

[54] **COLLIMATOR PARTICULARLY FOR HIGH RESOLUTION RADIOACTIVITY DISTRIBUTION DETECTION SYSTEMS**

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[58] Field of Search .... **250/105, 71.5 S**

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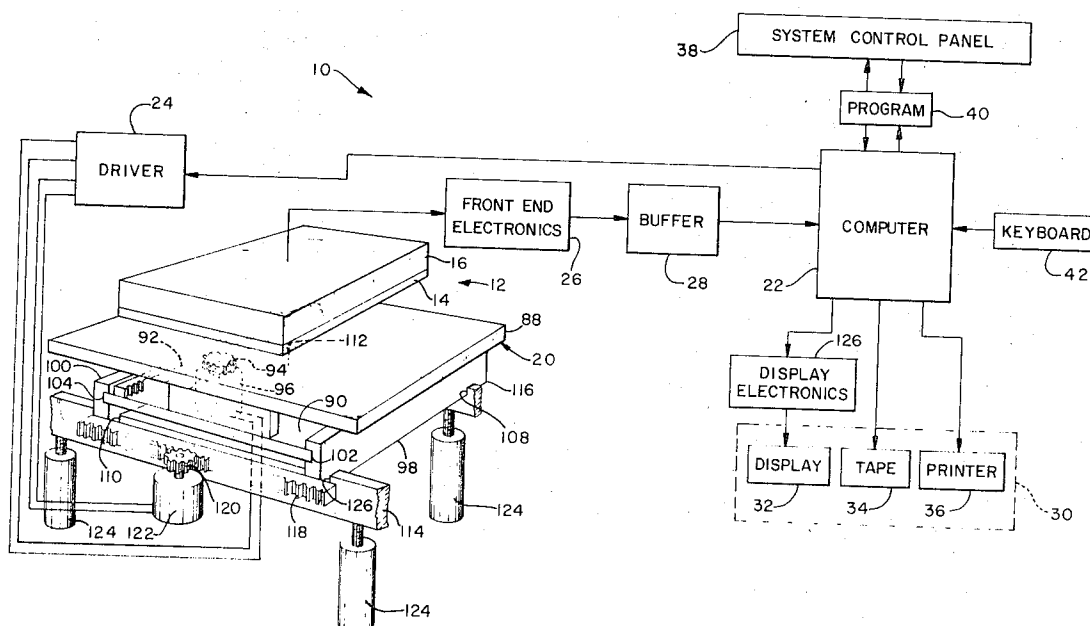
Attorney, Agent, or Firm—Morse, Altman, Oates & Bello

[57]

**ABSTRACT**

Radiation emitted from a subject positioned on a programmable X,Y platform is directed through a multi-plane focused collimator and is detected by means of an array of sensing devices. The collimator comprises a registered stack of photoetched plates, each plate formed with a series of hole sets and each stack of hole sets defines downwardly converging collimator bores. One hole set is distinguished from another hole set by different hole profiles, each hole profile defining a specific focal length. The platform, which is in spaced relationship with the collimator, is moved incrementally along its X and Y axes in steps defining a programmed scanning pattern, each step being an integral multiple of the distance between adjacent sensing devices. The number of radioactive events detected at each step is temporarily held in a buffer memory and then applied to a digital data storage unit in a computer. Upon completion of the programmed scanning sequence, the stored data, which represents the radioactivity detected at various depth of the subject, is applied to a display for presentation as a composite half tone pictorial representation of the detected radioactive events.

**5 Claims, 5 Drawing Figures**



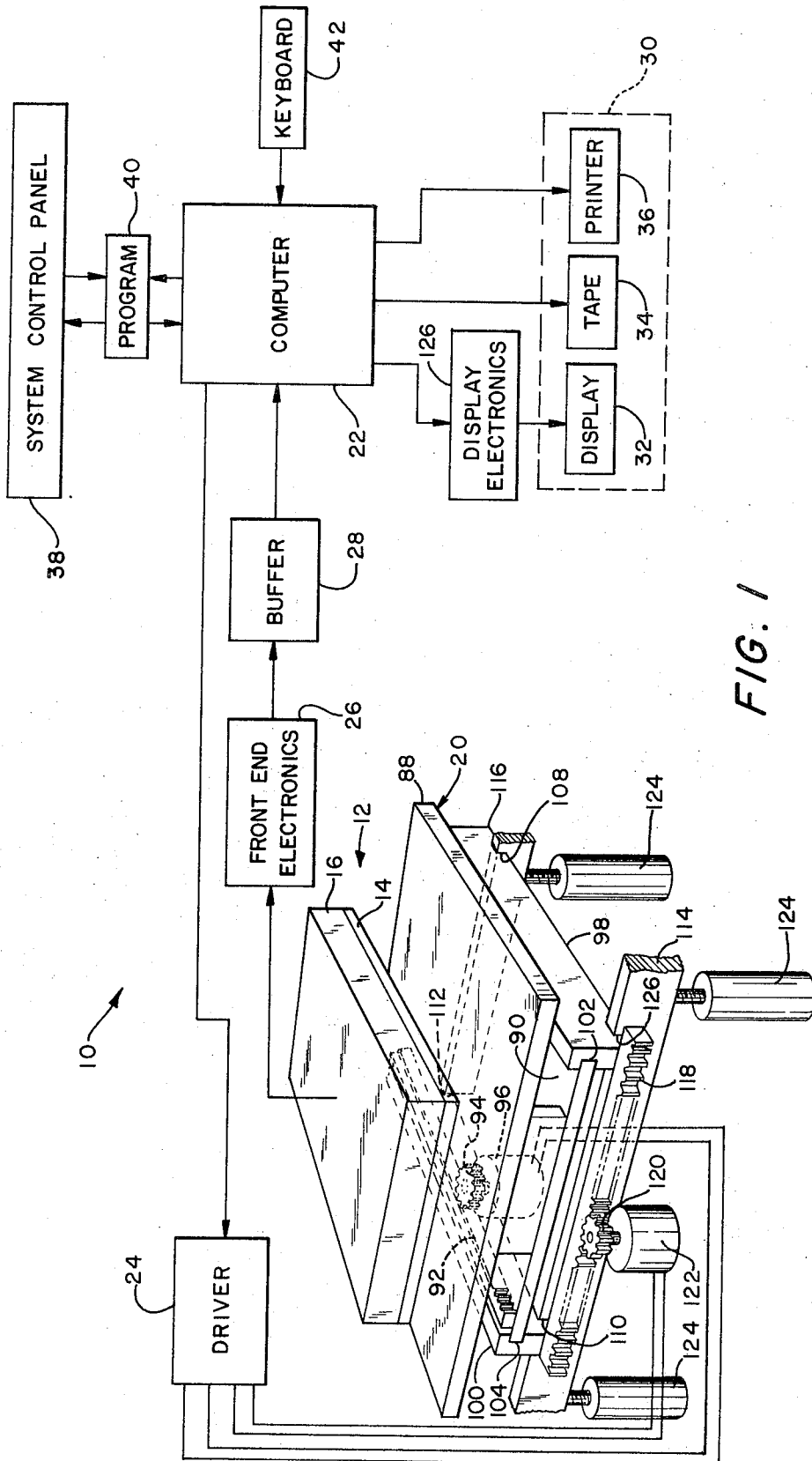
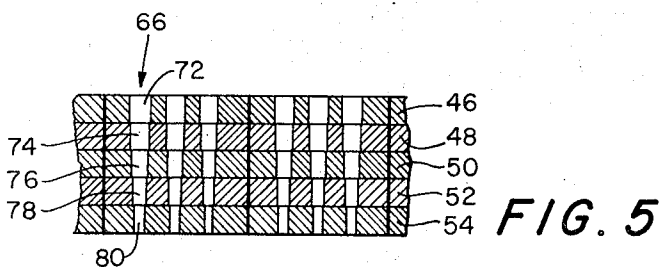
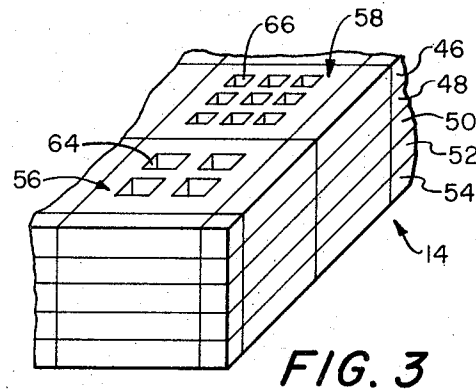
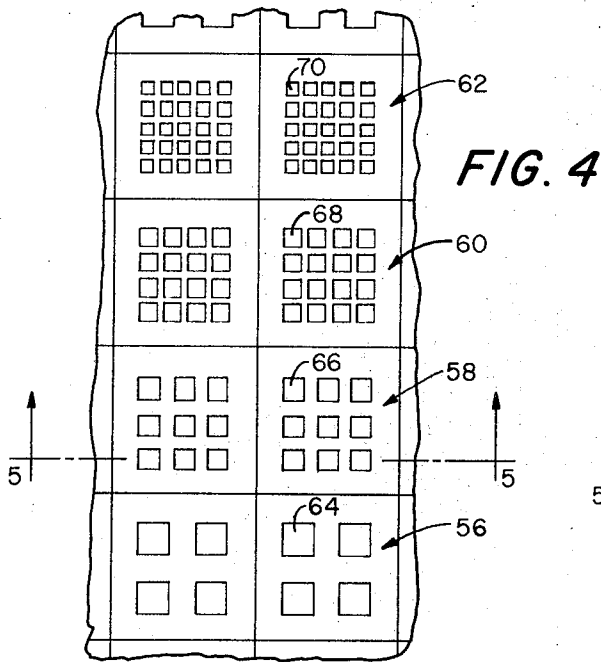
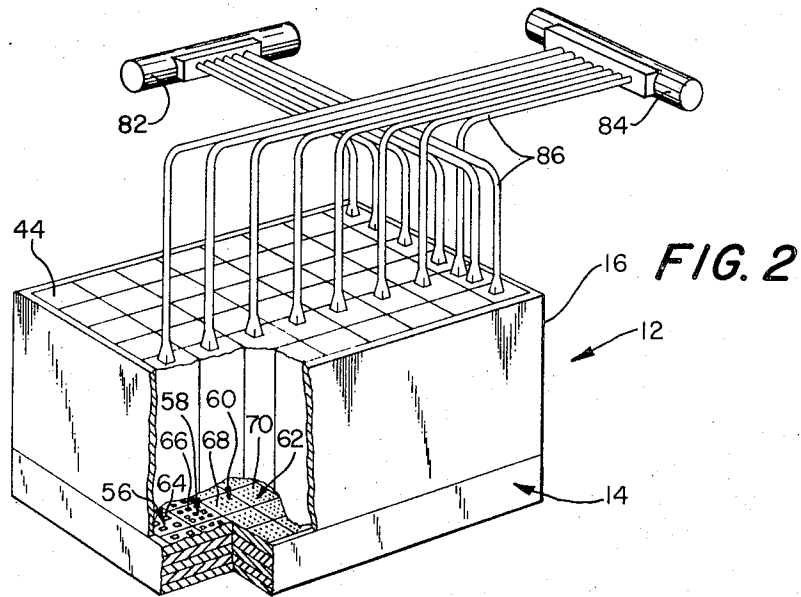


FIG. 1



# COLLIMATOR PARTICULARLY FOR HIGH RESOLUTION RADIOACTIVITY DISTRIBUTION DETECTION SYSTEMS

## BACKGROUND OF THE INVENTION

### 1. Field of Invention:

The present invention relates to radiation detectors and, more particularly, to a radioactivity distribution detection system having a multi-plane focused collimator.

### 2. Description of the Prior Art:

Various types of radioactivity distribution detection systems have become known in the art for determining the location of radioactive material injected in diagnostic amounts into a human body or the like. These systems have not proven to be entirely satisfactory. For example, due to a low degree of resolution or definition in the displayed data, such systems have suffered from the disadvantage that a limited amount of information is presented with respect to low level radioactive events. Furthermore, such systems have suffered from the disadvantage that, in order to obtain data of radioactive events at various subject depths, a collimator having one focal length is replaced by a collimator having another focal length. Such collimators are costly to produce and time consuming to change.

## SUMMARY OF THE INVENTION

It is an object of the present invention to provide a collimator, particularly for a high resolution radioactivity distribution detection system, for presenting a half tone display of the relative concentrations of a radioactive isotope at various depths within a section of a structure containing an unknown distribution of activity. Radiation emitted from a subject positioned on a programmable X,Y platform is directed through a multi-plane focused collimator and is detected by means of an array of sensing devices. The collimator comprises a registered stack of photoetched plates; each plate formed with a series of hole sets, corresponding hole sets of adjacent plates being in registration. A downwardly converging collimator bore is formed by corresponding registered holes of each hole set of adjacent plates, each hole set having a plurality of collimator bores of like focal length. The collimator bores of one hole set is distinguished from the collimator bores of another hole set by different hole profiles and focal lengths. The X,Y platform, which is spaced relationship with the subject, is moved along its X and Y axes in incremental steps defining a preprogrammed scanning pattern, each step being an integral multiple of the distance between adjacent sensing devices. The number of radioactive events detected at each scanning step is temporarily held in a buffer memory and then fed to a digital data storage unit in a computer. Upon completion of the programmed scanning sequence, the stored data, which represents detected radioactive events at various depths within the structure, is applied to a display for half tone presentation of a composite pictorial representation of the detected radioactive events.

The invention accordingly comprises the device possessing the construction, combination of elements, and arrangement of parts that are exemplified in the following detailed disclosure, the scope of which will be indicated in the appended claims.

## BRIEF DESCRIPTION OF THE DRAWINGS

For a fuller understanding of the nature and objects of the present invention, reference should be had to the following detailed description taken in connection with the accompanying drawings wherein:

FIG. 1 is a block and schematic diagram of a system embodying the invention;

FIG. 2 is a perspective, partly broken away, illustrating a multi-plane focused collimator and a sensing array embodying the invention;

FIG. 3 is a perspective, somewhat exaggerated, of the multi-plane focused collimator of FIG. 2;

FIG. 4 is a plan view of the multi-plane focused collimator of FIG. 3; and

FIG. 5 is a section taken along the lines 5—5 of FIG. 4.

## DETAILED DESCRIPTION OF THE INVENTION

Generally, the invention is characterized by a radioactivity distribution detector having a multi-planar focused collimator and a programmable X,Y platform for presenting a high resolution, half tone pictorial display of the relative concentrations of a radioactive isotope at various depths within a section of a structure containing an unknown distribution of activity. Specific applications of the invention is the visualization of body structures, organs and defects in subjects undergoing a diagnosis following administration of a diagnostic amount of radioactive material. By complementing a radioactivity distribution detector with a multi-planar focused collimator and a half tone display, the invention provides a radioactivity distribution detecting system which is characterized by high detection probability, distinct uniformity and clarity in reproduction characteristics, and high resolution in the presented data.

Referring now to FIG. 1, a radioactivity distribution detection system 10 comprises a detector assembly 12 which includes a photoetched focused collimator 14 and an array 16 of individual scintillators. In the illustrated embodiment, collimator 14 is a multi-plane focused collimator characterized by at least two different focal lengths. A subject under diagnosis (not shown) is positioned on a programmable X,Y platform 20 which is in spaced relationship to detector assembly 12, a section of the subject under diagnosis being in registration with collimator 14. In response to command signals generated by a computer 22, scanning signals are generated by a driver 24 which operate to move platform 20 in a specified scanning pattern. Individual scintillation events in detector assembly 12 are sensed and the coordinate position on each event is digitized in front-end electronics 26.

All acceptable data sensed by detector 12 and passed through front-end electronics 26 is accumulated and stored in a buffer memory 28. Each event sensed at a particular X,Y location of the subject, defined by the X,Y position of platform 20 with respect to detector 12, is addressed into memory 28 and accumulated to previous events having the same address. The number of events stored at a given address is the number of recorded disintegrations having originated within the monitored subject at a point, the X,Y location of which corresponds to the given address. Following the accumulation period, the accumulated data in raw digital form is applied to computer 22 for further processing. Computer 22 generates signals to a display 30 for pre-

sentation. As hereinafter described, by way of example, the data is presented selectively on a half tone display 32, a magnetic tape 34, and a printer 36. Operation of the system is directed from a control panel 38 which is interconnected with computer 22 via a programmer 40. A manual data input 42, for example a keyboard, is provided for logging any pertinent data in display 30.

Referring now to FIG. 2, it will be seen that detector 12 is an electro-optical system comprising array 16 of individual radioactive sensitive elements 44, typically distributed in columns of 21 elements and in rows of 14 elements. Each detecting element 44 is a scintillator composed of, for example, a thallium activated sodium iodide crystal or a cesium crystal. As described herein, after, scintillator array 16 is mounted in spaced registration with collimator 14 and each scintillator 44 is disposed in registration with a tapered collimator bore. It is to be understood that the occurrence of a scintillation event in any one scintillator 44 is sensed and its coordinate X,Y position is digitally encoded in front-end electronics 26 and fed into memory 28. The number of scintillation events for each step of the program scanning sequence is accumulated in a corresponding X,Y location in memory 28, for example a 294 word coinci-

|                                       |        |         |         |         |         |        |
|---------------------------------------|--------|---------|---------|---------|---------|--------|
| Focal length .....                    | 3.5    | 3.0     | 2.5     | 2.0     | 1.5     | 1.0    |
| Collimator bore width at top .....    | 0.0364 | 0.04246 | 0.05096 | 0.06290 | 0.08474 | 0.1274 |
| Collimator bore width at bottom ..... | .0318  | .0364   | .04246  | .05096  | .0637   | .08498 |
| Wall separation at top .....          | .0188  | .02505  | .03622  | .04127  | .0289   | .0289  |
| Wall separation at bottom .....       | .01645 | .0215   | .03018  | .03302  | .02168  | .01928 |

dent current core memory. Upon completion of each scanning step, the events stored in memory 28 for that X,Y location of the subject with respect to detector 12 are coupled in parallel to computer 22 and memory 28 is cleared. That is, as platform 20 is moved to the next X,Y position, the events accumulated in memory 28 for the previous X,Y position of platform 20 are fed to computer 22 and memory 28 is cleared and ready for reception of new data.

Referring now to FIGS. 3, 4, and 5, it will be seen that collimator 14 comprises a stack of registered plates 46, 48, 50, 52 and 54. In the illustrated embodiment of FIG. 4 by way of example, each plate is formed with a series of holes sets 56, 58, 60, and 62. Hole set 56 includes four like collimator bores 64, hole set 58 includes 9 like collimator bores 66, hole set 60 includes 16 like collimator bores 68 and hole set 62 includes 25 like collimator bores 70. Each hole set occupies substantially the same area and is distinguished from another hole set by the number of collimator bores and the profile of the collimator bores, the smaller number of collimator bores in each set having the larger collimator bore profile. Each plate is composed of a radioactivity shielding material, for example, a metal having at least the density of lead. In the preferred embodiment, each plate is composed of lead and each collimator bore is formed by a material removal process, such as a photoetching technique using known chemical reactions. It is to be understood that, in alternative embodiments, the number of registered plates is other than five, for example, one, three, four, seven and so on.

As best shown in FIG. 5, the interior faces of each collimator bore downwardly converge and define a downwardly and inwardly tapering collimator bore. As previously indicated, each plate formed with a series of

hole sets and each hole set includes a number of apertures having like profiles. Corresponding apertures of correlative hole sets of adjacent plates are in registration with one another and define a downwardly and inwardly converging collimator bore. That is, a collimator bore 66 is defined by apertures 72, 74, 76, 78 and 80 of plates 46, 48, 50, 52 and 54 respectively. The profile of aperture 74 is slightly smaller than the profile of aperture 72, the profile of aperture 76 is slightly smaller than profile of aperture 74 and so on. From the foregoing it will be readily appreciated that, although the faces of each aperture is substantially in a vertical plane, a stack of registered apertures having progressively smaller profiles defines a downwardly and inwardly converging collimator bore.

The collimator bores of each hole set are characterized by like focal lengths and each hole set is distinguished from another hole set by a different focal length. It is to be understood that, in alternative embodiments, collimator 14 is other than a multi-plane collimator, for example a single-plane collimator characterized by like collimator bores having a single focal length. The following table provides the dimensional characteristics, in millimeters, of collimator bores having different focal lengths.

As best shown in FIG. 2, photomultiplying devices 82 and 84 are optically coupled to array 16 of scintillator crystals 44. Photomultiplier 82 includes a plurality of photodetectors (not shown), one photodetector for each column of scintillators 44. Photomultiplier 84 includes a plurality of photodetectors (not shown) for each row of scintillators 44. Each photodetecting device is optically coupled to its associated detecting element by means of light pipes 86, typically composed of a material which transmits the wavelengths emitted from the scintillator, for example, an acrylic resin such as a methyl methacrylate, a clear epoxy, glass, etc. That is, each photomultiplier is connected to a plurality of photodetectors, each photodetector optically coupled to one scintillator in a row or column. It will thus be understood that, each event sensed by a detecting element 44 produces an output signal which is multiplied by the photomultiplying devices 82 and 84. By reason of their optical coupling, these photomultiplying devices provide information as to the X,Y coordinate position of the sensed radioactivity event. Each detecting element 44 within array 16 causes a response in only one unique pair of photodetectors. In consequence, the arrangement of detecting elements 44, light pipes 86 and the photodetectors is such as to provide a technique for obtaining digital information from crystal array 16, each unique pair of photodetectors providing X and Y coordinate signal data.

In alternative embodiments, the optical system is organized to obtain the digital coordinate information in a binary coded format. Each detecting element 44 has connected to it adequate numbers of light pipes 86 to provide a coded signal. The system is one of piping light from the crystal array for each scanning step of programmable platform 20 in order to obtain binary combinations representing the X,Y coordinate position of the event detecting during that scanning step.

Referring again to FIG. 1 of the drawings, it will be seen that programmable X,Y platform 20 comprises a table 88 which is mounted to a slidable member 90. A rack 92 which engages a pinion 94 of a drive 96 mounted to member 90. Member 90 is slidably received in guideways 98, 100 which are provided in parallel guides 102, 104, respectively, rack 92 being in parallel spaced relationship to guides 102, 104. Guideway 98 extends along the longitudinal axis of guide 102 and guideway 100 extends along the longitudinal axis of guide 104. Guides 102 and 104 are formed also with a pair of transverse guideways 106, 108 and 110, 112, respectively. Guideway 106 is in registration with guideway 110 and guideway 108 is in registration with guideway 112. Fixed guides 114 and 116 are slidably received in guideways 106, 110 and 108, 112, respectively. Fixed guides 114 and 116 are in parallel spaced relationship with one another and in perpendicular spaced relationship with guides 102, 104. Mounted to guides 102, 104 in parallel spaced relationship with guides 114, 116, is a rack 118 which engages a pinion 120 of a drive 122. It will be realized from the foregoing description that table 88, member 90 and rack 92 are slidable in a first direction within guideways 98, 100; and guides 102, 104 and rack 118 are slidable in a second direction within guideways 106, 108 and 110, 112; the first and second directions being mutually perpendicular to one another. For convenience, by way of example, the first and second directions will be referred to as the X and Y directions, respectively, so that drive 96 operates to move table 88 in the X direction and drive 122 operates to move table 88 in the Y direction. Drives 96 and 122, for example stepping motors, are controlled by signals generated by driver 24 in response to command signals from computer 22. It is to be understood that platform 20 is movable also in the Z axis by means of jack screws 124, for example.

Computer 22 is programmed to move platform 20 in a scanning sequence of 16, 8 or 4 incremental steps, each step being an integral multiple of the distance between adjacent scintillators 44. Since detector 12 comprises 294 elements arranged in columns of 21 and in rows of 14, each incremental step measures 294 independent spatial segments which corresponds to the 294 spatial segments of multi-bore collimator 14. Each collimator bore is used to limit the field of view of each scintillator 44 to a unique spatial segment in the object being measured. In this manner, an image of the organ under diagnosis is obtained which is made up on 294 picture elements corresponding to the 294 unique spatial segments isolated by the multi-bore collimator. The shape and volume of each separate spatial segment in the object is defined solely by the geometry of each collimator bore. The multi-bore collimator breaks up the organ into 294 equal spatial segments which are then presented as 294 picture elements. The shape and volume of the spatial segment isolated by the collimator bore determine the spatial resolution of the imaging system, the spatial resolution obtainable being dependent upon the number of spatial segments. That is, the information content of the final image defines a one-to-one correspondence to the number of independent spatial segments that are isolated in the object of the collimator bores. Different collimator configurations result in spatial segments which differ in shape and volume. In the illustrated collimator configuration, measurements are obtained at different depths within the sub-

ject under diagnosis. It is to be understood that, in alternative embodiments, collimator 14 comprises a plurality of like collimator bores and measurements are obtained at a single depth with the subject under diagnosis.

The shape and volume of the spatial segment isolated by a collimator bore can be altered due to septal penetration, Compton scattering, and finite intrinsic spatial resolution of the detector. The final image with maximum information content is achieved when the volume of interest is viewed with the highest number of independent spatial segments, and when each independent spatial segment is recorded with a statistically significant number of detected events.

The number of independent spatial segments observable is increased to the theoretical limit of collimator resolution by moving the subject to a number of N different positions. Since each position measures 294 independent spatial segments which generate the corresponding 294 picture elements, the final image consists of N times 294 picture elements. The information content of each picture element is determined uniquely by the collimator with no deterioration of information due to finite intrinsic spatial resolution at the detector. This information integrity is maintained because the array of individual crystals yields unique X,Y positioning for every event detected. Septal penetration is minimized or eliminated by using thicker collimators which maintain sufficiently thick septa. The number of independent spatial segments cannot be increased by simply increasing the number of holes in the collimator, except at low energy, because septal penetration destroys the information content of each picture element, that is, the spatial segments blow up in size.

As previously indicated, control 98 is programmed to move platform 20 in a scanning sequence of 16, 8 or 4 incremental steps. It is to be understood that, in alternative embodiments, the scanning sequence is other than 16, 8 or 4 incremental steps, for example, 32, 2 or 1.

As previously indicated, multi-plane collimator 14 comprises four collimators repeated over the array of crystals. In the preferred embodiment, these four focussed collimators are provided with 4, 9, 16, and 25 holes having focal lengths of 1.5, 2.0, 2.5 and 3.0 inches, respectively. The thickness of the collimator is approximately 0.40 inch with a spatial resolution of approximately 0.44 inch. The data obtained during the four accumulations are stored in the proper address locations in memory 28 in order to generate four separate images corresponding to the four focal depths. All four views are simultaneously presented in one single image for easy evaluation.

It is preferred that an isotope such as Technetium 99m (Tc99m) is used because it is a pure gamma emitter which minimizes dose to the patient. Tc99m is administered in allowed doses than can yield observed events of about 20,000 per second. Application of other isotopes, such as IN 113m and Ba113m allow at least an equal or greater amount of specific activity for the same dose with the twofold advantage of higher penetration through the cranium and better staining qualities. This possible development in pharmacology requires the handling of data rate inputs up to one half million per second to take full advantage of their value. A realistic accumulation time per view using Tc99m with adequate spatial resolution is 10-30 seconds. At 20,000 events/sec., this would allow between 200,000

and 600,000 events per view. At higher rates shorter accumulation times could be used down to one second per view.

Data accumulated for the first incremental scanning step is addressed into memory 28 in the manner hereinbefore described. At the end of the first accumulation period, the data in memory 28 is fed to computer 22 for further processing and memory 28 is cleared. Platform 20 is then moved to the second incremental scanning step, a new frame of data is accumulated and is stored in memory 28. When the last incremental scanning step data stored in memory 28 has been fed to computer 22, the system is ready to present a combined image display.

In the illustrated embodiment, the stored data is selectively presented on display 32, magnetic tape 34 and a printer 36. Preferably, display 32 is a cathode ray tube which receives scanning data from a display electronics unit 126. The basic numerical data generated by computer 22 and fed to display electronics, unit 126, i.e., the number of events recorded at each X,Y address position, is converted into a binary coded symbol whose half-tone value is proportional to the number of recorded events. The binary coded symbol generated by display electronics unit 126 is applied to display 32 for controlling the intensity of each segment of the combined image presented on the cathode ray tube. That is, the combined image presented on the cathode ray tube is a composite half-tone display which represents the number of recorded events for each X,Y address position, the greatest number of recorded events being represented by the highest intensity or brighter image.

Since certain changes may be made in the foregoing disclosure without departing from the scope of the invention herein involved, it is intended that all matter contained in the above description and depicted in the accompanying drawings be construed in an illustrative and not in a limiting sense.

What is claimed is:

1. A multi-plane collimator comprising:

- a. a first plate formed with at least first and second holes having first and second profiles, respectively, said first hole having a boundary in the form of a cylindrical surface of revolution about a first axis which is perpendicular to the plane of said first plate, said second hole having a boundary in the form of a cylindrical surface of revolution about a second axis which is perpendicular to the plane of said first plate, said first profile larger than said second profile; and
- b. a second plate formed with at least third and fourth holes having third and fourth profiles, respectively, said third hole having a boundary in the form of a cylindrical surface of revolution about a third axis which is perpendicular to the plane of said second plate, said fourth hole having a boundary in the form of a cylindrical surface of revolution about a fourth axis which is perpendicular to the plane of said second plate, said third profile larger than said fourth profile;
- c. said first plate mounted in juxtaposition to said second plate in such a manner that said first and third axes are in registration and said second and fourth axes are in registration;
- d. said first profile slightly larger than said third profile, said first and third holes defining a down-

wardly and inwardly converging first collimator bore having a first focal length;

- e. said second profile slightly larger than said fourth profile, said second and fourth holes defining a downwardly and inwardly converging second collimator bore having a second focal length which is different from said first focal length.

2. A collimator comprising:

- a. a first photoetched plate formed with at least first and second hole sets, said first and second hole sets including at least two apertures each, the apertures of said first hole set having a first profile and the apertures of said second hole set having a second profile, said first profile larger than said second profile, said apertures of said first and second hole sets having a boundary in the form of a cylindrical surface of revolution;
  - b. a second photoetched plate formed with at least third and fourth hole sets, said third and fourth hole sets including at least two apertures each, the aperture of said third hole set having a third profile and the apertures of said fourth hole sets having a fourth profile, said third profile larger than said fourth profile, said apertures of said third and fourth hole sets having a boundary in the form of a cylindrical surface of revolution;
  - c. said first photoetched plate mounted in juxtaposition to said second photoetched plate in such a manner that the apertures of said first hole set are in registration with the apertures of said third hole set and the apertures of said second hole set are in registration with the apertures of said fourth hole set;
  - d. said first profile slightly larger than said third profile and said second profile slightly larger than said fourth profile;
  - e. the axis of each aperture of said first hole set is in registration with the axis of each aperture of said third hole set and defined downwardly and inwardly converging first collimator bores, each of said first collimator bores having like focal lengths;
  - f. the axis of each aperture of said second hole set is in registration with the axis of each aperture of said fourth hole set and define downwardly and inwardly converging second collimator bores, each of said second collimator bores having like focal lengths;
  - g. said focal lengths of said first collimator bores being different from said focal lengths of said second collimator bores.
3. A radiation monitoring system for detecting radioactivity in a subject, said system comprising:
- a. collimator means including a first plate formed with at least first and second holes having first and second profiles, respectively, said first hole having a boundary in the form of a cylindrical surface of revolution about a first axis which is perpendicular to the plane of said first plate, said second hole having a boundary in the form of a cylindrical surface of revolution about a second axis which is perpendicular to the plane of said first plate, said first profile larger than said second profile, and a second plate formed with at least third and fourth holes having third and fourth profiles, respectively, said third hole having a boundary in the form of a cylindrical surface of revolution about a third axis which

is perpendicular to the plane of said second plate, said fourth hole having a boundary in the form of a cylindrical surface of revolution about a fourth axis which is perpendicular to the plane of said second plate, said third profile larger than said fourth profile, said first plate mounted in juxtaposition to said second plate in such a manner that said first and third axes are in registration and said second and fourth axes are in registration, said first profile slightly larger than said third profile, said first and third holes defining a downwardly and inwardly converging first collimator bore having a first focal length, said second profile slightly larger than said fourth profile, said second and fourth holes defining a downwardly and inwardly converging second collimator bore having a second focal length which is different from said first focal length;

- b. a plurality of scintillator means defining an array disposed in juxtaposition with said collimator means, said collimator bores and scintillators mounted in registration, one of said scintillator means mounted in registration with only one of said collimator bores;
- c. data means operatively connected to said plurality of scintillator means for detecting radioactivity events, for accumulating detected events in address locations corresponding to said array and for generating data signals representing the number of events accumulated at each address locations; and
- d. display means operatively connected to said data means for presenting said data signals.

4. A radiation monitoring system for detecting radioactivity in a subject, said system comprising:

- a. photoetched collimator means including a first photoetched plate formed with at least first and second holes having first and second profiles, respectively, said first hole having a boundary in the form of a cylindrical surface of revolution about a first axis which is perpendicular to the plane of said first photoetched plate, said second hole having a boundary in the form of a cylindrical surface of revolution about a second axis which is perpendicular to the plane of said first photoetched plate, said first profile larger than said second profile, and a second photoetched plate formed with at least third and fourth holes having third and fourth profiles, respectively, said third hole having a boundary in the form of a cylindrical surface of revolution about a third axis which is perpendicular to the plane of said second photoetched plates, said fourth hole having a boundary in the form of a cylindrical surface of revolution about a fourth axis

which is perpendicular to the plane of said second photoetched plate, said third profile larger than said fourth profile, said first photoetched plate mounted in juxtaposition to said second photoetched plate in such a manner that said first and third axes are in registration and said second and fourth axes are in registration, said first profile slightly larger than said third profile, said first and third holes defining a downwardly and inwardly converging first collimator bore having a first focal length, said second profile slightly larger than said fourth profile, said second and fourth holes defining a downwardly and inwardly converging second collimator bore having a second focal length which is different from said first focal length;

- b. a plurality of scintillators defining an array disposed in juxtaposition with said collimator, said collimator bores and scintillators mounted in registration, one of said scintillators mounted in registration with only one of said collimator bores;
- c. photodetecting means associated with each said scintillator for detecting radioactivity events;
- d. light conducting means optically coupling each of said scintillators to each said photodetecting means;
- e. memory means operatively connected to each said photodetecting means for accumulating and storing detected events data in address locations;
- f. computer means operatively connected to said memory means for processing said stored data;
- g. movable platform means in spaced relationship with said array, said subject positioned on said movable platform means;
- h. means for moving said movable platform means in incremental steps defining a scanning pattern, radioactivity events being detected at each incremental step; and
- i. display means operatively connected to said computer means for presenting said processed data as a combined pictorial display.

5. The radiation monitoring system as claimed in claim 4 including display electronic means operatively connected between said computer means and said display means, said display means being a cathode-ray tube, said display electronic means generating coded scanning data signals to said cathode-ray tube, each said coded scanning data signal defining a half-tone value proportional to the number of events detected by each said scintillator, said coded scanning data signal controlling the intensity of each segment of said combined pictorial display, a half-tone combined image being presented on said cathode-ray tube.

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