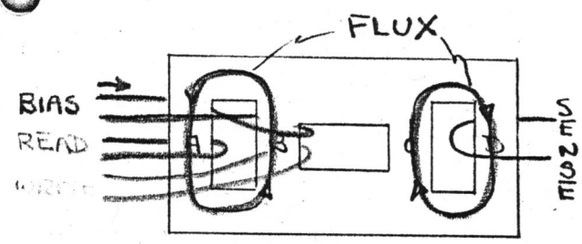
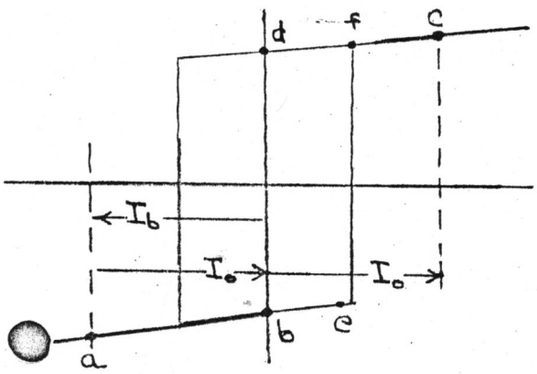
IP 1 ~~Confidential~~ HARVEST

MPRO 3

BIASED MULTI-PATH STORAGE ELEMENT
COINCIDENT-CURRENT SELECTION



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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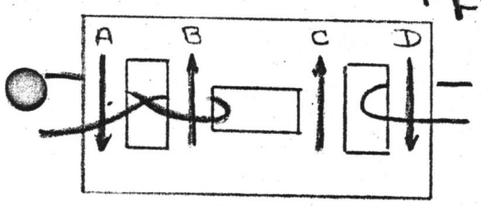
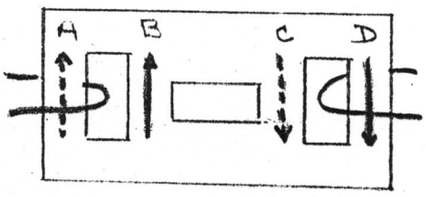
JAN 64

STORED Ø — FLUX — BIAS — SENSE — READ — WRITE



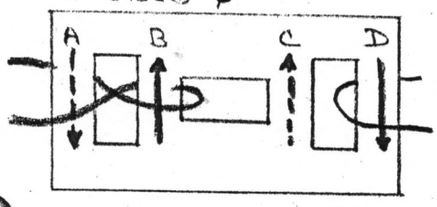
NOTE: BROKE ARROW INDICATES FLUX CHANGE

READING Ø



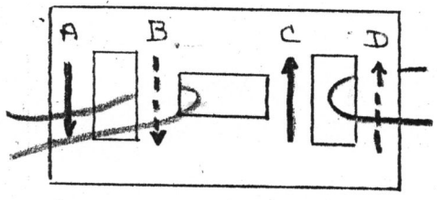
APPLYING FULL SELECT, $2I_o$, OPPOSES BIAS ON LEG A, REVERSES THE FLUX IN THAT LEG AND LEG C. SINCE THERE IS NO CHANGE OF FLUX LEG D, THERE IS NO OUTPUT ON THE SENSE WINDING

STORED Ø



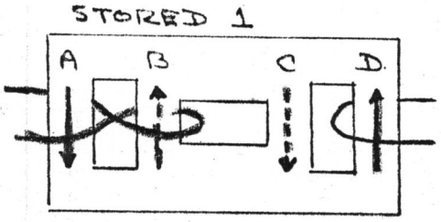
UPON REMOVAL OF READ SIGNAL, BIAS RESTORES LEGS A AND C. THIS IS THE STORED Ø WHICH FOLLOWS ALL READ OPERATIONS

WRITING 1



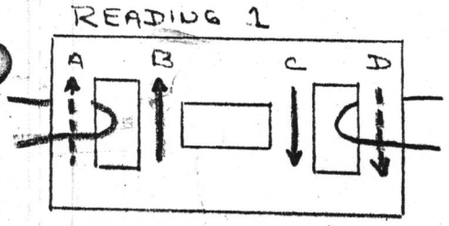
A FULL SELECT, $2I_o$, OPPOSES BIAS ON LEG B AND CAUSES FLUX DIRECTION ON LEG B TO CHANGE AND ALSO LEG D. AN INHIBIT WINDING TO OPPOSE THE WRITE WILL PERMIT WRITING Ø

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 Ø CONDITION

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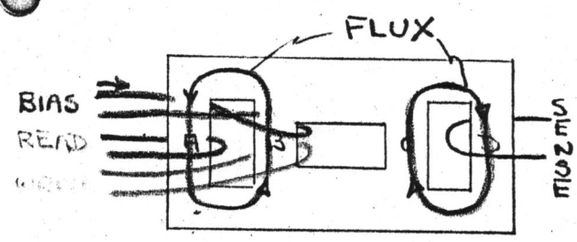
BIASED MULTI-PATH STORAGE ELEMENT COINCIDENT-CURRENT SELECTION



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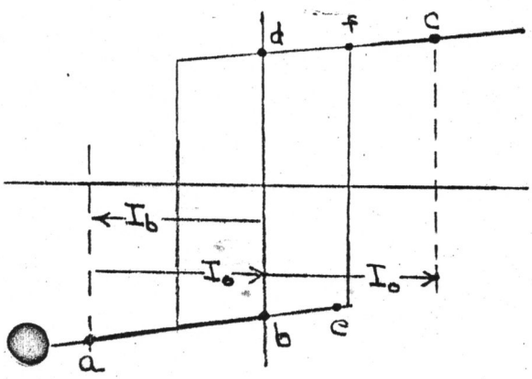

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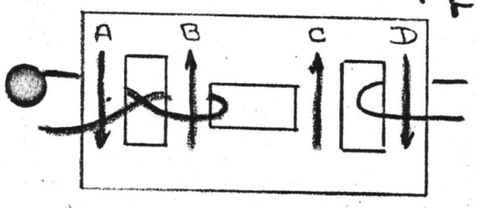

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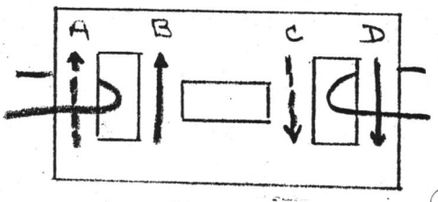

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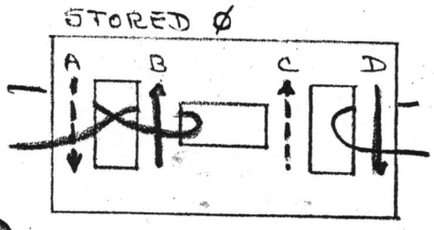

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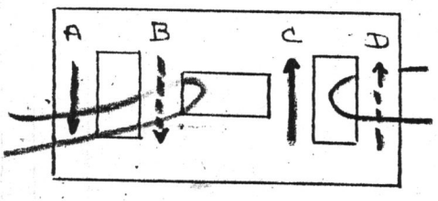

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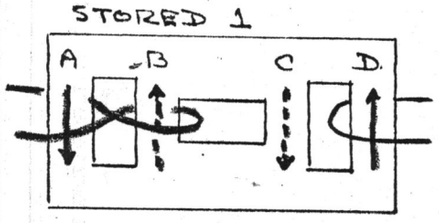

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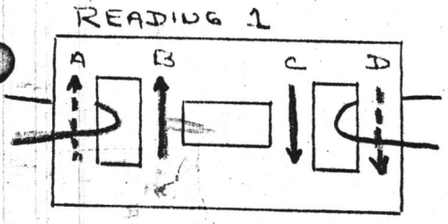

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