

DECLASSIFIED
 E.O. 13526
 Authority
 By L.S. NAVA, Date 11-18

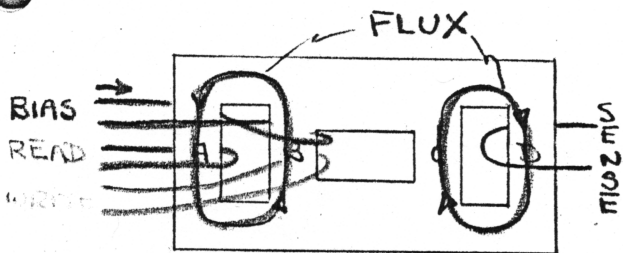
~~IP 1 Confidential~~

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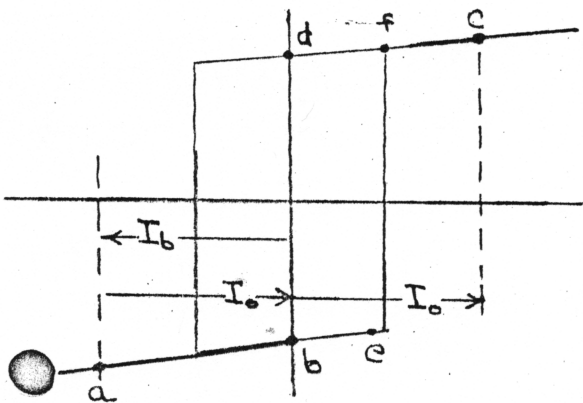
BIASED MULTI-PATH STORAGE ELEMENT
 COINCIDENT-CURRENT SELECTION

Declassified by D. Janosek,
 Deputy Associate Director for Policy and Records
 on 21-10-2010 and by *[Signature]*

WE
 JVC



TYPICAL STRUCTURE - CROSS SECTIONAL
 AREAS (LEGS) $A=B=C=D$. FOUR WINDINGS
 ARE REQUIRED TO OPERATE THE
 CORE, BIAS, READ, WRITE, & SENSE.
 TO OPERATE THE CORE IN A MEMORY
 PLANE, THE READ WINDING IS REPLACED BY 2 WIRES (X & Y
 LINES) AND THE WRITE WINDING BY 2 WIRES (X & Y LINES)



THE HYSTERESIS LOOP FOR SQUARE LOOP
 MATERIAL TO OPERATE THE CORE REQUIRES:
 a to b AND d to c BE AS FLAT AS POSSIBLE
 THE BIAS CURRENT CAN BE A DIRECT
 CURRENT AND SHOULD BE ABLE TO
 DRIVE THE LEGS WELL INTO SATURATION
 (POINT a ON HYSTERESIS LOOP.) CONSIDER
 APPLYING A CURRENT I_o NOW ON THE

READ OR WRITE WINDING. THE CURRENT WILL
 HAVE LITTLE EFFECT IF IT IS EQUAL TO I_b IN MAGNITUDE.
 HOWEVER APPLYING $2I_o$, THE LEG (EITHER A FOR WRITE, OR B
 FOR READ) WILL BE DRIVEN BY $2I_o - I_b$, FOR $I_b = I_o$ THE
 LEG IS DRIVEN BY A CURRENT OF I_b MAGNITUDE, BUT OF
 OPPOSITE DIRECTION CAUSING THE FLUX TO REVERSE IN THAT
 LEG AS LONG AS $2I_o$ IS APPLIED. UPON REMOVAL OF $2I_o$
 THE LEG WILL BE DRIVEN BY THE BIAS CURRENT AND THE
 FLUX WILL RETURN TO THE ORIGINAL DIRECTION.

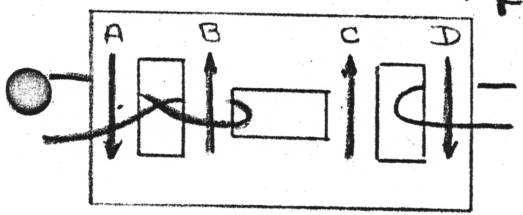
BECAUSE OF THE BIAS, AND WITH NO OTHER CURRENTS
 APPLIED THE FLUX WILL IN A & B HAVE THE DIRECTION
 SHOWN. SINCE THESE LEGS ARE EQUAL AND SATURATED
 THERE CAN BE NO NET CHANGE OF FLUX IN LEGS C & D.
 THE FLUX AS SHOWN IN LEGS C & D ABOVE IS THE DIRECTION
 OF FLUX AFTER A READ SIGNAL HAS BEEN APPLIED.
 WHEN THE READ SIGNAL IS APPLIED DIRECTION OF FLUX
 CHANGES IN LEGS A & C. NO CHANGE IN D, SO NO OUTPUT
 ON SENSE WINDING "STORED 0." (CHANGING FLUX TAKES
 THE PATH OF LEAST RELUCTANCE.)

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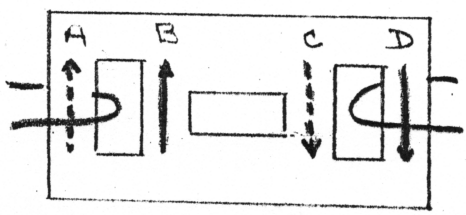
STORED ϕ



— FLUX — BIAS — SENSE — READ — WRITE

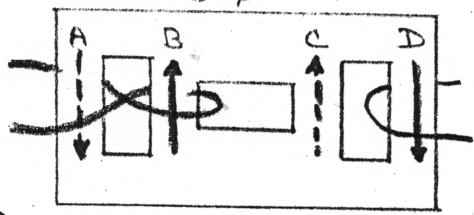
NOTE: BROKE ARROW INDICATES FLUX CHANGE

READING ϕ



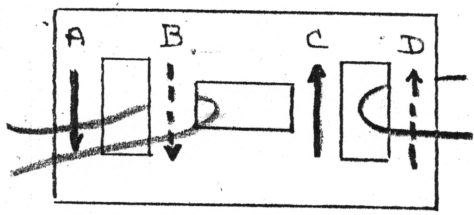
APPLYING FULL SELECT, $2I_0$, OPPOSES BIAS ON LEG A, REVERSES THE FLUX IN THAT LEG AND LEG C. SINCE THERE IS NO CHANGE OF FLUX LEG D, THERE IS NO OUTPUT ON THE SENSE WINDING

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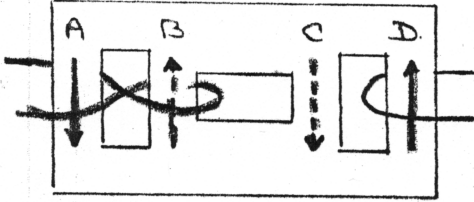
UPON REMOVAL OF READ SIGNAL, BIAS RESTORES LEGS A AND C. THIS IS THE STORED ϕ WHICH FOLLOWS ALL READ OPERATIONS

WRITING 1



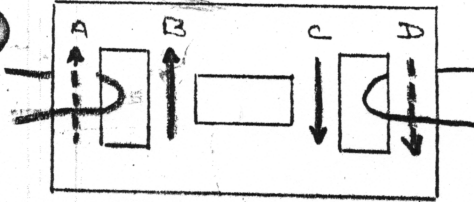
A FULL SELECT, $2I_0$, OPPOSES BIAS ON LEG B AND CAUSES FLUX DIRECTION ON LEG B TO CHANGE AND ALSO LEG D. AN INHIBIT WINDING TO OPPOSE THE WRITE WILL PERMIT WRITING ϕ

STORED 1



THE EFFECT OF THE BIAS WHEN THE WRITE PULSE ENDS IS TO RESTORE LEG B AND REVERSE LEG C. THE FLUX IN D REMAINS UPWARD.

READING 1



READING OPPOSES FLUX LEG A, BUT D NOW REVERSES PRODUCING LARGE SIGNAL OUTPUT ON SENSE WINDING. THE EFFECT OF BIAS AFTER READING IS TO THE STORED ϕ CONDITION

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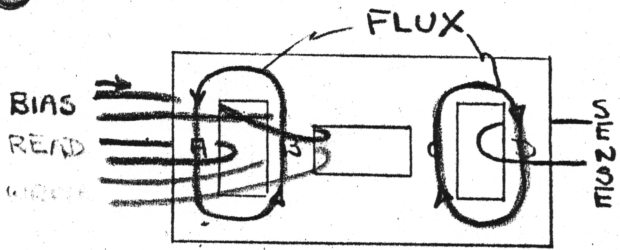
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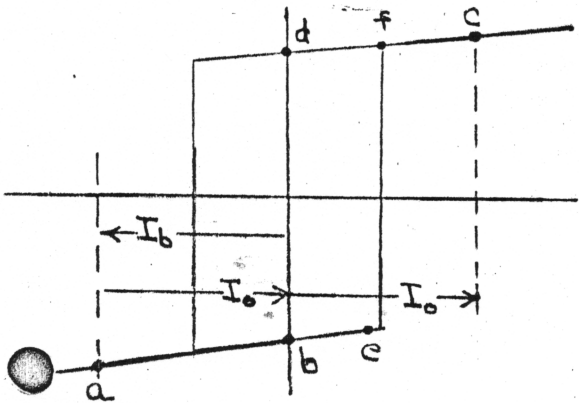
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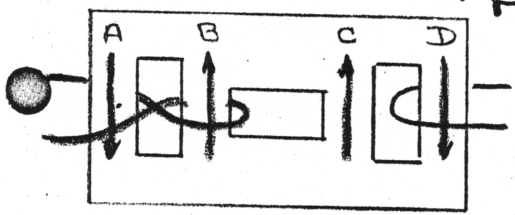
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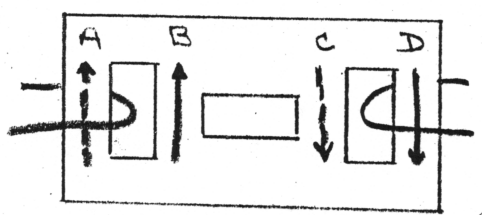
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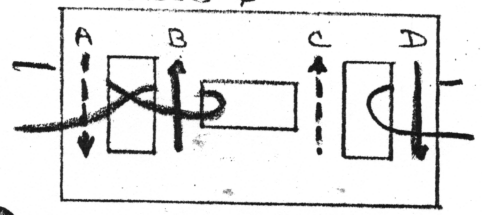


READING ϕ



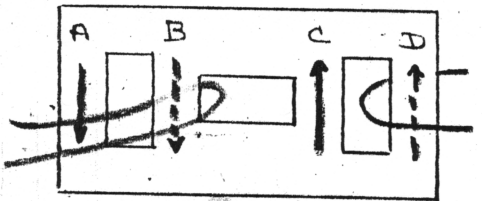
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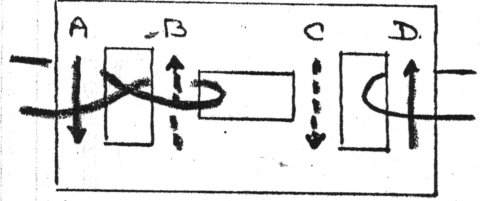
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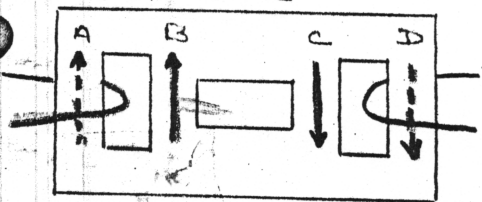
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