CHAPTER 2
The First Electronic Television

Section 2.1
The Race for Electronic Television

While Baird was the pacemaker with his demonstration of the first working television system [1] on January 26, 1926, Zworykin and Farnsworth, in the USA were independently racing to be first with an advanced system of electronic television (Figure 2.1).

Figure 2.1: Farnsworth's Dissector-Multiplier Camera, 1934

On May 27, 1926, Philo Farnsworth set up his laboratory in an apartment in Los Angeles. Late in the summer of 1926, Farnsworth connected together the various component parts of the electronic circuit to his first image dissector tube. This glass vacuum tube had taken two months of trial and error to produce. Based on Farnsworth's original concept of electronic television, this venture had cost partners, Gorrell and Everson, six thousand dollars from personal funds. The partners watched in anticipation along with Farnsworth's wife Elma as the system took shape. Unfortunately, the situation turned to disappointment when it became apparent that in haste, Farnsworth had overlooked one very important specification. The generators produced a very high surge of power for an instant during start-up. The sensitive apparatus should have remained disconnected until after this surge had occurred. Inevitably during 'switch-on' a rush of electric current surged through the apparatus instantly destroying the circuits and the first untested image dissector.

Elma Farnsworth wrote: [2]
"I knew what a terrible shock this was to him. I could see the thoughts whirling in his head. Was this to be the end of his dream?"

Gorrell and Everson, although disappointed, were not easily dissuaded from the project. However, they decided that more confidence was required before they could convince others to finance the television scheme. It was decided that Farnsworth's ideas should be tested, verified and supported. A patent attorney and an expert from the Californian Institute of Technology were elected to critically interview Farnsworth and appraise the image dissector concept. Farnsworth revealed his scheme in confidence and presented the technical information before this panel of 'experts'. The outcome was positive. Farnsworth had a novel concept, which although daring, appeared to be technically feasible. With renewed confidence Everson visited the Crocker Bank in San Francisco with a view to raising the sum of twenty five thousand dollars.

Elma Farnsworth: [3]
"The backing syndicate proposed to put up the money and act as trustees for 60 percent of the venture. Of the remaining 40 percent, Phil was to have 20 percent and George and Les were to divide the other 20 percent."

Farnsworth returned to electronic television on a more realistic scale on September 22, 1926, and established a television research section in the loft of the Crocker-Bishop Research Laboratory. Crocker, Head of the Crocker Bank, advised his business partner Roy Bishop a successful capitalist and engineer that Farnsworth was a good risk. Cliff Gardner, Farnsworth's former business partner and brother-in-law was called upon to work on the precision glass envelope for the image dissector tube. Elma Farnsworth assisted with secretarial work and helped with technical drawings. Bill Cummings, a professional glass technologist

from the University of California, assisted with the fabrication of the image dissector flask and trained Gardner in the art of glass blowing.

On 7 December 1927, Farnsworth applied for his first television patent [4] entitled 'Television System.'

Based on an entry in Farnsworth's notebook dated 7 September 1927, Abramson wrote: [5]
"It is claimed that on September 7, 1927, he was able to transmit an 'image' from one of his early camera tubes. It was no more than a moving blob of light that was reproduced on a receiving tube, but it proved his new system would work."

Abramson [6] indicated that the Farnsworth family had never accepted that Zworykin operated an electronic camera tube at an earlier date. Everson [7] and Hofer [8] describe the first televised image from a transparency as a "moving blob" while Elma Farnsworth described it as a "One-dimensional moving line." [9] It was later reported at a press demonstration in September 1928 that after a year of refinements the image quality had significantly improved. [10]

Burns wrote: [11]
"The demonstration consisted of the transmission of silhouettes and films but not of television in which the light is reflected from an object was used. The received images were displayed on a cathode-ray tube screen and were 1.25 x 1.5 inches in size. They had to be viewed preferably in a darkened room because of their faint brightness."

Farnsworth was not alone in the dissector concept. The earliest disclosure was a German patent applied for on April 5, 1925 by Dieckmann and Hell. [12] Figure 2.2 illustrates this device showing two sets of magnets for deflection. Hell indicated that they had built the tube but were unable to make it function. [13] This patent was issued on October 3, 1927, ten months after Farnsworth's American patent application of January 7, 1927. [14] In Britain C. E. C. Roberts, applied for a British patent [15] describing an electron image camera tube on June 22, 1928. However, there is no indication that Roberts was successful. The first 'working' image dissector must be attributed to

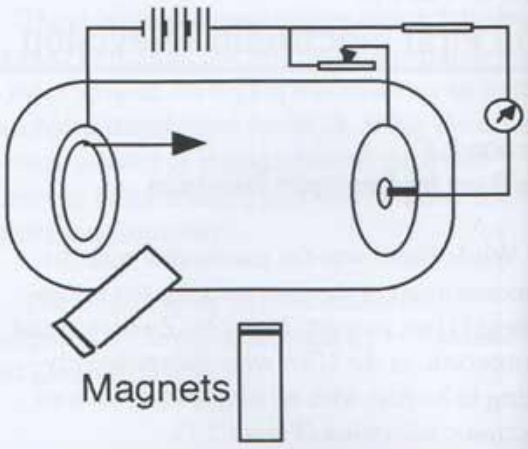

Figure 2.2: Max Dieckmann and Rudolph Hell's patent, 1925

Philo Farnsworth.

While it appears that Farnsworth was first to render an electronic image from an electronic camera tube, Zworykin believed that he should have priority. He based this on an earlier demonstration given to Westinghouse executive during the period 1923-1925. This was a claim which proved difficult for Zworykin to defend. Abramson [16] indicated that despite several claims made by Zworykin, stating that he had operated a television system as early as 1923, no real evidence was found to prove that this ever took place. Abramson [17] disputes that Farnsworth had the only operating camera tube in the world in 1927, and argues that Zworykin operated the first camera tube sometime betwee the middle of 1924 and the end of 1925.

Although relying on anecdotal evidence Burns wrote: [18]
"In the late summer/early autumn of 1925, Davis, Kitner and Schairer witnessed a demonstration of Zworykin's television scheme. 'A small cross was held in front of the transmitte cathode-ray tube and its image appeared on a screen at the end of the receiver cathode-ray tube."

Abramson further supported his argument that Zworykin was first: [19]
"This created a problem for me until I discovered a Westinghouse Memo dated June 25, 1926. It was actual evidence that tubes, both transmitting and receiving, had been bui and operated."

The Westinghouse Memo was entitled:
Problems of Television, Closing Report.
Abramson quoting from this Memo wrote: [20]
"This comes from the archives of the Westinghouse Labs in East Pittsburgh. This was in the form of a Westinghouse Research Report R429A, (marked "Confidential") dated June 25, 1926, written by V. Zworykin. This report indicated that some form of research project had been funded and worked on."

The above memo only serves to prove that television tubes existed for transmission and reception but it does not indicate that an image was sent and received prior to Farnsworth's success.

Although, the intellectual property rights for electronic television were later awarded to Farnsworth after a long and protracted patent interference action against Zworykin, it appears that the question of 'who was first' should remain open until further conclusive evidence is located.

The next section describes the technology of Zworykin's first camera, the iconoscope, which introduced the storage principle, and the Kinescope television receiver tube.

Figure 2.3: Zworykin's first camera tube

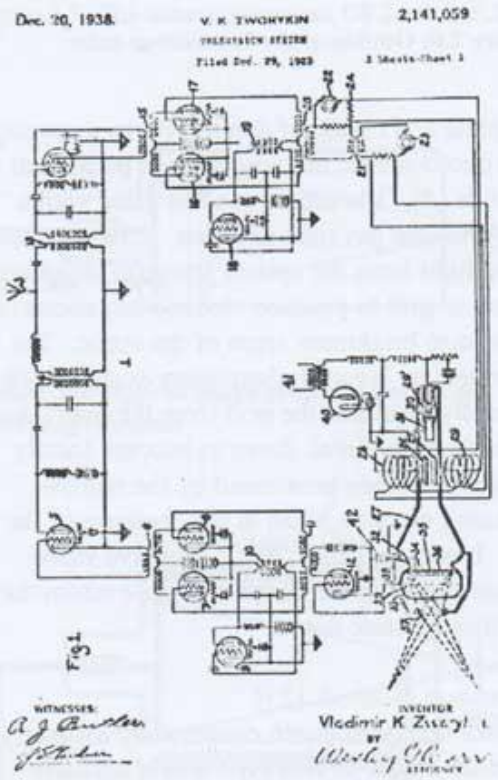

Figure 2.4: Zworykin's television camera patent: US 2,141,059, 1923

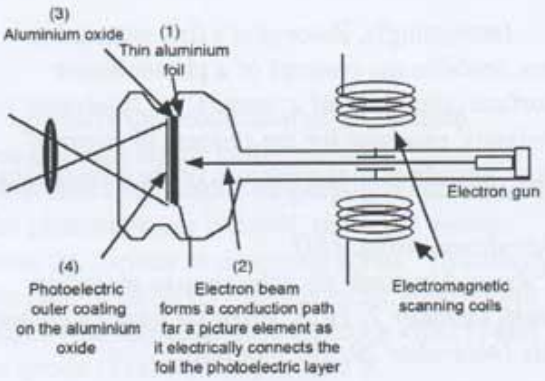

Figure 2.5: Details of Zworykin's 1923 television camera