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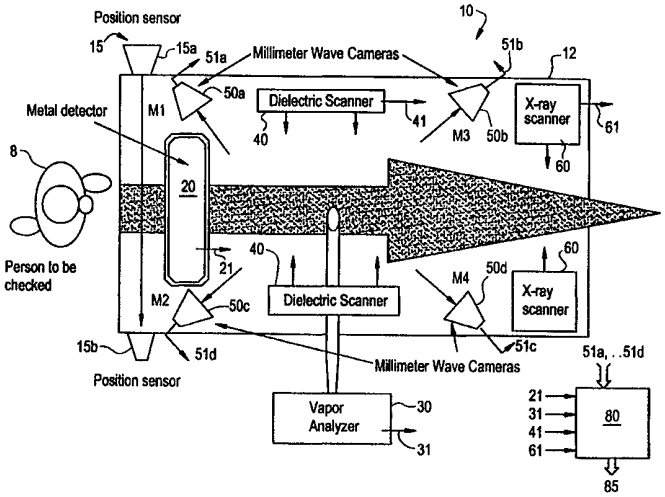

(57) Abstract

An integrated walk–through system (10) for detecting concealed or suspicious objects includes a portal (12) in which a person (8) may walk through without interruption; a device (15) responsive to a person's entry into the portal for generating a trigger signal to start a detection process; one or more of a dielectric scanner device (40), an x–ray scanner device (60), a metal detector device (20), a millimeter wave camera device (50a, ... 50d), and vapor collection and analysis device (30), or a combination thereof, for performing respective detection processes in response to receipt of the trigger signal, each dielectric scanner device, x–ray scanner device, metal detector device, millimeter wave camera device, and vapor collection and analysis device generating corresponding output signals (21, 31, 41, 51a, ... 51d, 61); and, a computing device (80) for receiving the output signals from each dielectric scanner device, an x–ray scanner device, a metal detector device, a millimeter wave camera device, and vapor collection and analysis device, and generating an alarm signal (85) indicating detection of a target object carried by the person.

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AN INTEGRATED WALKTHROUGH PERSONNEL SCANNER SYSTEM FOR SECURITY PORTALS

CROSS-REFERENCE TO RELATED APPLICATIONS

The following patent application is based on and claims the benefit of U.S. Provisional Patent Application Serial No. 60/062,684 filed October 22, 1997.

FIELD OF THE INVENTION

The present invention relates generally to walk-though scanning systems such as found in airport check-in, or other high-risk security areas, and more particularly, to a novel scanning system implementing a combination of different detection technologies, each optimized for the detection of certain types of concealed or suspicious objects or features.

BACKGROUND OF THE INVENTION

Portals for screening people carrying metallic objects or explosives exist in several forms. They, in general, are classified as walk-in systems which require that the person stand still at a designated spot for at least a few seconds while being scanned; and, walk-through systems, where the person walks through a portal, e.g., metal detection portals as seen in airports. The walk-in systems are inconvenient in that the person has to stand still at a designated spot which slows down the throughput in the system. The person additionally becomes aware of the security scan, which may not be desirable in certain circumstances. Some of the walk-in systems available in the market are: SecurScan® portal system by Thermedics Inc., MA, USA, which is used for the collection of explosive vapors, and, the Secure

1000® by Nicolet Imaging Systems, USA which is used for detecting concealed objects on persons using X-rays.

Walk-through portals exist for different types of scanning, the most popular being the metal detection portals as seen in airports. Issued U.S. Patent No. 4,987,767 designed and developed by CPAD Technologies Inc. (Nepean, Canada) describes a walk-through portal for collecting and analyzing explosive vapors from concealed objects on people. Ion Track Instruments Inc. (Mass., USA) has developed the ITI 85 Scanner utilizing an air curtain principle for transporting explosives vapors onto a collector for analysis. Detection of concealed objects is done using X-ray scanning in the scanner developed by Nicolet Imaging Systems, USA. The SecurScan® portal system made by Thermedics Inc. has been modified to a walk-through system with brushes for removing traces of explosives from people's clothing which are then processed and analyzed using a gas chromatographic column and a chemiluminescent detector.

Each of the above described systems rely on a single method to detect concealed objects like metal or plastic guns, explosives or other suspicious items. However, it would be much more desirable to provide a walk-through portal integrating more than one of the above technologies in order to create a synergistic detection system.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide a novel walk-though screening and detection system employing an integrated multi-dimensional detection and analysis system.

It is another object of the present invention to provide a novel walk-though screening and detection system employing an integrated multi-dimensional detection and analysis system including one or more of a metal detector, a vapor analyzer, a dielectric strength scanner, a set of set of active and/or passive millimeter wave cameras, and, an X-ray scanner, or a combination thereof.

According to the principles of the invention there is provided an integrated walk-though system for detecting concealed or suspicious objects comprising: a portal in which a person may walk through without interruption; a device responsive to a person's entry into the portal for generating a trigger signal to start a detection process; one or more of a dielectric scanner device, an x-ray scanner device, a metal detector device, a millimeter wave camera device, and vapor collection and analysis device, or a combination thereof, for performing respective detection processes in response to receipt of the trigger signal, each dielectric scanner device, x-ray scanner device, metal detector device, millimeter wave camera device, and vapor collection and analysis device generating corresponding output signals; and, a computing device for receiving the output signals from each dielectric scanner device, an x-ray scanner device, a metal detector device, a millimeter wave camera device, and vapor collection and analysis device and generating a signal indicating detection of a target object carried by the person.

BRIEF DESCRIPTION OF THE DRAWINGS

Further features and advantages of the invention will become more readily apparent from a

consideration of the following detailed description set forth with reference to the accompanying drawing, which specifies a preferred embodiment of the invention, in which:

Figure 1 illustrates the integrated walk-through personnel scanner system of the invention .

DETAILED DESCRIPTION OF THE INVENTION

Figure 1 is schematic diagram depicting the main components of the integrated walkthrough personnel scanner system 10 of the invention. As shown in Figure 1, the system consists of a walk-through portal 12. Preferably, the portal may be disguised as part of an archway or corridor when it is necessary to conceal the scanning process. As a person 8 walks into the portal 12 a proximity sensor 15, for example, one consisting of an infra-red transmitter 15a and detector 15b, is triggered which generates a signal to start the detection and analysis processes of the various detectors in the integrated walk-through scanner system 10.

Preferably, there are at least two different kinds of detectors providing in the integrated walk-through system. However, in the embodiment as shown in Figure 1, there are five different types of detection systems including: a metal detector 20 for generating a signal 21 in proportion to the amount of metal carried by the person 8 and generates an alarm when the signal exceeds a preset threshold; a vapor analyzer 30 for sampling the circulating air in the portal 12 for explosive vapor and particulate which are carried by the air stream from any concealed explosives, and generates a signal 31 if any previously calibrated explosives are present in the

sample and an alarm signal if the magnitude of the signal exceeds a preset threshold; a Dielectric Strength scanner 40 which detects abnormal changes in the dielectric constant of an object it scans and accordingly generates a signal 41 representing this change, in addition to generating an alarm if the changes are significant enough as determined by a previously set signal strength; a set of active or passive millimeter wave cameras 50a,..,50d which scan the person 8 as he/she walks through the portal 12 and generates respective images 51a,..,51d of the person from all angles, which may then be analyzed using pattern recognition techniques to yield an alarm if any suspicious pattern is discovered; and, an X-ray scanner 60 which uses low level X-ray radiation to scan the person for any suspicious concealed objects as he/she walks through the portal and creates a set of images 61 which are then analyzed using pattern recognition techniques to yield an alarm if any suspicious pattern is discovered.

The analysis of multi-state output signals 21, 31, 41, 51a,..,51d, and 61 and the decision to generate an overall alarm is carried out by computer software executing on computer system 80 with or without expert human assistance. For instance, the different outputs are processed to form a matrix comprising all possible combinations from which a final alarm determination may be made. Preferably, a neural network or AI device implementing fuzzy logic may be employed for processing the multi-state signals and generating an alarm signal 85. It should be understood that the level of security alert and the level of tolerance of false alarm rates determines the

type of analysis performed by the software and the alarm 85 to be generated.

The data results from the different detectors are processed in such a way as to readily arrive at conclusions about the people and the objects they carry as they walk through the portal.

The foregoing merely illustrates the principles of the present invention. Those skilled in the art will be able to devise various modifications, which although not explicitly described or shown herein, embody the principles of the invention and are thus within its spirit and scope.

WHAT IS CLAIMED IS:

1. An integrated walk-though system for detecting concealed or suspicious objects comprising:

a portal in which a person may walk through without interruption;

means responsive to a person's entry into said portal for generating a trigger signal to start a detection process;

one or more of a dielectric scanner device, an x-ray scanner device, a metal detector device, a millimeter wave camera device, and vapor collection and analysis device, or a combination thereof, for performing respective detection processes in response to receipt of said trigger signal, each said dielectric scanner device, x-ray scanner device, metal detector device, millimeter wave camera device, and vapor collection and analysis device generating corresponding output signals; and,

means for receiving said output signals from each said dielectric scanner device, an x-ray scanner device, a metal detector device, a millimeter wave camera device, and vapor collection and analysis device and generating a signal indicating detection of a target object carried by said person.

2. A method for detecting concealed or suspicious objects comprising:

enabling entry of a person through a walk-through portal apparatus having one or more of a dielectric scanner device, an x-ray scanner device, a metal detector device, a millimeter wave camera device, and vapor collection and analysis device, or a

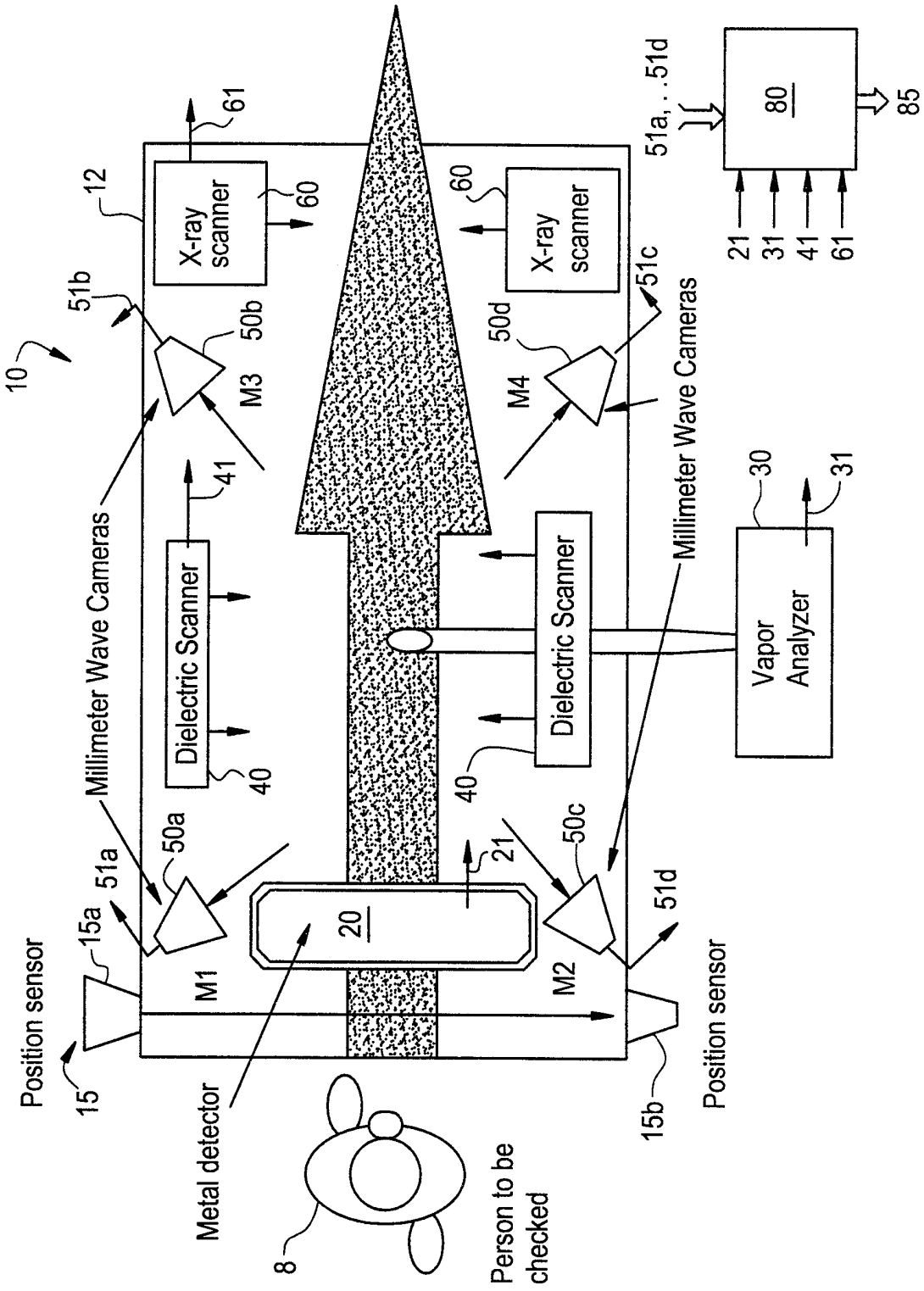
combination thereof, for performing respective detection processes;

generating a trigger signal to start each respective detection process;

receiving said output signals from each said dielectric scanner device, an x-ray scanner device, a metal detector device, a millimeter wave camera device, and vapor collection and analysis device; and,

generating a signal indicating detection of a target object carried by said person.

FIG. 1


10
12
X-ray scanner
60
61
51b
50b
M3
Millimeter Wave Cameras
41
Dielectric Scanner
40
50a
51a
15a
Position sensor
15
M1
20
21
Metal detector
8
Person to be checked
M2
50c
51d
15b
Position sensor
Dielectric Scanner
40
Vapor Analyzer
30
31
Millimeter Wave Cameras
M4
50d
51c
X-ray scanner
60
51a, . . 51d
80
85
21
31
41
61

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US98/22272

A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) :G08B 23/00
US CL :340/573.1

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 340/573.1, 572.1, 541, 551-567, 632; 73/23.36, 863; 378/57

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

APS

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X,P	US 5,760,314 A (BROMBERG et al) 02 June 1998, Abstract and Figure 23.	1-2
Y,P	US 5,692,028 A (GEUS et al) 25 November 1997, the whole document.	1-2
Y	US 5,227,800 A (HUGUENIN et al) 13 July 1993, the whole document.	1-2
Y	US 4,987,767 A (CORRIGAN et al) 29 January 1991, the whole document.	1-2

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

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