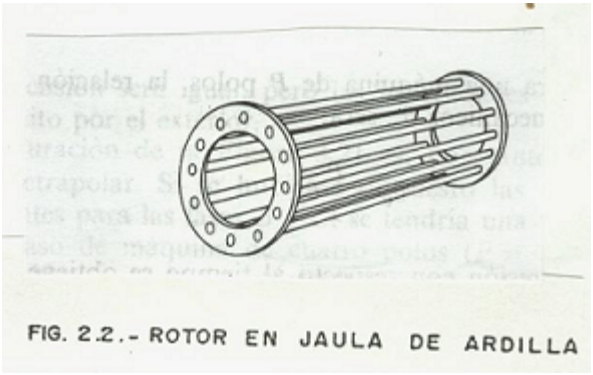


FIG. 2.2.- ROTOR EN JAULA DE ARDILLA

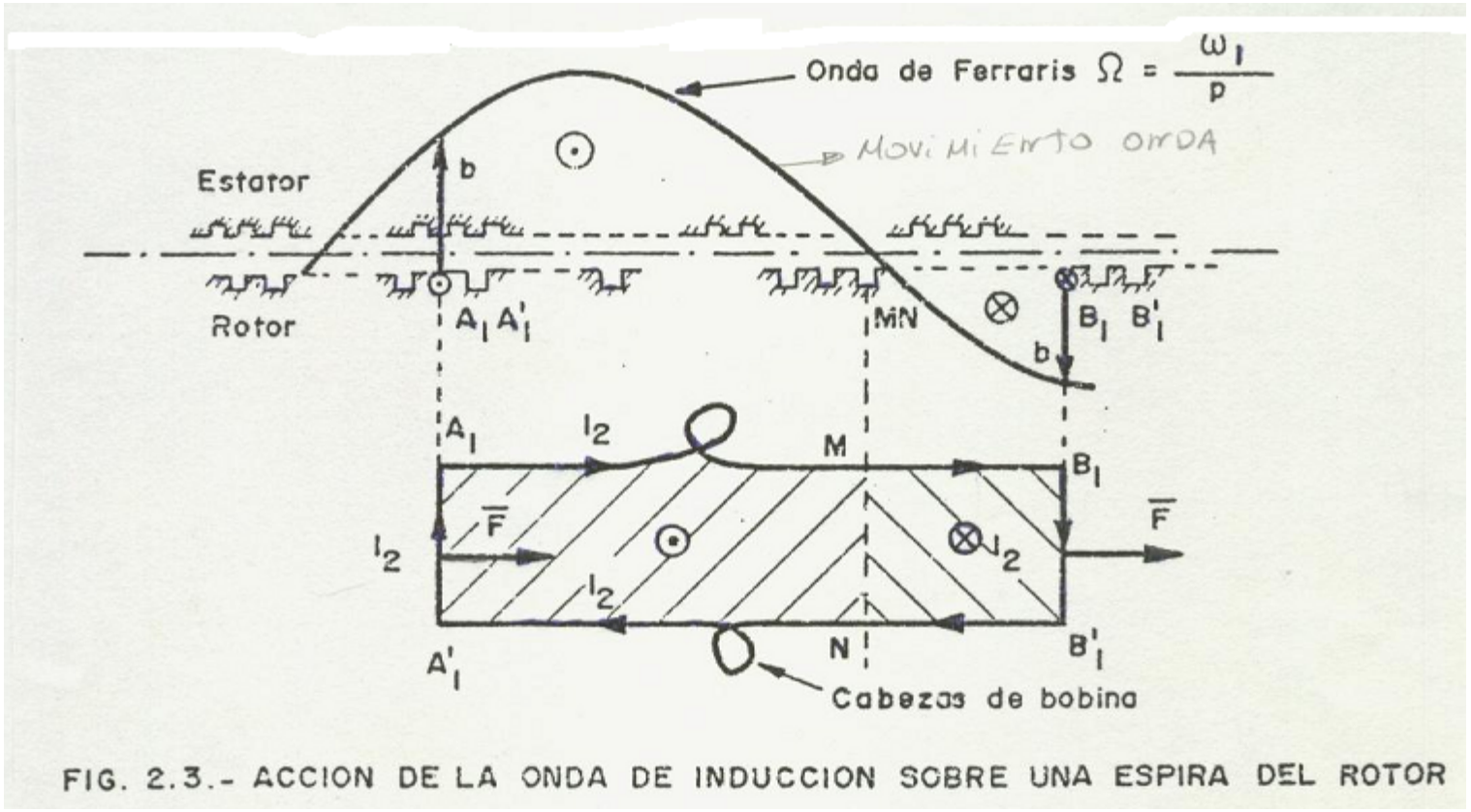



FIG. 2.3.- ACCION DE LA ONDA DE INDUCCION SOBRE UNA ESPIRA DEL ROTOR

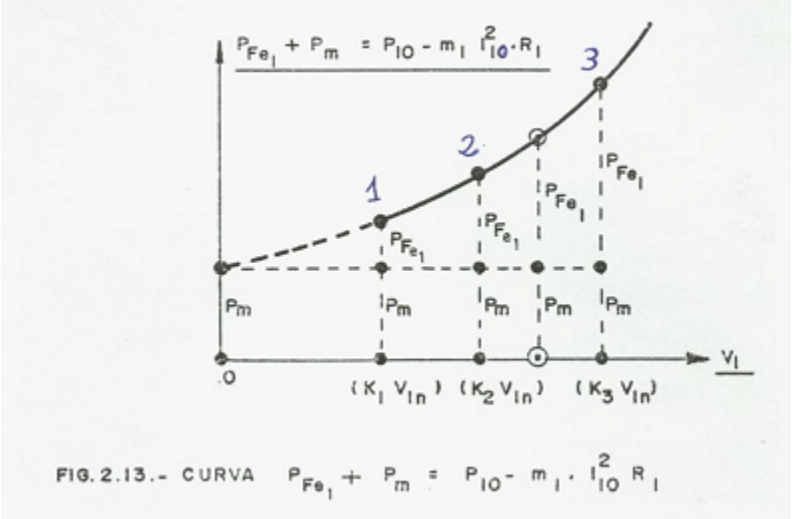



FIG. 2.13.- CURVA $P_{Fe_1} + P_m = P_{10} - m_1 \cdot I_{10}^2 R_1$

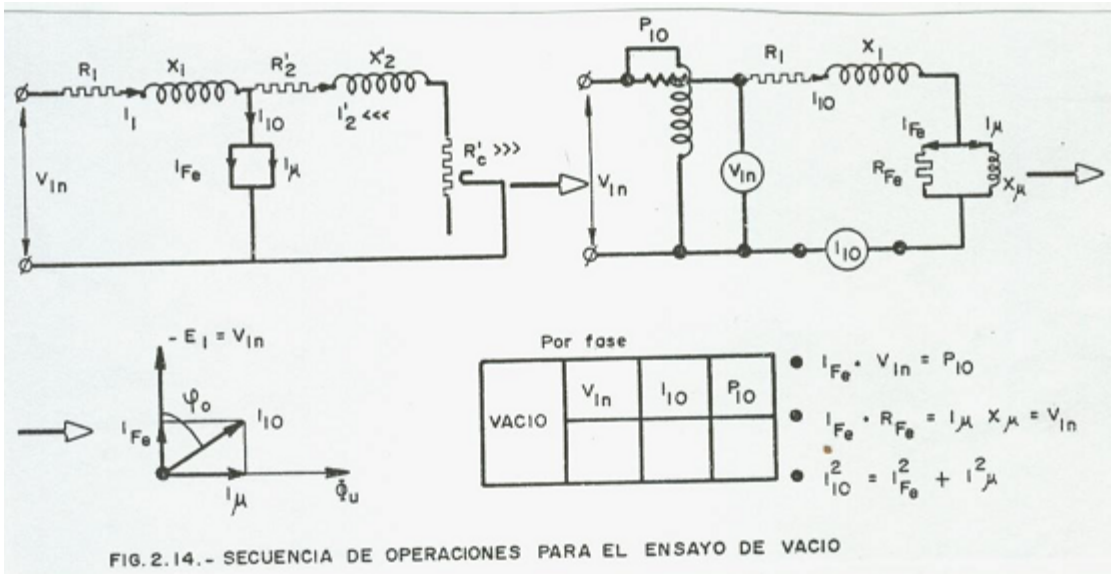



FIG. 2.14.- SECUENCIA DE OPERACIONES PARA EL ENSAYO DE VACIO

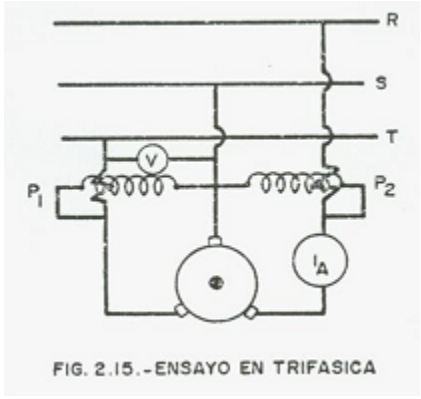



FIG. 2.15.-ENSAYO EN TRIFASICA

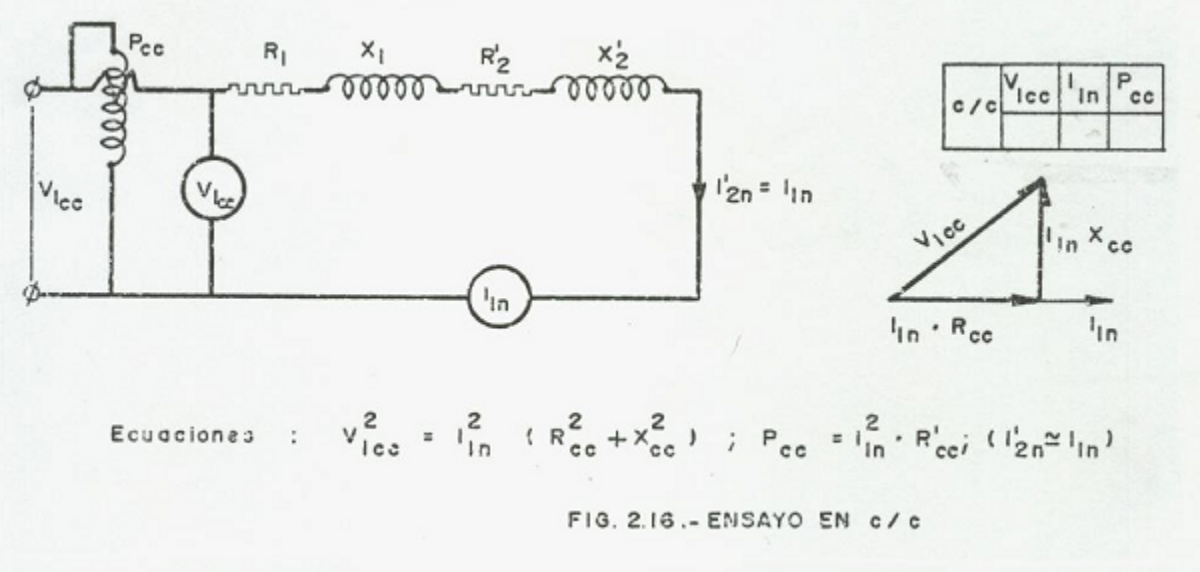



FIG. 2.16.- ENSAYO EN c/c

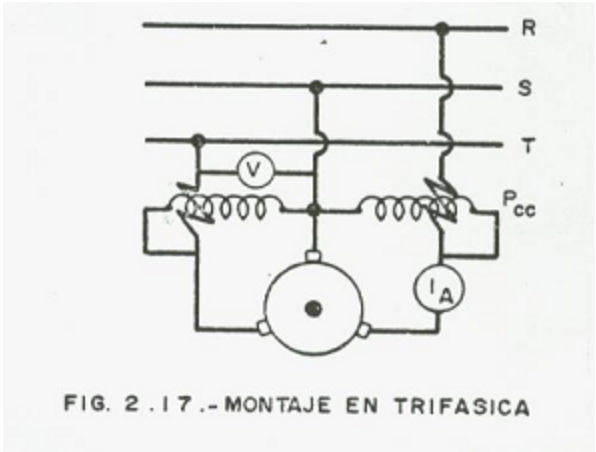



FIG. 2.17.- MONTAJE EN TRIFASICA

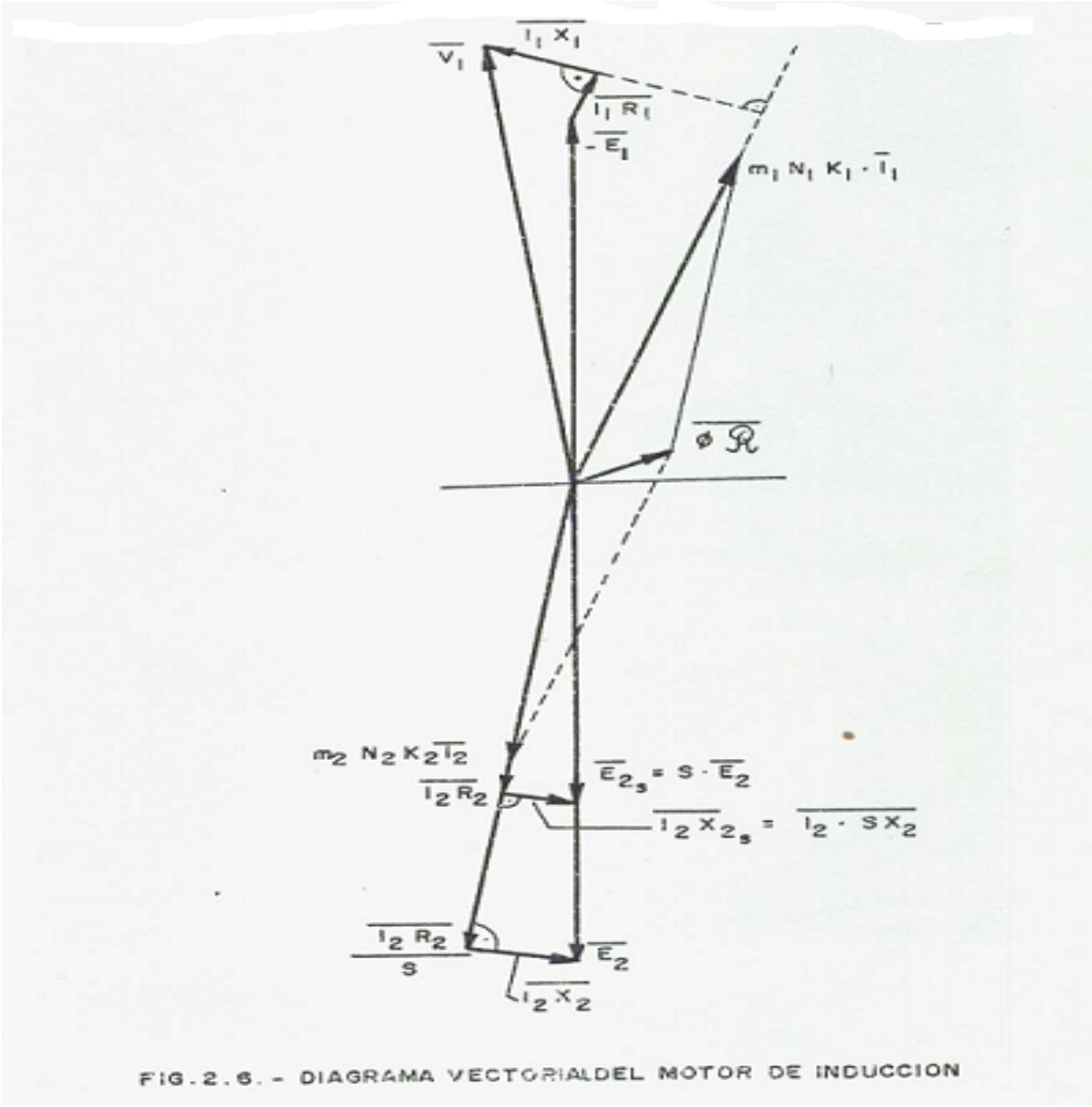



FIG. 2.6. - DIAGRAMA VECTORIALDEL MOTOR DE INDUCCION

c) Diagrama vectorial de la reducción al primario. Figura 2-8)

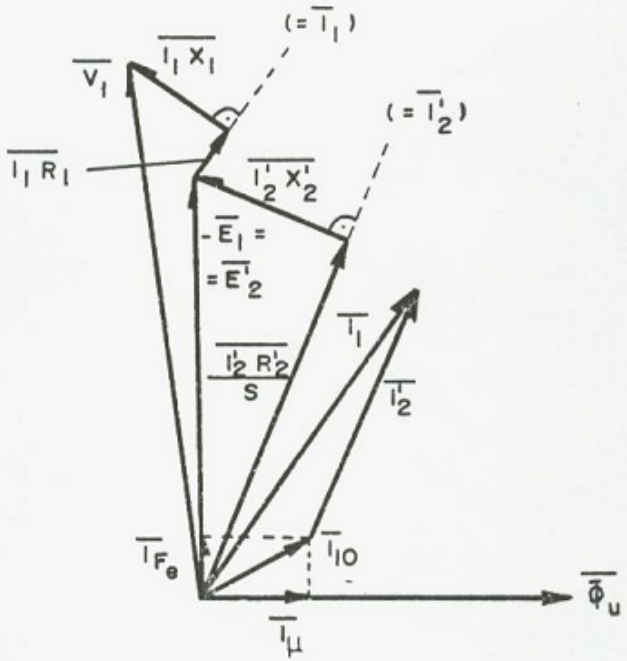



FIG. 2.8.- DIAGRAMA VECTORIAL

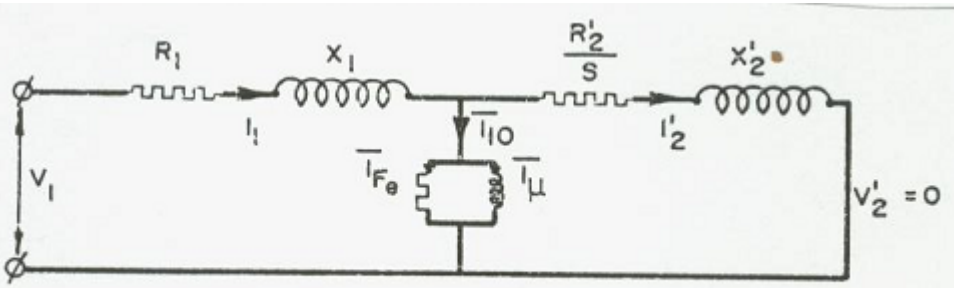



FIG.2.9.- CIRCUITO EQUIVALENTE

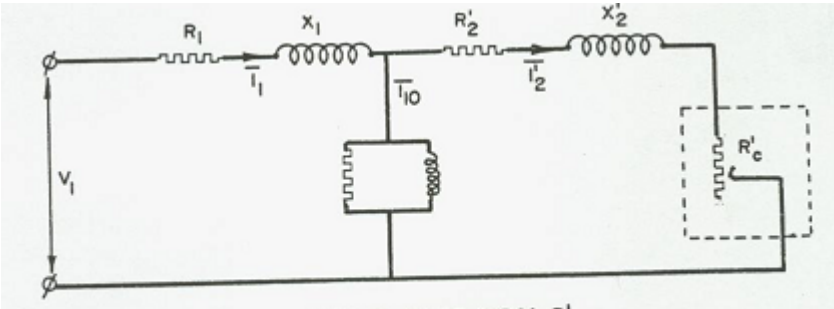



FIG. 2.10.- RESISTENCIA DE CARGA $R'_c$

$$P_a = P_{cu_2} + P_{m_i}$$

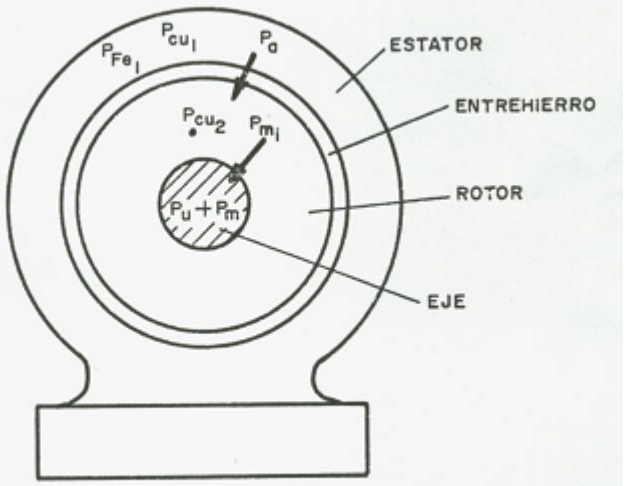



FIG. 2.12.- ESQUEMA DE DISTRIBUCION DE POTENCIAS

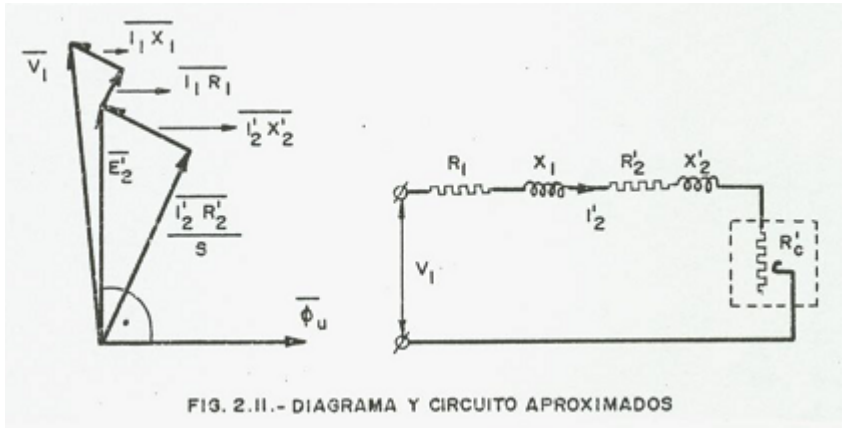
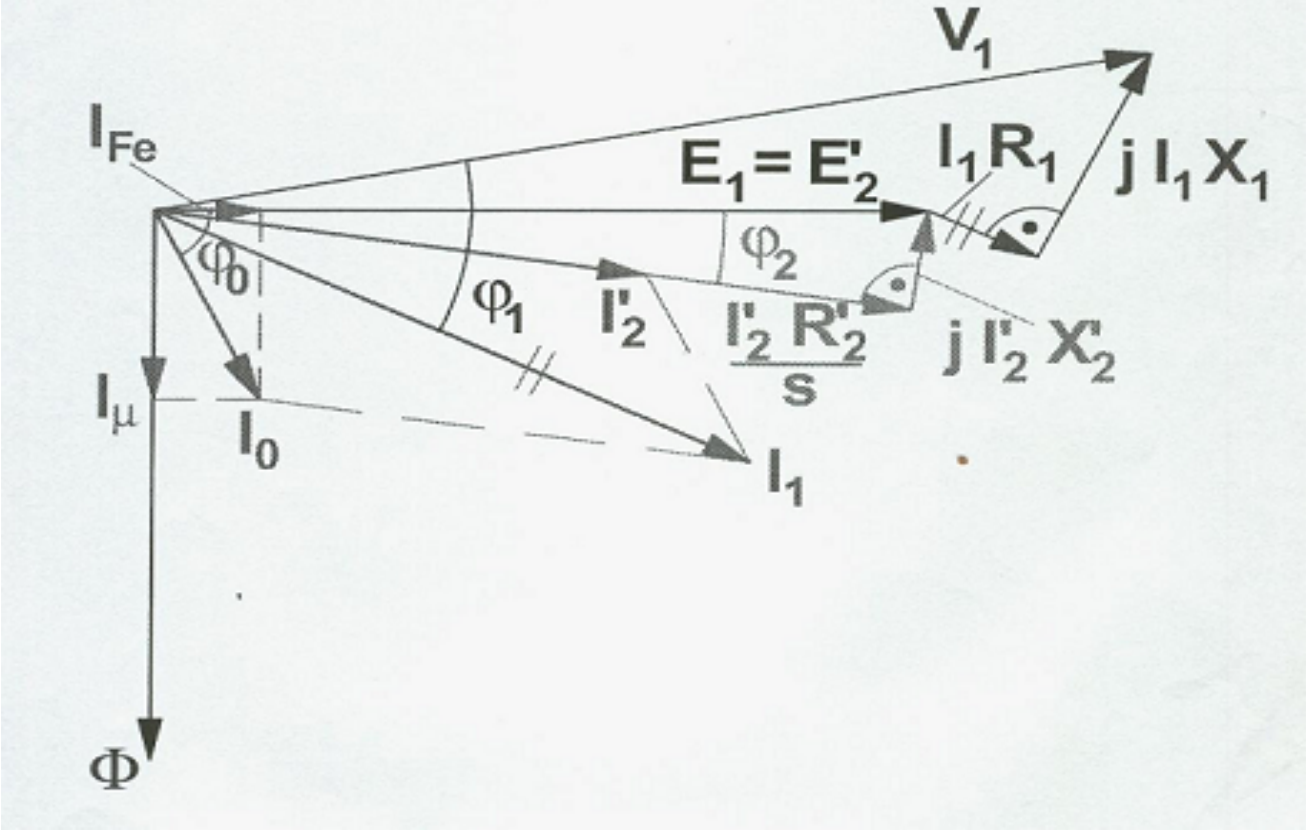



FIG. 2.11.- DIAGRAMA Y CIRCUITO APROXIMADOS

# DIAGRAMA FASORIAL DE UN MOTOR ASINCRONO



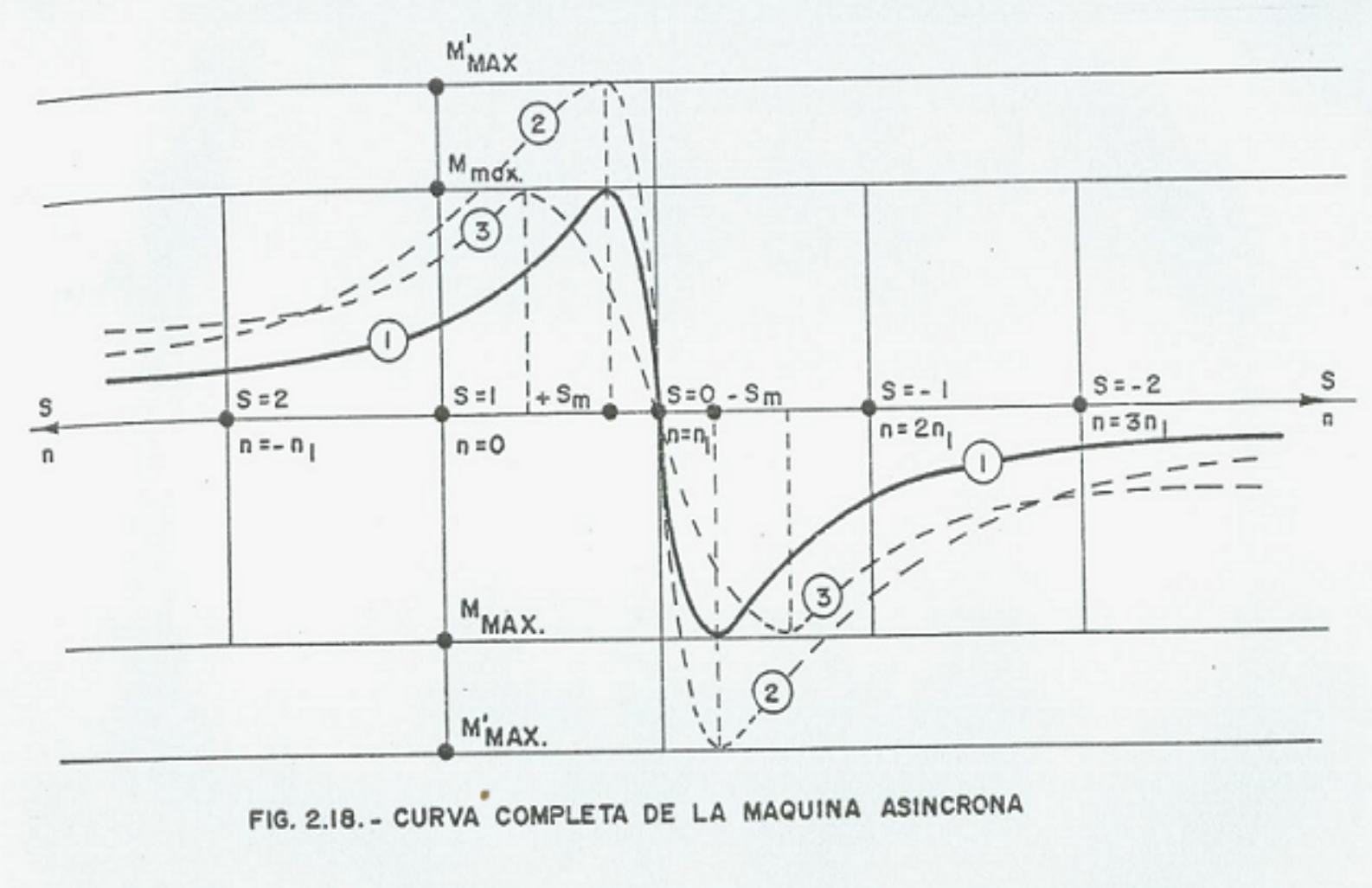



FIG. 2.18.- CURVA COMPLETA DE LA MAQUINA ASINCRONA

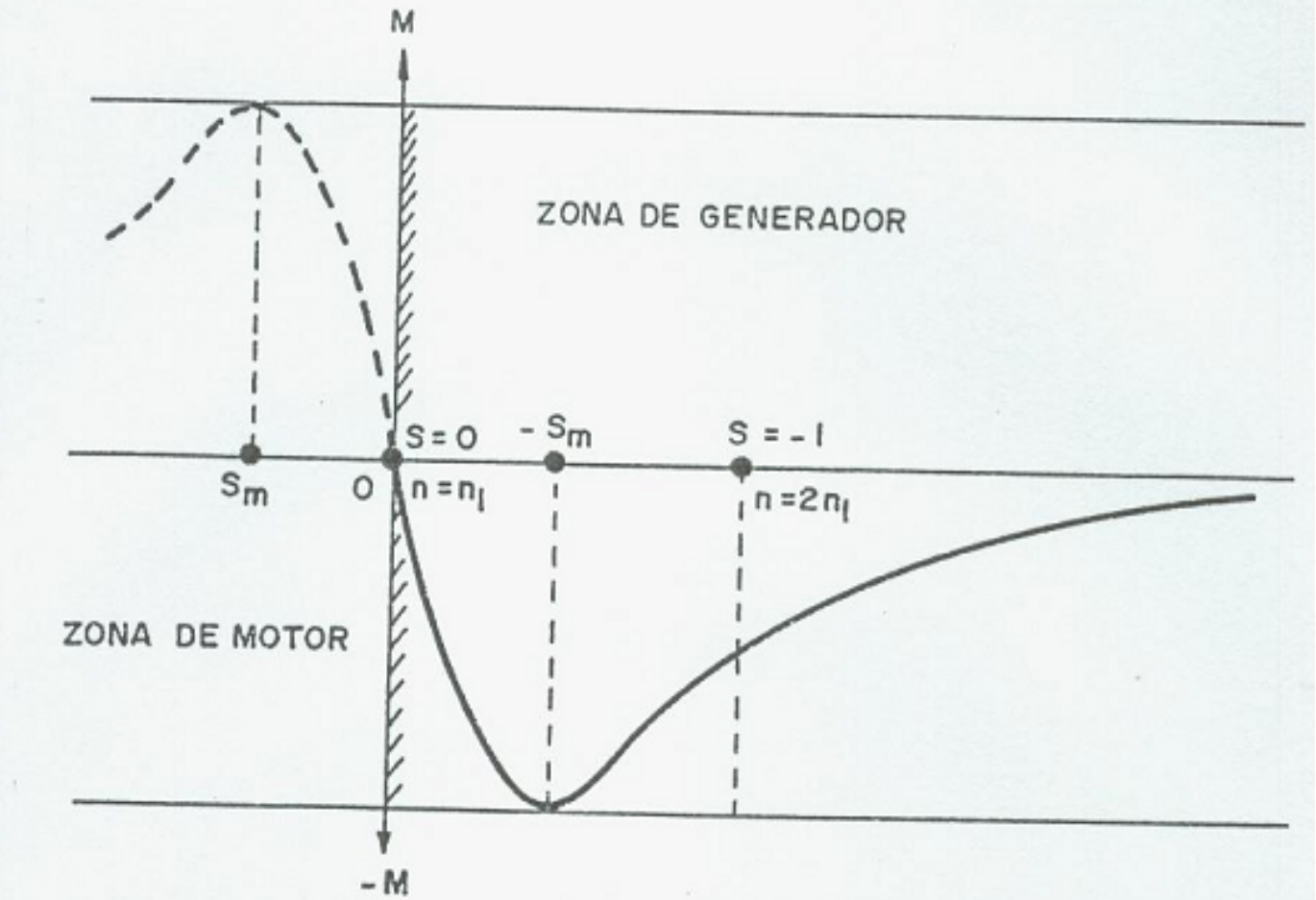



FIG. 2.25.- LA MAQUINA ASINCRONA COMO GENERADOR

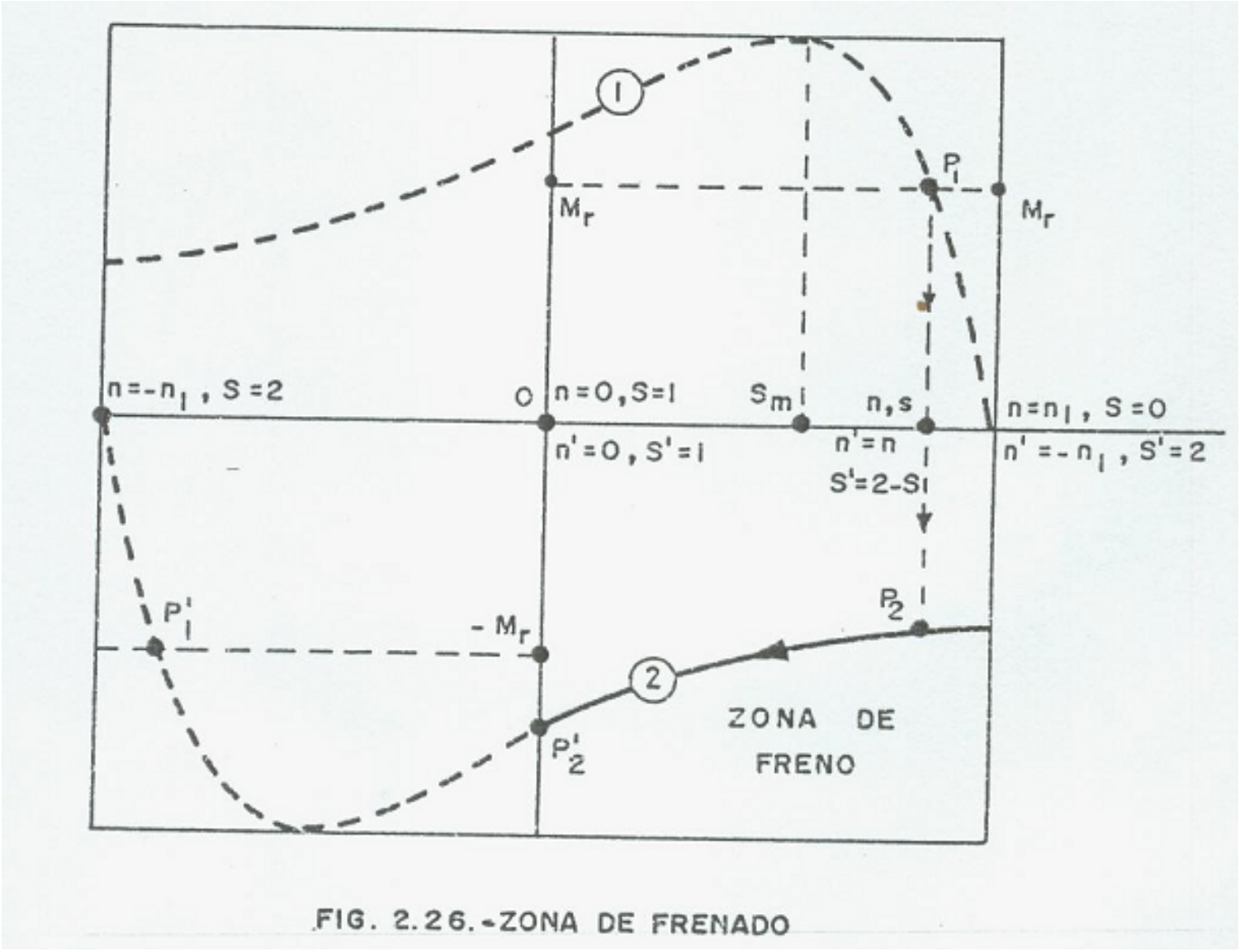



FIG. 2.26.-ZONA DE FRENADO

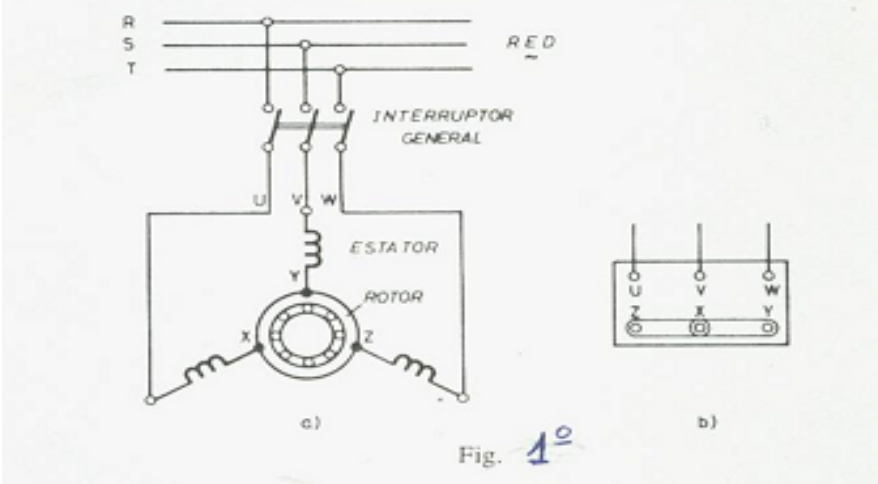

R
S
T
RED
INTERRUPTOR GENERAL
U
V
W
ESTATOR
Y
ROTOR
X
Z
a)
b)

Fig. 1º

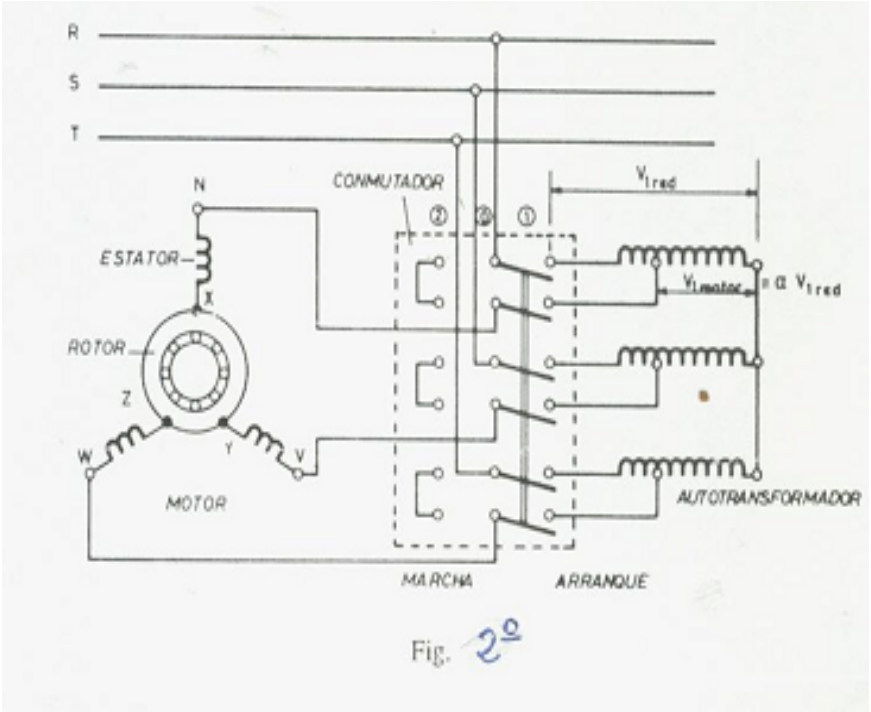

R
S
T
N
CONMUTADOR
ESTATOR
X
ROTOR
Z
W
Y
V
MOTOR
$V_{1red}$
$V_{1motor}$
$= a\ V_{1red}$
AUTOTRANSFORMADOR
MARCHA
ARRANQUE

Fig. 2º

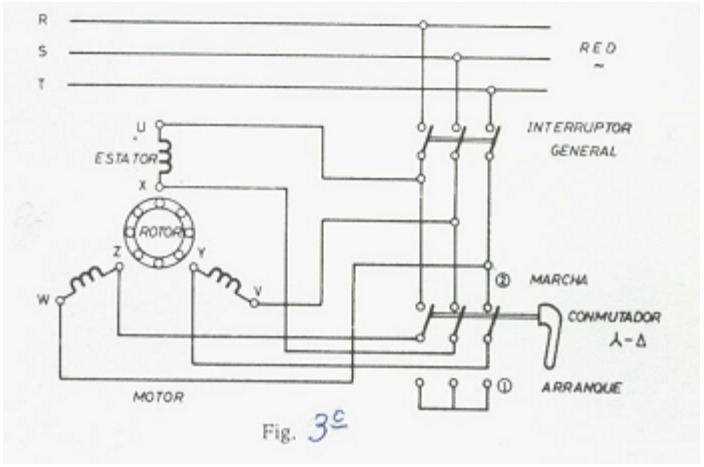



Fig. 3º

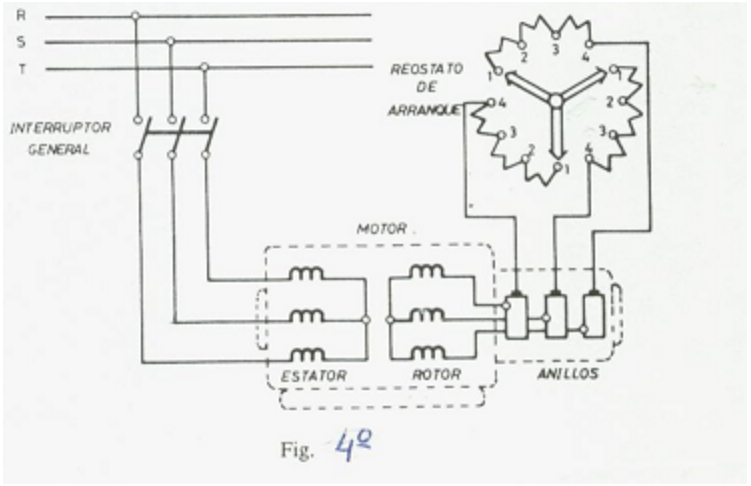



Fig. 4º

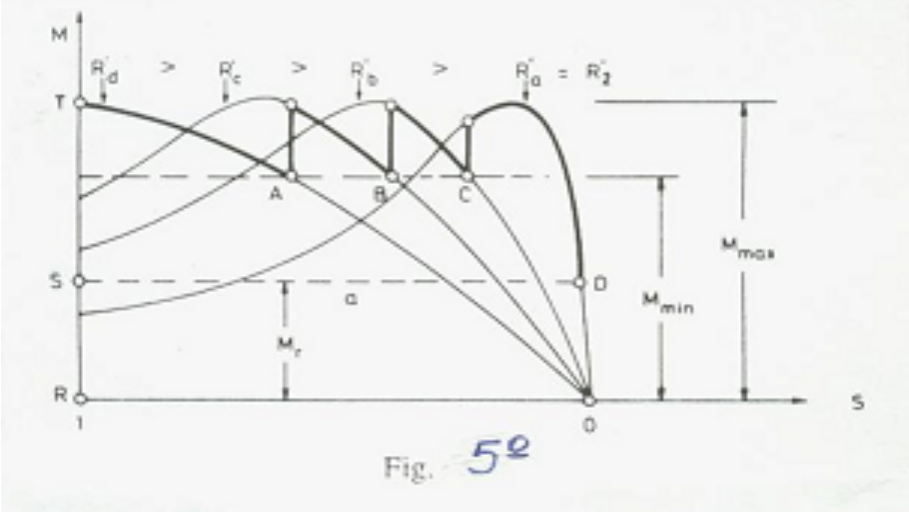



Fig. 5º

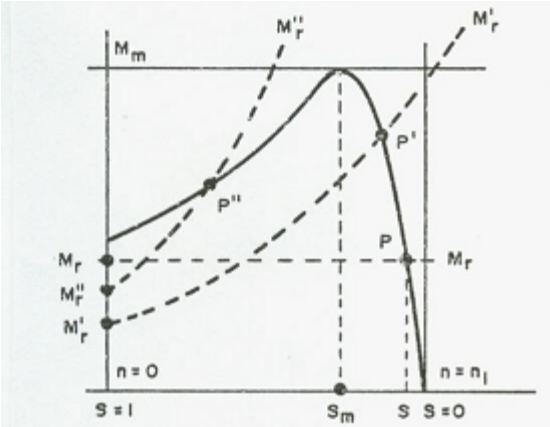



FIG. 2.19.- CURVA DEL MOTOR

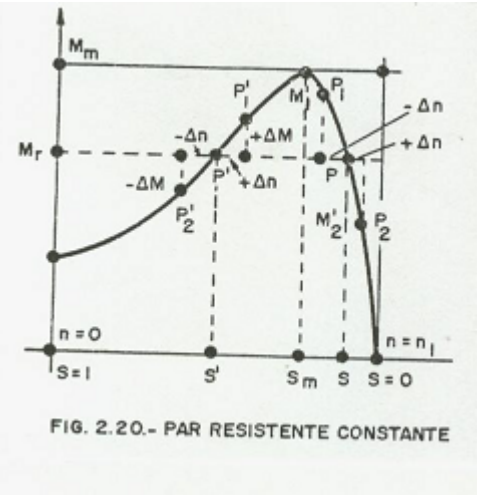



FIG. 2.20.- PAR RESISTENTE CONSTANTE

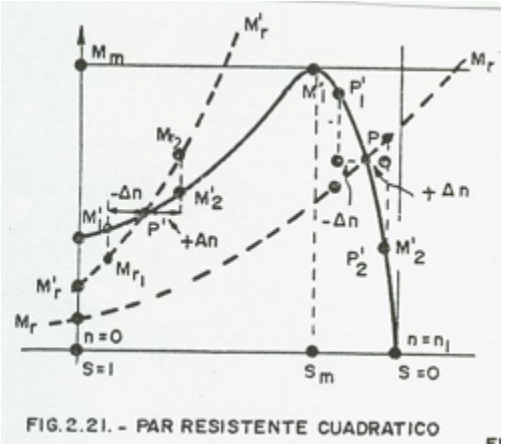



FIG. 2.21. - PAR RESISTENTE CUADRATICO

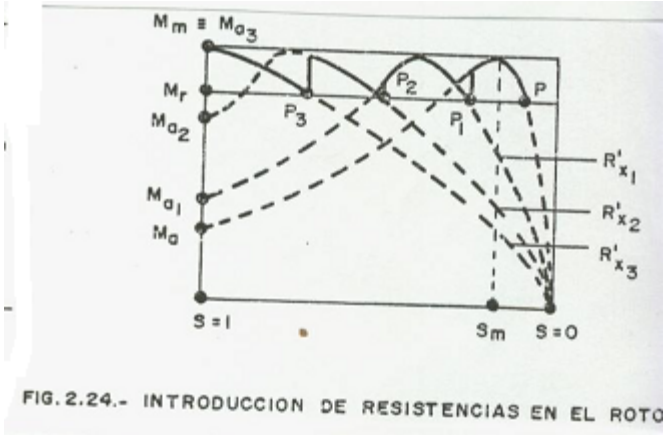



FIG. 2.24.- INTRODUCCION DE RESISTENCIAS EN EL ROTO

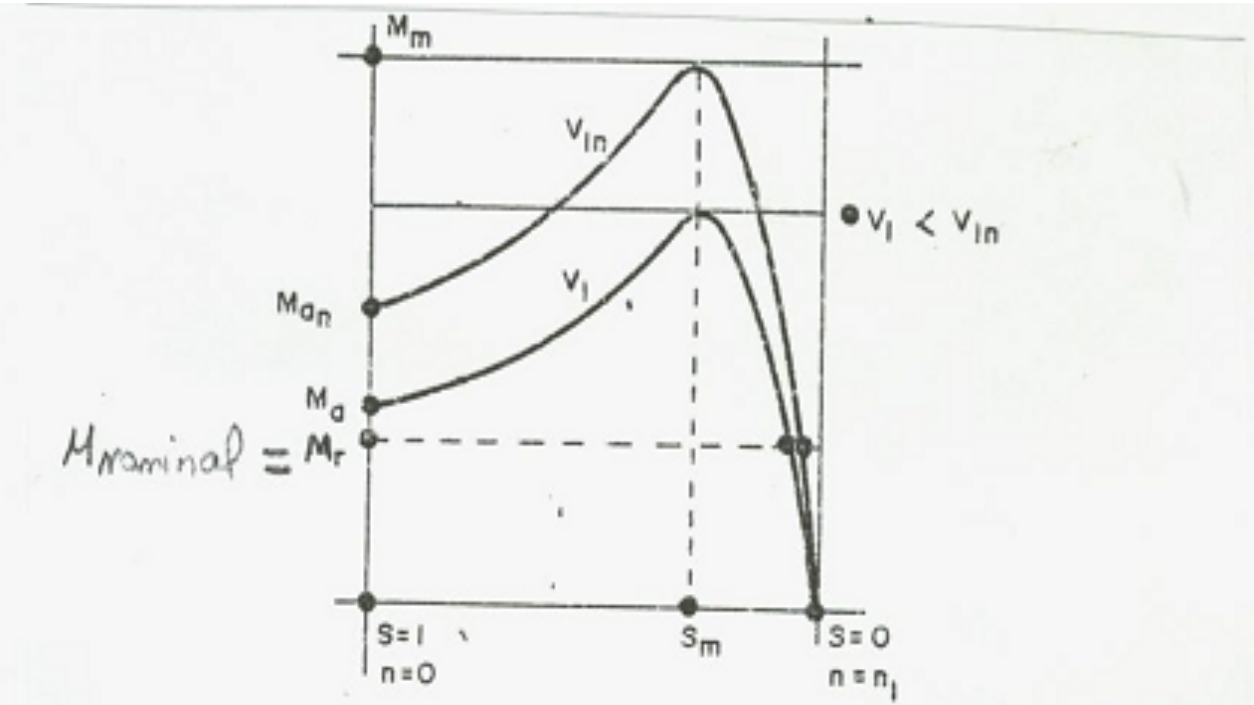



FIG. 2.23.- EFECTO DE LA REDUCCION DE LA TENSION DE ALIMENTACION