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SUBJECT: PROPOSAL FOR REDUCING THE NUMBER OF TUBES USED IN DRIVING A MAGNETIC MATRIX SWITCH

To: N. H. Taylor

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Date: July 9, 1953

Abstract: A scheme is outlined which eliminates roughly half the bias drivers used in present models of the magnetic matrix switch. It calls for an increase of about 50% in the number of wires passing through a core in the switch.

The usual scheme for driving a magnetic matrix switch (shown in Fig. 1) having 2^n cores and the same number of output windings, calls for 2n separate bias windings, one set winding and one reset winding. An alternate scheme calls for 2 (n-1) bias windings, 2 set windings and 1 reset winding. In this note we will refer only to the first scheme above. The results can be applied equally well to the alternate scheme. In either case the bias windings occur in pairs; one pair per digit flip-flop. Of the pair, one is activated by the "1" side of the flip-flop and the other by the "0" side. These windings will be referred to as the "1" and "0" windings respectively in this report.

A given flip-flop performs the logical function of selecting one of the two windings associated with it. Each of these windings threads half of the cores. In Fig. 1 for instance the "0" winding of the 2 flip-flop threads cores 4, 5, 6, 7 and the "1" winding cores 0, 1, 2, 3. The pairs of windings associated with the other flip-flops are made to divide the cores into halves also, but each division is made in a different way. For example the 2^1 flip-flop (Fig. 1) is seen to divide the cores in half by alternate groups of two. This arrangement of windings leaves only one core in the matrix unbiased for each setting of the flip-flops, all other cores being subjected to at least one unit and as many as "n" units of bias.

The modification of the above conventional magnetic matrix switch which is proposed is based essentially on the fact that all of the information in a flip-flop is contained in either of its two sides. Our process of selection could, for instance, be made to depend only on the condition of the "1" side of the flip-flop. Suppose we make the "0" winding of a particular flip-flop independent of the condition of the "0" side of the flip-flop, and instead have it automatically pulsed whenever the switch is to be operated.

In order to have this flip-flop produce an effect equivalent to that in the usual switch we must have the "1" winding, when it is selected:

a) perform its usual function of biasing half the cores,
b) perform the additional function of cancelling the effects of the automatic "0" bias on the other half of the cores.

This cancellation is readily accomplished by having the "1" winding in addition to biasing its half of the cores in the matrix, send its current in the opposite direction through the other half. Fig. 2 shows a diagram of the proposed scheme.

Let us examine the 2^2 flip-flop and its associated windings. The "0" winding automatically biases cores 4-7. If the "0" side of the flip-flop is on, the "1" winding is not pulsed and we have the desired result. If the "1" side of the flip-flop is on, the "1" winding is pulsed. This means that cores 0-3 are biased and cores 4-7 receive current which tends to cancel the automatic bias of the "0" winding. We therefore have cores 0-3 biased and 4-7 unbiased, which is the desired result. The other digit flip-flops and windings may be seen to operate similarly.

The total number of bias drivers used in this system becomes n "1" bias drivers, one "0" bias driver where the usual magnetic matrix switch has n "1" bias drivers, and n "0" bias drivers. For a large switch this proposed design cuts the number of tubes approximately in half.

The main disadvantage of this system is that it requires the cancellation of currents within a core. Added noise on non-selected cores or possibly unequal outputs for different selected cores may result from differences in currents assumed to be cancelling. It also requires an increase of something less than 50% in the total number of turns on the switch.

An incidental advantage is that the buffers which are normally turned on by the flip-flops and which actually drive the "0" and "1" windings need not be gated drivers in order to be off during the period when the switch is not in use. Since there are no buffers hanging on the "0" side of the flip-flop we can simply set all the flip-flops to the "0" side during the periods when the switch is inoperative.

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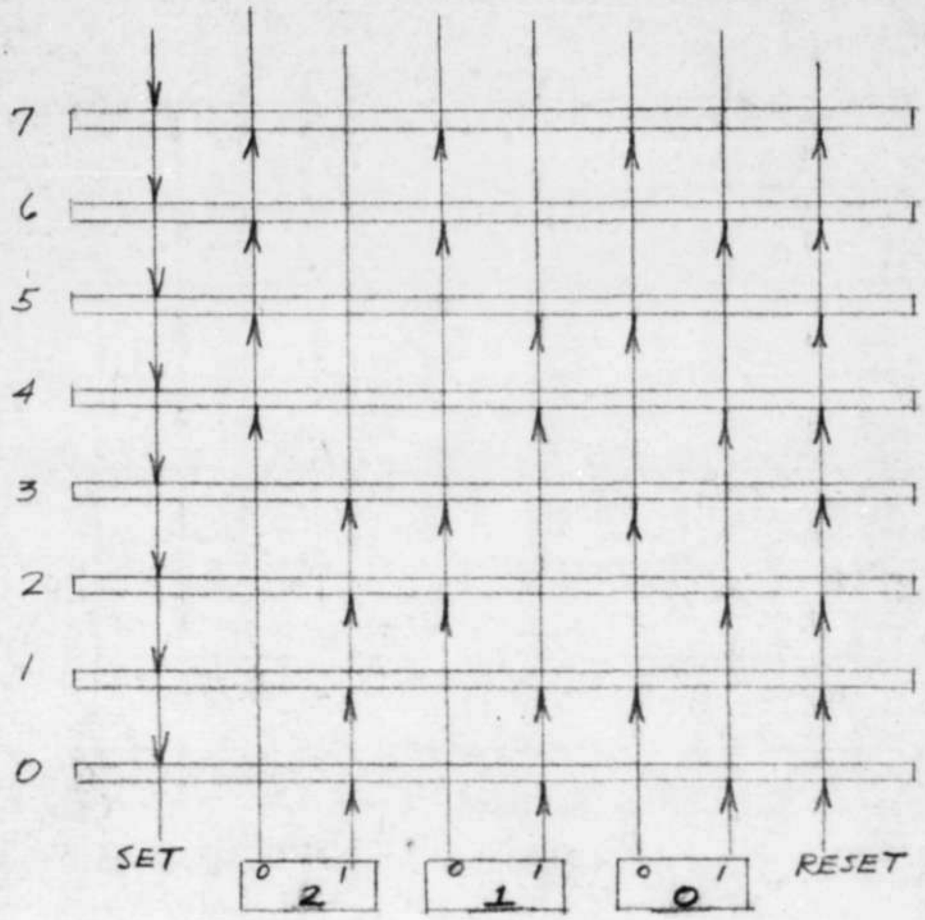
Attached drawings: SA 55534
SA 55535

SA-55534



An arrow pointing up indicates current passing through core so as to bias it off. An arrow pointing down indicates opposite current direction.

Schematic of Olsen Switch

Fig. 1

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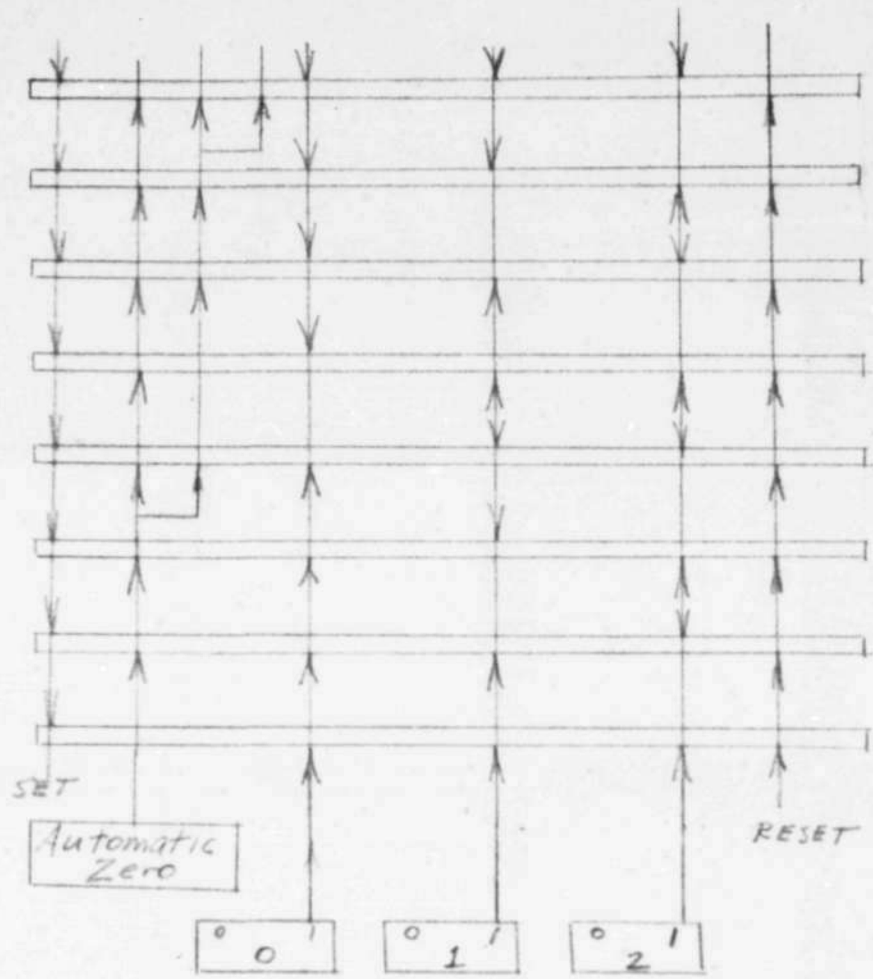

Proposed Scheme For Reduction of Tubes In Olsen Switch

Fig. 2

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