multiple tumors, the projections can be misleading even when two projections from different angles are taken.

Additional detectors are desirable to provide more information about the radioactivity pattern with greater speed, i.e. by simultaneously scanning from many directions. One possible configuration is shown in Fig. 2 with the detectors arranged in two planes on each side of the head. The number of coincidences equals $\left(\frac{n}{2}\right)^2$, where n is the total number of detectors. This arrangement is more sensitive to counts at the center of the pattern than at the top and bottom, and some of the detectors are farther from the center than others. It was finally decided to arrange the detectors in a circle as shown in Fig. 3. The system has 32 detectors with 1 1/4 inch diameter by 1 inch deep NaI crystals arranged in a 15 inch diameter circle. Figure 3 shows the sensitive areas which intersect the head, for the coincidences between detector No. 1 and the opposing detectors. The head is, therefore, "scanned" simultaneously from each detector resulting in 9 to 11 paths through the head producing coincidences for each detector. An average head will produce about 170 to 180 coincidence combinations. This ring will take data in one plane and will be moved in 10 steps along the vertical axis of the head to obtain three-dimensional data.

Coincidence Pair Counting System

In addition to the detector counting assembly the system includes: 1) coincidence circuitry which counts coincident pulses between any pair of detectors and codes the data in a form suitable for storage in 2) a Two-Dimensional Pulse Height Analyzer memory.[4]

The detectors are numbered from 1 to 32 sequentially around the circumference. The coincidence counting system, using standard Computer Control Co. "S-Pacs"[5] and compatible laboratory-built circuitry, examines each event, rejecting single counts and multiple coincident counts of three or greater, and finally codes the two detectors in the pair for memory storage. The lower number detector is coded in a train of pulses equal to its assigned number and stored in the X memory of the Two-Dimensional Analyzer. The higher number detector is simultaneously coded into another pulse train equal to its assigned number and stored in the Y memory.

Referring to the system block diagram (Fig. 4), each of the 32 detector amplifier outputs drives one input of a 2 input NAND circuit which in turn sets one stage of the 32 stage shift register. The other input is a gate common to all 32 input NANDS which can prevent setting of the shift register during analysis of an event.

When the input gate is open, any single or multiple coincident event(A) can set the appropriate shift register stages in parallel. The Clock Gate Flip-Flop(B) is set by the switching of any shift register stage through the 32 fold "OR" circuit. The input NAND gate closes immediately(R) preventing acceptance of any more detector pulses until completion of the analysis. The Clock Gate Flip-Flop triggers Pulse Shaper(C) which inhibits for 10μsec the start of the gate(F) to the Clock Multivibrator(G). During this delay period, the states of all 32 stages of shift register are examined in parallel to determine whether the event was a single or a multiple coincidence. Since only the coincidence pair of 0.51 Mev annihilation gammas is of interest in this scan, the analysis of singles and all other multiple coincidences are prevented. The three standardized outputs from the coincidence analyzer, indicating the number of switched shift register stages, are converted in the logic NAND-NOR circuitry to a standard one or zero level voltage(D); logic zero (0 volt represents a coincidence pair, and logic one (-6 volts) represents a single or triple or