

6. Low Level Discriminator Using Tunnel Diode Monostable and Bistable Circuit.

A tunnel diode monostable circuit the threshold level of which can be adjusted is connected to a tunnel diode bistable circuit the threshold level of which is fixed by a constant current source. This two circuits are coupled to two difference amplifier of which the first one has a variable threshold and the second one has a delay line which is used to send pulse to reset the tunnel diode bistable circuit to the original stable state through a reset circuit (See Fig. 6.1)

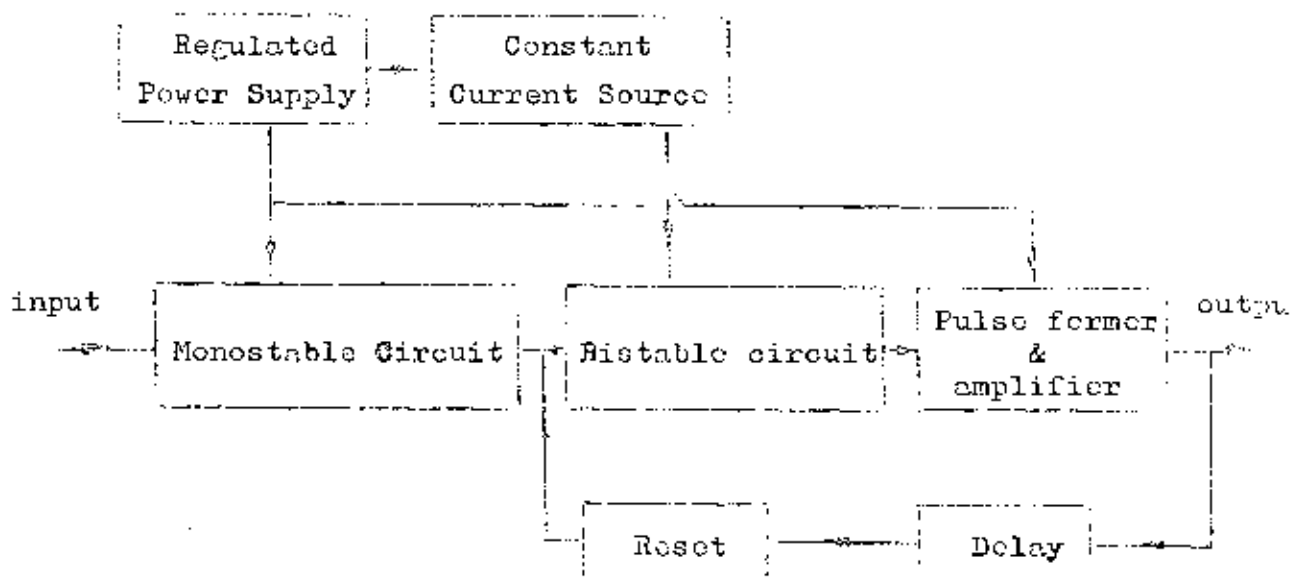
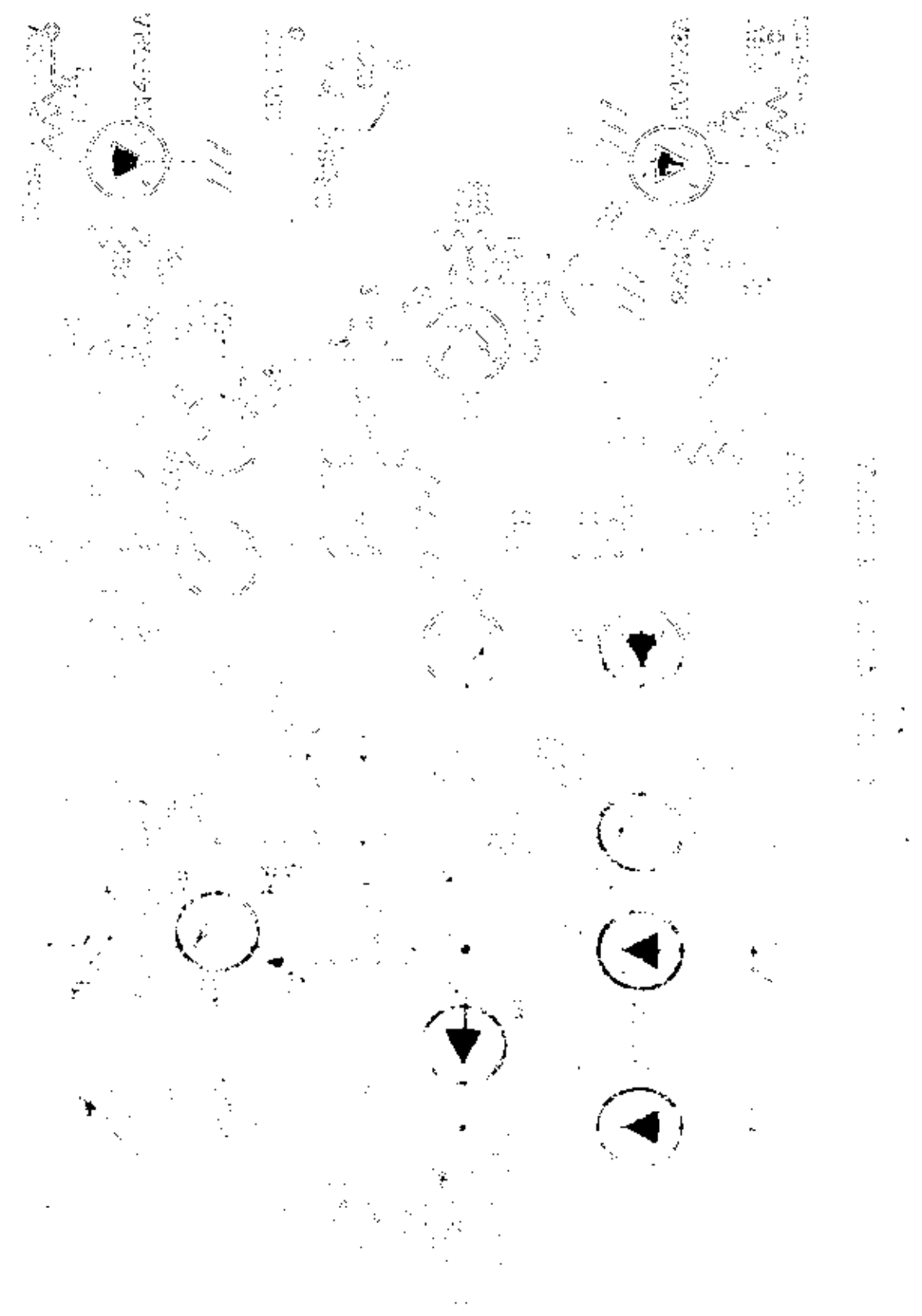


Fig. 6.1 Block diagram of a discriminator using both tunnel diode monostable and bistable circuit.



111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130 131 132 133 134 135 136 137 138 139 140 141 142 143 144 145 146 147 148 149 150 151 152 153 154 155 156 157 158 159 160 161 162 163 164 165 166 167 168 169 170 171 172 173 174 175 176 177 178 179 180 181 182 183 184 185 186 187 188 189 190 191 192 193 194 195 196 197 198 199 200

111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130 131 132 133 134 135 136 137 138 139 140 141 142 143 144 145 146 147 148 149 150 151 152 153 154 155 156 157 158 159 160 161 162 163 164 165 166 167 168 169 170 171 172 173 174 175 176 177 178 179 180 181 182 183 184 185 186 187 188 189 190 191 192 193 194 195 196 197 198 199 200

When a monopulse with amplitude large enough to trigger the tunnel diode TD 1 enters the input circuit the threshold level of which can be adjusted by the resistance R_{TD} (See Fig. 6.2) and R_L , a pulse will be transmitted to tunnel diode TD 2 to turn to the other stage. This voltage change at TD 2 will switch the — transistor Q 1 of the first difference amplifier (transistor Q 1, and Q 2) to conduct. The threshold level of transistor Q 1 can be adjusted by varying the 500 ohm potentiometer. The signal pulses at the collector of Q 1 and Q 2 are sent to the second difference amplifier (transistor Q 3 and Q 4.) The output signal is taken from the collector of the transistor Q 3 while the other signal from the collector of the transistor Q 4 is delayed by a delay line for 0.5 μ sec. to switch the transistor Q 5 to conduct in order to reset the tunnel diode TD 2 to the original stable state. Both negative and positive power supplies are stabilized by using Zener diodes.

6.2 Experimental results and linearity of the discriminator.

The experimental result is obtained by applying a signal from a mercury pulser to the input and varying the resistance R (See Fig. 6.3) we have.

$$\text{Current Sensitivity} = \frac{32 \times 10^{-3}}{300} = 107 \mu a$$

The curve shows a remarkable linearity through the range of 0 to 150 mv. of signal input although the sensitivity is decreased by a factor of 10 in comparison with the other two circuits, this is due to the charge stored in the switching diode D1, the switching speed of which is rather low.

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