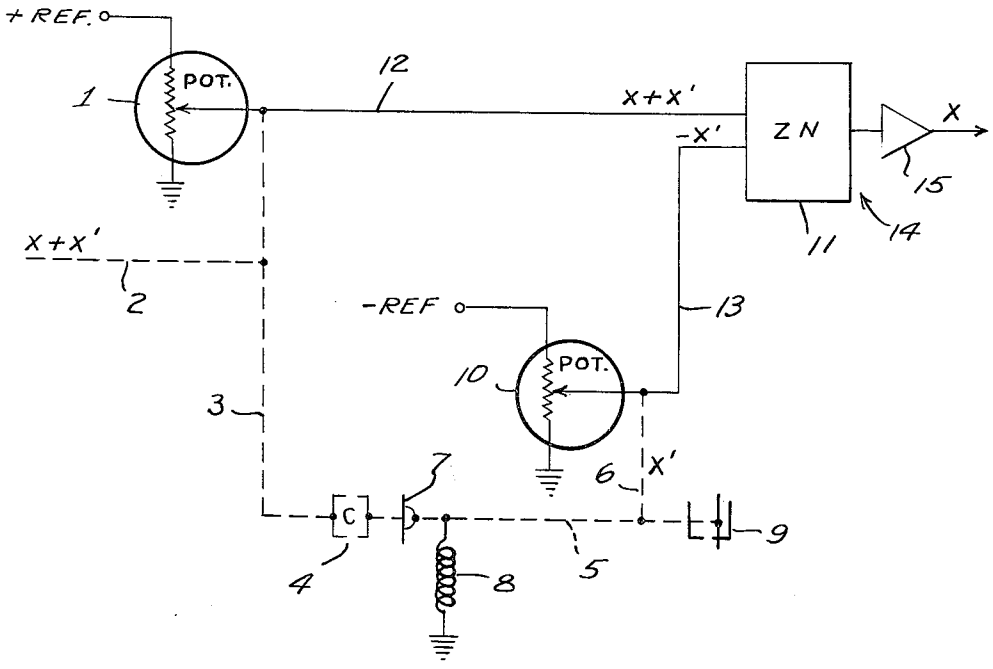
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MEMORY DEVICE FOR ANALOG COMPUTERS

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MEMORY DEVICE FOR ANALOG COMPUTERS

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This invention relates to memory devices which have special utility in the analog computer art. Memory devices serve in this art to store quantities temporarily while their input continues to change and require resynchronizing components which cause the stored analog and the analog which has accumulated during the storing to be combined after the storing has terminated. Typically these components comprise a heart cam with a spring biased follower and a clutch, the latter serving to interrupt the follower output during the storing period and, in conjunction with the action of the spring on the cam, to resynchronize the follower and the cam at the end of the period. These resynchronizing components are disposed in the mechanical drive for a voltage device such as a potentiometer.

According to the invention there is provided a memory device the voltage device of which is continuously driven even during the storing period so that after the period, resynchronization of the device is not required. Generally this is achieved by the addition of a second voltage device which also receives the changing input during the storing period and applies it in analog voltage form to the voltage output of the principal device in such a manner as to prevent the output of the memory from changing with its input. After the storing period the output of the second device is removed and the output of the principal device, which is continuously synchronized with its input device, is restored as the sole voltage generator in the memory system.

One object of the invention is to provide an improved memory device which is simple and economical to construct and operate.

Other objects and advantages of the invention may be appreciated on reading the following detailed description which is taken in conjunction with an accompanying drawing which schematically illustrates one embodiment thereof.

Referring to the drawing a linear potentiometer 1 referenced by a positive voltage source is driven by a mechanical drive comprising connected shafts 2 and 3. The shaft 3 also has mounted thereon one disc of clutch 4 the other disc of which is connected to shaft 5 connected to potentiometer shaft 6. The potentiometer shaft 6 serves to position the slider of a potentiometer 10 which is negatively referenced. The rotation of the shaft 5 is zero biased by a spring 8 and is limited by a limit stop 9. The limit stop 9 protects the potentiometer 10 from being positioned beyond its limits. A slipping means 7 is interposed between the clutch 4 and the limit stop 9 to protect shaft 5 should the limit stop 9 reach its limit while shaft 3 is still rotating the clutch which in turn is rotating shaft 5.

An adding network 11 receives the output of the potentiometers 1 and 10 on conductors 12 and 13, respectively. The output circuit 14 of the network includes an amplifier 15.

The operation of the memory device with reference to the drawing is seen to be the preservation of the input on shaft 2 while the output may be another value depending upon whether or not the clutch 4 is engaged.

With the clutch 4 disengaged the value (X) on shaft 2 positions the slider of the potentiometer 1 by means of shaft 3. The positive voltage on conductor 12 is an

electrical analog of the mechanical position (X) of the shaft 2 and this voltage is placed into the adding network 11. Since the clutch 4 is disengaged shaft 5 is in its zero position and potentiometer 10 has a zero output on conductor 13. The output of the circuit 14 will be the same value (X) as the voltage on conductor 12.

If at this time the value (X) is to be preserved for a given time the clutch 4 is engaged. The value on shaft 2 is now $(X+X')$ and potentiometer 1 has its slider positioned so that the electrical analog on conductor 12 is $(X+X')$. This value is placed into the adding network 11. With the clutch 4 engaged only the value (X') is placed on shaft 5, by means of shaft 3, which positions the slider of potentiometer 10. The electrical analog on conductor 13 is now $(-X')$ and this value is placed into the adding network 11. The output of the output circuit 14 is still (X).

Once the operator has finished using the value (X) he declutches the clutch 4 and the value $(X+X')$ on shaft 2 becomes the output of the output circuit 14.

In the above manner the value being placed on the shaft 2 is always preserved even though at a particular time the output of the output circuit is held constant so that this constant value can be utilized.

Various modifications of the memory system as described herein may be effected by persons skilled in the art without departing from the scope and principle of the invention as defined in the appended claims.

What is claimed is:

1. A memory device comprising a potentiometer, a second potentiometer, a mechanical drive for said potentiometers, selective means for making and breaking the mechanical connection between said drive and said second potentiometer and an output circuit connected to the output of each of said potentiometers, said circuit including an adding network.

2. A memory device comprising a positively referenced potentiometer, a negatively referenced potentiometer, a mechanical drive connection for said potentiometers, a clutch and spring return means in the mechanical drive connection for said negatively referenced potentiometer and an adding network connected to the output of said potentiometers.

3. A memory device comprising a pair of potential difference measuring instruments, each of said instruments being adapted to establish a voltage in its output according to a mechanical analog position, a mechanical drive shared on the input side of each instrument, a selective make and break device disposed in the drive for one of the instruments, an adding network connected to the output of each of said instruments and means for removing potential from the said one of the instruments accumulated thereon while the latter was selectively connected to said drive.

4. A memory device comprising mechanical drive means, means for producing a voltage in response to said drive means, a second means for producing a voltage in response to said drive means, means for selectively adding the output of the two voltage producing means and means for selectively removing from said adding means accumulated voltage placed therein by one of said voltage producing means.

5. A memory device comprising, a first potentiometer which is referenced by a positive voltage, a second potentiometer which is referenced by a negative voltage, an input shaft, means for positioning the sliders of said potentiometers in accordance with the position of said input shaft, means for selectively engaging or disengaging the input shaft from said second potentiometer, and an adding network for receiving the outputs of said potentiometers and summing them.

6. A memory device as claimed in claim 5 wherein a biasing spring is interposed in said means for positioning said second potentiometer for returning the slider of said second potentiometer to a zero position whenever said selective engaging or disengaging means is disengaged.

7. A memory device as claimed in claim 6 wherein a limit stop and a slip means is interposed in said positioning means for said second potentiometer for protecting said second potentiometer and said positioning means from being overloaded.

No references cited.