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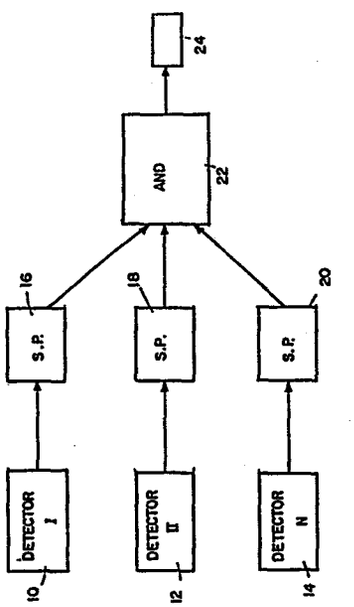
(54) Detection apparatus.

(57) Apparatus for receiving information from an information bearing scene comprising apparatus for receiving information from the information bearing scene in accordance with a first technique, apparatus for receiving information from the information bearing scene in accordance with a second technique, different from the first technique, apparatus for combining the information received from the information bearing scene in accordance with the first and second techniques and apparatus for providing an output indication representing the combined information, particularly where the first and second techniques, which are different, are selected from the following set of techniques: near and far invisible band radiation detection, ultrasonic detection, radar detection, X-ray detection, other radiation detection, visual detection.



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DETECTION APPARATUS.

The present invention relates to identification and detection apparatus in general and, in particular, to identification apparatus such as intrusion detection, access control and fire detection apparatus combining at least two detection techniques.

BACKGROUND OF THE INVENTION

There are a great variety of detection devices on the market today. Such devices serve a multitude of purposes, intrusion detection, smoke or fire detection, tracking moving objects, and detecting the presence of undesirable persons, objects and/or occurrences.

A great variety of imaging and detection techniques are currently in use in widely disparate fields. For example, in welding, both X-ray and ultrasonic techniques are used to determine the soundness of a weld at locations which cannot be examined visually.

In another area, the detection of tumors in vivo in man or animals, a wide variety of techniques, including, for example, X-ray, ultrasonic, radiation and NMR mapping techniques are used.

Common to all of the above-identified exemplary applications is the fact that the information output of a single detection technique is presented to the user at any given time

for analysis. The user, depending on his training, may be able to integrate internally the information presented to him separately, according to different detection and imaging techniques, but is faced with a natural human limitation as to the amount of such information that he can consider simultaneously.

SUMMARY OF THE INVENTION

It is therefore an object of the present invention to provide detection apparatus for intrusion or other detection having wider applicability and flexibility by providing a combined output of two or more different detecting techniques.

There is thus provided in accordance with the present invention detection apparatus including apparatus for receiving information in accordance with a first detection technique, apparatus for receiving information in accordance with a second detection technique, different from the first technique, apparatus for combining the information received in accordance with the first and second techniques, and apparatus for providing an output indication representing the combined information.

Further in accordance with the present invention, the first and second techniques, which are different, may be selected from the following set of techniques: detection in non-visible bands, such as UV or IR, detection in visible bands, other radiation detection, Ultrasonic detection, doppler effect detection, and other sonic detection.

According to one preferred embodiment of the present invention there is provided intrusion detection apparatus including a sonic detector providing a first output indication in response to the sonic information detected, a radiation detector

providing a second output indication in response to the radiation detected, and logic apparatus for ANDing said first and second output indications and providing an output indication representing the combined information.

Further in accordance with the present invention the radiation detector may be selected from the following detection apparatus: visible ray detector, detector of rays in the non-visible range, such as UV and IR, other radiation detector apparatus; and the sonic detector may be selected from the following detection apparatus: ultrasonic detector, microwave detector, doppler effect detector, and other sonic detector apparatus.

There is additionally provided in accordance with the present invention a technique for detection of an undesirable occurrence including the steps of receiving information in accordance with a first detection technique, receiving information in accordance with a second detection technique different from the first technique, combining the information received in accordance with the first and second techniques, and providing an output indication representing the combined information. According to a preferred embodiment of the invention, the first technique includes a sonic detection technique and the second technique includes a radiation detection technique.

Additionally in accordance with a preferred embodiment of the present invention there is provided an audio-visual "signature" access control and record keeping system comprising

regarding audio and visual characteristics of a person, apparatus for comparing the audio and visual characteristics with reference characteristics and apparatus responsive to the results of the comparison for permitting or denying access to such person.

Further in accordance with this embodiment of the invention, the audio visual access control system may also be responsive to audio identification information furnished verbally by a person.

In accordance with another embodiment of the present invention, there is provided a remote open area intrusion or fire identification system comprising a video sensor which is operative to scan a predetermined region, a thermal sensor which is also operative to scan the predetermined region and apparatus for combining information derived from the video sensor and the thermal sensor for providing an output indication of intrusion or fire.

Additionally in accordance with this embodiment of the invention, there may be provided apparatus for comparing the sensor output with a predetermined reference for increasing resolution. This reference may be a stored sensor output image.

There is also provided in accordance with an embodiment of the present invention apparatus for receiving information from an information bearing scene comprising apparatus for receiving information from the information bearing scene in accordance with a first technique, apparatus fbr receiving information from the information bearing scene in accordance with a second technique, different from the first technique, apparatus for combining the information received from the information bearing scene in accordance with the first and second techniques and apparatus for providing an output indication representing the combined information.

Further in accordance with an embodiment of the present invention, the first and second techniques, which are different, may be selected from the following set of techniques: UV detection, IR detection, ultrasonic detection, radar detection, X-ray detection, other radiation detection, visual detection.

Additionally in accordance with an embodiment of the invention, the output indication may comprise a composite visually sensible picture.

Additionally or alternatively, the output indication may comprise an analysis of the combined information in accordance with predetermined empirical criteria suited to the application.

Additionally in accordance with an embodiment of the present invention, a composite picture or other output indication may be produced after thresholding the information received according to various techniques to isolate significant features

contained therein.

Further in accordance with an embodiment of the present invention, there is provided a technique for receiving information from an information bearing scene comprising the steps of receiving information from the information bearing scene in accordance with a first technique, receiving information from the information bearing scene in accordance with a second technique, different from the first technique, combining the information received from the information bearing scene in accordance with the first and second techniques and providing an output indication representing the combined information.

BRIEF DESCRIPTION OF THE DRAWING

The apparatus of the present invention will be further understood and appreciated from the following detailed description taken in conjunction with the drawing in which:

Fig. 1 is a block diagram illustration of detection apparatus operative in accordance with a preferred embodiment of the present invention;

Fig. 2 is a block diagram illustration of access control apparatus constructed and operative in accordance with one preferred embodiment of the invention;

Fig. 3 is a block diagram illustration of fire and/or intrusion detection apparatus constructed and operative in accordance with another preferred embodiment of the invention;

Fig. 4 is a block diagram illustration of apparatus for receiving information from an information bearing scene in accordance with a preferred embodiment of the present invention;

Figs. 5A and 5B are block diagrams of two preferred embodiments of apparatus for receiving and processing information in accordance with the present invention; and

Fig. 6 is a block diagram illustration of a preferred embodiment of the invention useful in an automatic welding operation.

DETAILED DESCRIPTION OF THE INVENTION

Reference is now made to Fig. 1 which is a block diagram illustration of detection apparatus in accordance with a preferred embodiment of the present invention. Detection apparatus comprises at least a first detector 10 and a second detector 12 and may include as many detectors as desired, through n-th detector 14. Detectors 10, 12 and, if present, 14 operate according to at least two different detection techniques. Preferably one of detectors 10 and 12 is a sonic detector and the other is a radiation detector.

Any conventional sonic or radiation detection means may be employed in the present invention. These include, but are not limited to, UV detection, IR detection, visible ray detection, detection of rays in the non-visible range, other radiation detection, Ultrasonic detection, doppler effect detection, and other sonic detection. The combination of techniques chosen corresponds to the detection problems and requirements associated with the location in which the detection apparatus is to be installed.

The output of each of detectors 10, 12 and 14 is supplied to corresponding signal processing circuitry 16, 18, and 20, which is normally commercially available from the manufacturer of the detector itself. This signal processing circuit is operative to provide an output indication in accordance with the information received by the detector above a predetermined threshold.

The output indications from the plurality of signal

processing circuits 16, 18 and 20, are supplied to activator circuitry 22, which may typically be an AND gate, which is operative to activate an output indicator 24 upon receiving signals above the predetermined threshold level from both detectors. Output indicator 24 may comprise local or distant alarm means, a flashing light, automatic explosion suppression apparatus or any other utilization means suitable for the type of occurrence being detected.

Reference is now made to Fig. 2 which illustrates access control apparatus constructed and operative in accordance with a preferred embodiment of the present invention. A conventional video camera with sound, such as the type manufactured by Sony, provides audio and visual inputs 30 and 32. Each of these inputs may first be recorded by suitable recording means 34 and 36 respectively. Alternatively, the recording step may be eliminated and the inputs may be employed on-line.

The recorded or on-line audio and visual inputs are each subject to analysis by respective analysis apparatus 38 and 40 so as to isolate or identify certain predetermined characteristics thereof. For example, if the video camera is directed at a person, the analysis of the visual input may include a determination of the persons height and width or other physical dimensions, an analysis of face characteristics, and/or an analysis of facial color, for example.

If a human voice is subject to analysis, the analysis may take into account a person's name identification, his pronunciation of given letters or combinations of letters, frequency characteristics, intonation and other speech

characteristics.

Apparatus for audio and visual analysis of the type employed is commercially available in the area of robotics and artificial intelligence.

It is noted that a desired level of analysis may be applied to the visual and audio inputs and if desired, the entire input may be transmitted further, without analysis. The analysis is provided to reduce the amount of information required to be transmitted stored and compared while preserving, insofar as possible, the identifying characteristics of the inputs.

The audio and visual inputs, as analyzed to the desired degree are then combined by suitable combining circuitry such as a mixer 42 to define a "combined image". This combined image is actually a storable identification record based on a combination of audio and visual inputs. The "combined image" may be an image which may be visually sensed by a human, such as a picture, whose visual information is displayed in monochrome and whose audio input is expressed as the color in which the visual information is displayed.

As an alternative, the "combined image" need not be a visually sensible image at all but may be instead an electronic signature identifying a person by a combination of characteristics derived from the visual and audio inputs.

The important feature is that the "combined image" be derived from a plurality of different types of inputs, which are combined to significantly increase reliability of identification.

When it is sought to provide a reference image for

later comparison, the "combined image" is supplied to storage apparatus 44. When it is sought to make an identification based on previously stored information, the "combined image" is supplied to a image register 46. A comparator 48 then compares the stored information in storage apparatus 44 with the "combined image" in image register 46 and in accordance with predetermined criteria provides a Yes/No identification output to utilization apparatus 50, such as physical access control apparatus. Utilization apparatus 50 may also be responsive to other identification criteria, such as the insertion of an identification card, the application of an access code, etc.

It is noted that although audio and visual inputs have been employed in the example described above, any other combination of two or more types of inputs may be employed, for example, visual and thermal, olfactory, weight, etc.

Reference is now made to Fig. 3 which illustrates remote open space fire and/or intrusion detection apparatus constructed and operative in accordance with a preferred embodiment of the present invention. The apparatus typically comprises an optical sensor 60 and a thermal sensor 62. These sensors may be mounted on suitable high places or on surveillance aircraft or spacecraft and are operated in a scanning mode to scan relatively large regions. Scanning apparatus 64 is provided to produce the desired scanning. This apparatus is preferably responsive to inputs from one of the two sensors for causing the scanning apparatus to divert from its normal scanning pattern and to concentrate on a region in which some input of interest was received by either or both of the sensors.

The outputs of the optical and thermal sensors are supplied to respective analysis circuits 66 and 68, which are commercially available for use in weather satellites and the like. The ouput of the analysis circuits 66 and 68, which operate similarly to the circuits 38 and 40 of the apparatus of Fig. 2 described above, are supplied to image formation circuitry 70, which may be similar in structure and function to circuitry 42 of the apparatus of Fig. 2, and produces a "combined image" as described hereinabove.

The output of the image formation circuitry 70 is supplied either to a reference storage facility 72 or to a current "combined image" register 74. A comparator 76 is operative to compare the current and reference "combined images" to indicate whether a difference between them is indicative of an alarm situation. The difference may be evaluated by threshold apparatus incorporated in comparator 76. The output of comparator 76 is supplied to alarm indicating circuitry 78 which may be conventional alarm circuitry providing an audio, visual or combined alarm.

Reference is now made to Fig. 4 which is a block diagram illustration of apparatus for receiving information from an information bearing scene in accordance with a preferred embodiment of the present invention. The term "scene" is used throughout the specification and claims to denote a view or object having a predetermined spatial distribution about which information is sought to be received. The scene may be viewed in one, two, or three dimensions, in different directions and also over time. Thus it may be appreciated that the term "scene" in the context used herein refers equally to a weld being examined, a living organism, a flying object and any other static or moving collection of objects or materials, expanse of topography, or phenomenon having a spatial distribution.

In accordance with the present invention, a plurality of data acquisition elements 80 are arranged to "view" the scene, it being understood that the term "view" is not limited to an optical view but refers more generally to a data acquisition relationship with the scene by any suitable data acquisition technique. Each of at least two data acquisition elements 10 operates according to a different technique. Each of these techniques may be of itself entirely conventional. Examples of suitable data acquisition techniques are UV detection, IR detection, visible light detection, ultrasonic detection, high energy radiation mapping, X-ray absorption line spectrographics, NMR imaging, radar detection, etc. It is appreciated that a number of different techniques may be employed with the same type of radiation or emission. The combination of techniques chosen corresponds to the type of scene being viewed and the detection

problems and requirements associated therewith.

The output of each data acquisition element 80 is supplied to corresponding signal processing circuitry 82, which is normally commercially available from the manufacturer of the data acquisition element 80. This signal processing circuit is operative to provide an output indication in accordance with the corresponding technique employed by element 80 of the data acquired thereby.

The output indications from a plurality of signal processing circuits 82, each corresponding to a data acquisition element 80, are supplied to combination circuitry 84 which is operative to combine the data received from a plurality of acquisition elements 80, each according to a different technique, in an additive manner, so as to provide a combined and composite data collection which is directed to indicate predetermined features which are of interest in the scene being viewed. It is appreciated that the type of combination used is a function of the type of scene being viewed, the type of features which are of interest and the data acquisition techniques employed.

In practice, combination circuity 84 comprises a CPU based, programmable circuit. Combination circuitry 84 preferably provides an output to a visual display 86, which output represents a composite picture containing information acquired by a plurality of data acquisition techniques.

Further in accordance with an embodiment of the invention, combination circuitry 84 provides an output to feature analysis circuitry 88. Feature analysis circuitry 88 is also

typically CPU based, program controlled circuitry which incorporates pattern recognition circuitry which may be entirely conventional. This circuitry is operative to make determinations as to the presence or absence of predetermined features in the scene. Such features may be, for example, tumors in tissue, flaws in welds and flying objects.

Reference is now made to Fig. 5A which illustrates apparatus for receiving and processing information from a scene in accordance with a preferred embodiment of the present invention and comprising a plurality of data acquisition elements 90, operating according to different techniques, each associated with appropriate signal processing circuitry 92. It is appreciated that according to one embodiment of the invention, a plurality of identical data acquisition elements may be employed having different signal processing circuitry 92, thus providing outputs having different information bearing characteristics.

The output of each of signal processing circuits 92 is supplied to a combined picture synthesizer 94 and to a comparator 96 which is operative to indicate differences between the combined picture produced by synthesizer 94 and each individual picture. The combined picture synthesizer 94 provides an output to a combined picture display 98 and to combined picture analysis circuitry100, which may comprise a comparator which receives a reference input 101 representative of a standard representative combined picture.

The output of comparator 96 is supplied to a further comparator102 which compares the standard difference of each individual picture from the combined picture with reference

standard differences characteristic of the various detection techniques that are employed, which references are supplied by a reference input 104.

The outputs of analysis circuitry 100 and of comparator 102 are supplied to positive identification, presentation and display circuitry 106, which may comprise decision circuitry which matches the received inputs against predermined criteria. The output may be in the form of a picture indicating detection of an object or collection of objects at a given location or in any other usable form.

It is a particular feature of the present invention that the combined picture provided in accordance with a preferred embodiment of the present invention is normally a picture comprising information which cannot normally appear together on a picture produced by an one single technique. This combined picture may thus be understood to be a hybrid image of the scene containing a combination of information which was never before combined in a visually sensible form, particularly as a picture, in accordance with the prior art.

Reference is now made to Fig. 5B which illustrates another embodiment of apparatus for receiving and processing information received from a scene and comprising a plurality of data acquisition elements 110 with associated signal processing circuitry 112 whereby the signal output of each of at least two of the circuits 112 differs from the other. The output of each of circuits 112 is supplied to a comparator 114 which receives a reference input corresponding to the particular detection and

signal processing technique employed and provides an output indication of differences between the sensed image and the reference. This output indication may be understood to indicate highlights of particular significance in the received image. The highlights from a plurality of comparators 114 are supplied to data/picture analysis circuitry 116 which combines the highlights and provides either a combined picture based on the highlights or any other suitable analysis of their combined information content.

It is a particular feature of the present invention that the criteria governing the combination of the information content produced according to the various techniques may be tailored to the particular application in order to provide empirically the combination of the most useful information in the most convenient format for the user.

One example of the operation of the circuitry of the invention is in connection with an automatic welding process wherein on-line inspection of the weld occurs as the weld is being formed. In such a system , the voltage, current, rate of introduction of the welding material and the speed of welding are monitored and controlled in order to determine the quality of the weld. A basis for the control of these parameters is provided by circuitry of the type illustrated generally in Fig. 6 and comprising first and second data acquisition elements 130 and 132, which typically are a visible light sensor, such as a television camera, and an ultrasonic mapping element. The outputs of data acquisition elements 130 and 132 are supplied to respective signal processing circuits 134 and 136, which may be

entirely conventional, as are the data acquisition elements themselves.

The outputs of circuits 134 and 136 are, in turn, supplied to a combined picture synthesizer 138. Synthesizer 138, which may output to a monitor 130, preferably provides a combined picture indicating the temperature distribution in the weld and alongside, and the configuration of the weld. The output of synthesizer 138 is also supplied to a comparator 142 which compares the combined picture with a reference input 144, typically representing an acceptable weld. The output of comparator 142 is supplied to data storage and control circuitry 146 and 148 respectively. The control circuitry acts to determine the parameters, such as current, voltage, feed rate and progress rate in accordance with the similarity between the combined picture and the reference input.

It is a particular feature of this embodiment that the combined picture contains information which is not present in either one of the individual outputs of the data acquisition elements 130 and 132 and thus enables high quality automatic monitoring of the welding process. It is appreciated that additional data acquisition elements such as an IR detector may be added in parallel to elements 130 and 132 and used for providing control information.

It will be appreciated by persons skilled in the art that the present invention is not limited to what has been particularly shown and described hereinabove. Rather the scope of the present invention is defined only by the claims which follow:

CLAIMS

1. Detection apparatus comprising:

means for receiving information in accordance with a first detection technique;

means for receiving information in accordance with a second detection technique, different from said first technique;

means for combining the information received in accordance with the first and second techniques; and

means for providing an output indication representing the combined information.

2. Apparatus according to claim 1 and wherein said first and second techniques are selected from the group consisting of: visible ray detection, detection of rays in the non-visible range, other radiation detection, Ultrasonic detection, doppler effect detection, and other sonic detection.

3. Intrusion detection apparatus comprising:

a sonic detector providing a first output indication in response to the sonic information detected;

a radiation detector providing a second output indication in response to the radiation detected; and

logic means for ANDing said first and second output indications and providing an output indication representing the combined information.

4. Apparatus according to claim 3 and wherein said radiation detector is selected from the group comprising: near and far infrared detector; thermal detector; visible ray

detector; detector of rays in the non-visible range; and any combination of the above.

5. Apparatus according to claim 3 and wherein said sonic detector is selected from the group comprising: Ultrasonic detector; microwave detector; doppler effect detector; and any other sonic detector means.

6. A method for detection of an undesirable occurrence comprising the steps of:

receiving information in accordance with a first detection technique;

receiving information in accordance with a second detection technique different from the first technique;

combining the information received in accordance with said first and second techniques; and

providing an output indication representing the combined information.

7. Apparatus according to claim 6 and wherein said first technique is a sonic detection technique and said second technique is a radiation detection technique.

8. Apparatus for access control comprising:

first detector means for detecting a first type of characteristics of an object;

second detector means for detecting a second type of characteristics of an object;

means for combining the outputs of the first and second

detector means to form a "combined image";

means for comparing the combined image with a reference; and

means for permitting access in response to the output of said means for comparing.

9. Apparatus according to claim 8 and wherein said first means comprises video sensing means and said second means comprises audio sensing means and said video sensing means and audio sensing means are directed at a person seeking to gain access.

10. Apparatus according to claim 9 and also comprising means for extracting identifying characteristics from the outputs of said first and second means and wherein said "combined image" is based on said extracted characteristics.

11. Apparatus according to claim 8 and wherein said "combined image" is a visually sensible image.

12. Apparatus according to claim 8 and wherein said "combined image" is not a visually sensible image.

13. Apparatus for large scale monitoring of a region comprising:

first detector means for detecting a first type of characteristics of the region;

second detector means for detecting a second type of characteristics of the region;

means for combining the outputs of the first and second detector means to form a "combined image" of the region;

means for comparing the combined image with a reference; and

means for providing an alarm indication in response to the output of said means for comparing.

14. Apparatus according to claim 13 and also comprising means for causing said first and second detector means to scan said region.

15. Apparatus according to claim 14 and wherein said means for causing are responsive to the outputs of said first and second detector means for concentrating on areas in which detections occur.

16. Apparatus according to claim 13 and wherein said first means comprises optical sensing means and said second means comprises thermal sensing means.

17. Apparatus according to claim 13 and also comprising means for extracting identifying characteristics from the outputs of said first and second means and wherein said "combined image" is based on said extracted characteristics.

18. Apparatus according to claim 13 and wherein said "combined image" is a visually sensible image.

19. Apparatus according to claim 13 and wherein said "combined image" is not a visually sensible image.

20. Apparatus for receiving information from an information bearing scene comprising:

means for receiving information from the information bearing scene in accordance with a first data acquisition technique;

means for receiving information from the information bearing scene in accordance with a second data acquisition technique, different from the first technique;

means for combining the information received from the information bearing scene in accordance with the first and second techniques; and

means for providing an output indication representing the combined information.

21. Apparatus according to claim 20 and wherein said first and second techniques are selected from the following set of techniques: UV detection, IR detection, Ultrasonic detection, radar detection, X-ray detection, other radiation detection, visual detection.

22. Apparatus according to claim 20 and wherein said output indication comprises a composite visually sensible picture.

23. Apparatus according to claim 20 and wherein said output indication comprises an analysis of the combined information in accordance with predetermined empirical criteria suited to the application.

24. Apparatus according to claim 20 and also comprising means for providing control instructions in response to said output indication.

25. A technique for receiving information from an information bearing scene comprising the steps of:

receiving information from the information bearing scene in accordance with a first data acquisition technique;

receiving information from the information bearing scene in accordance with a second data acquisition technique, different from the first technique;

combining the information received from the information bearing scene in accordance with said first and second techniques; and

providing an output indication representing the combined information therefrom.

26. A technique according to claim 25 and also comprising the step of providing control instructions in accordance with said output indication.

27. A technique according to claim 26 and wherein said first and second information receiving steps comprise the steps of on-line monitoring of a weld by visible light and ultrasonic techniques and wherein said step of providing control instructions comprises the step of controlling at least one of the following welding parameters on line: current, voltage, welding material feed rate, welding progress rate.

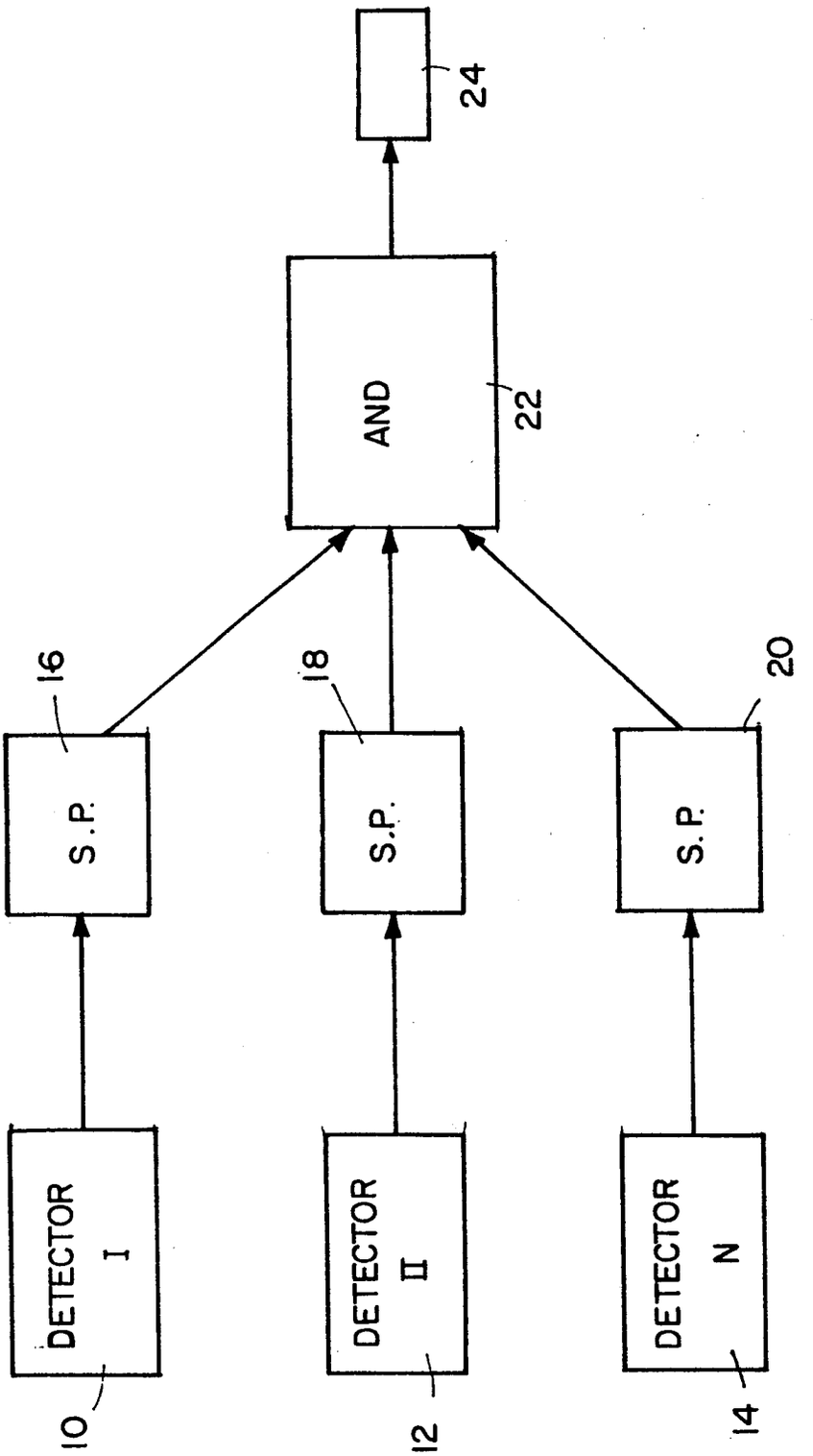
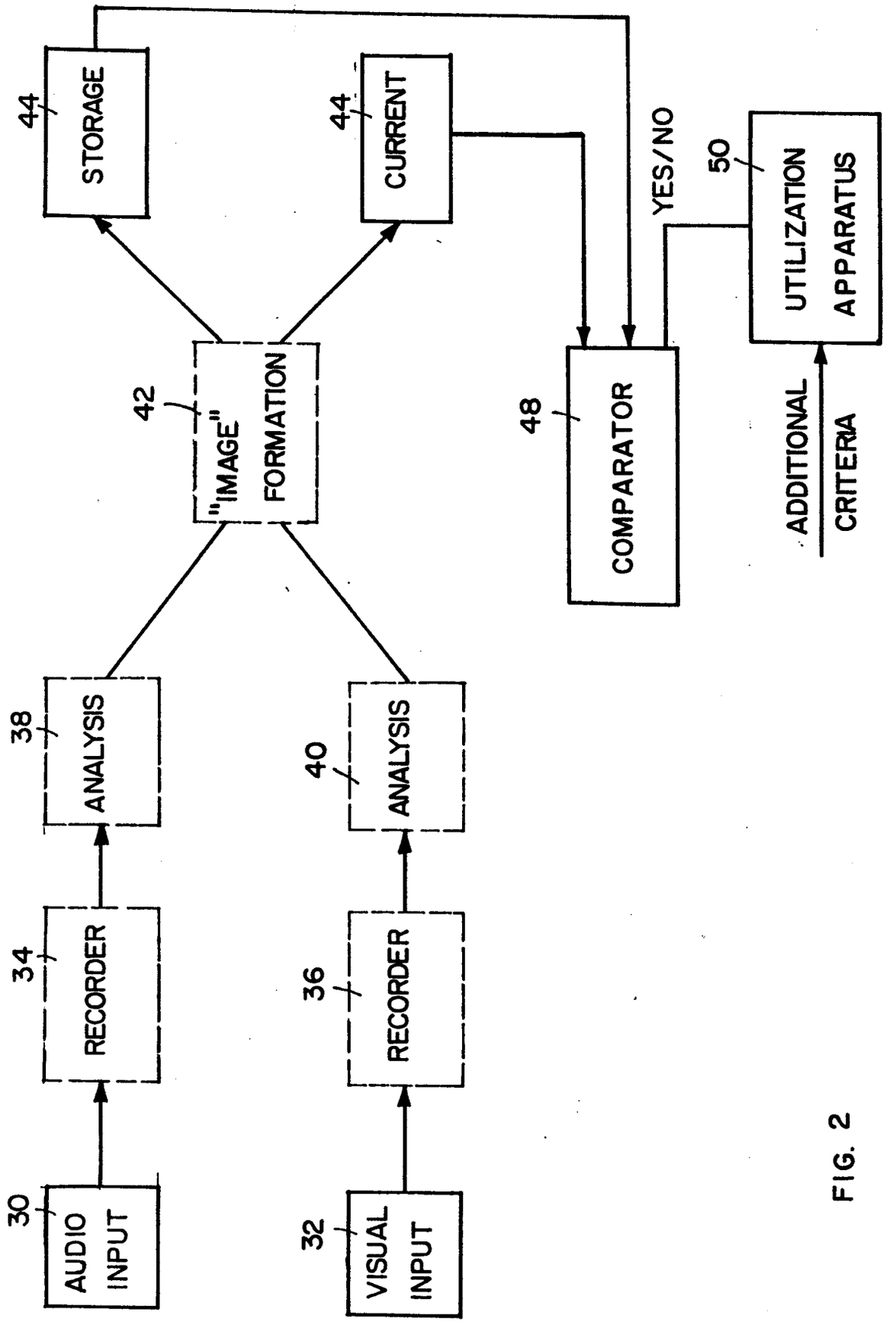

24
AND
22
16
18
20
S.P.
S.P.
S.P.
DETECTOR I
DETECTOR II
DETECTOR N
10
12
14

FIG. 1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VISUAL INPUT
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RECORDER
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RECORDER
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ANALYSIS
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ANALYSIS
40
"IMAGE" FORMATION
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STORAGE
44
CURRENT
44
COMPARATOR
48
YES/NO
50
UTILIZATION APPARATUS
ADDITIONAL CRITERIA

FIG. 2

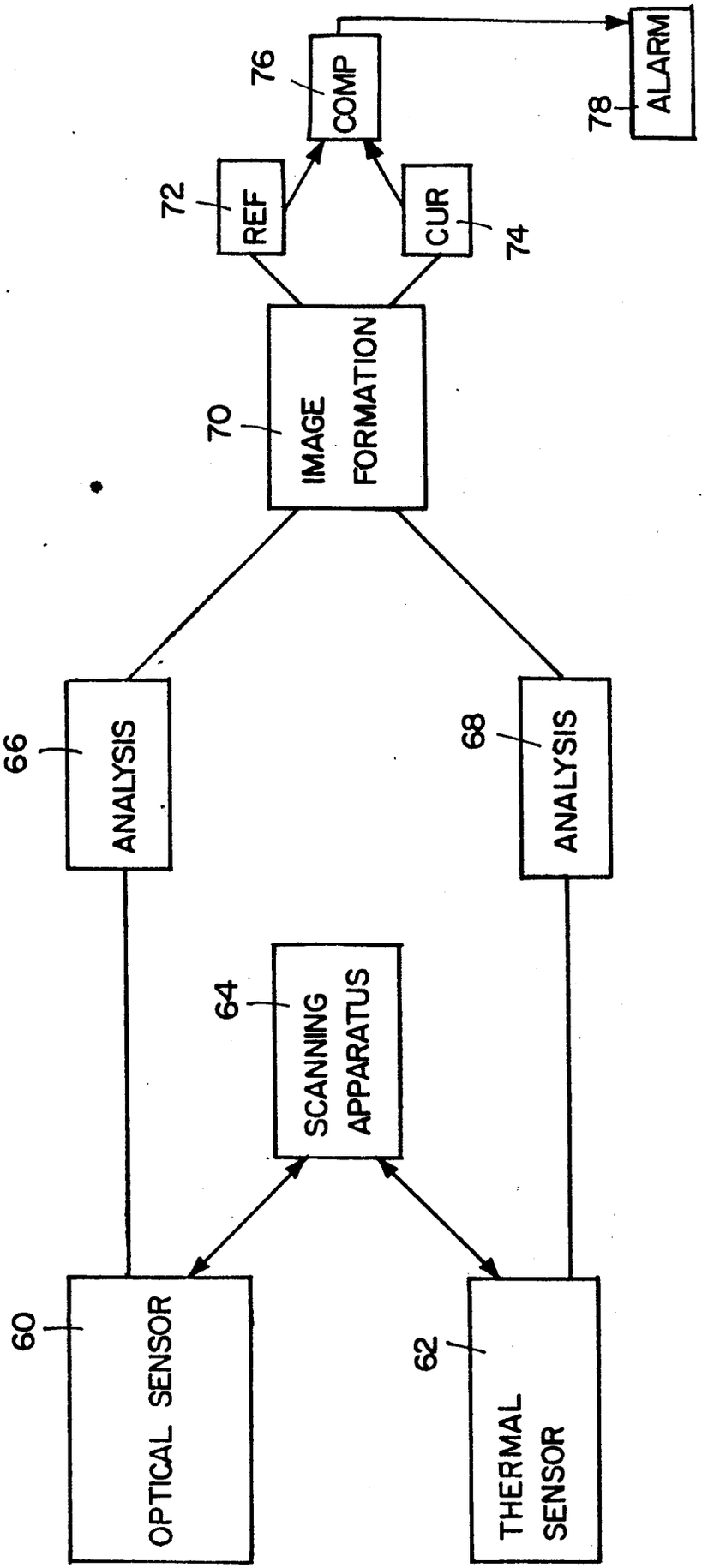
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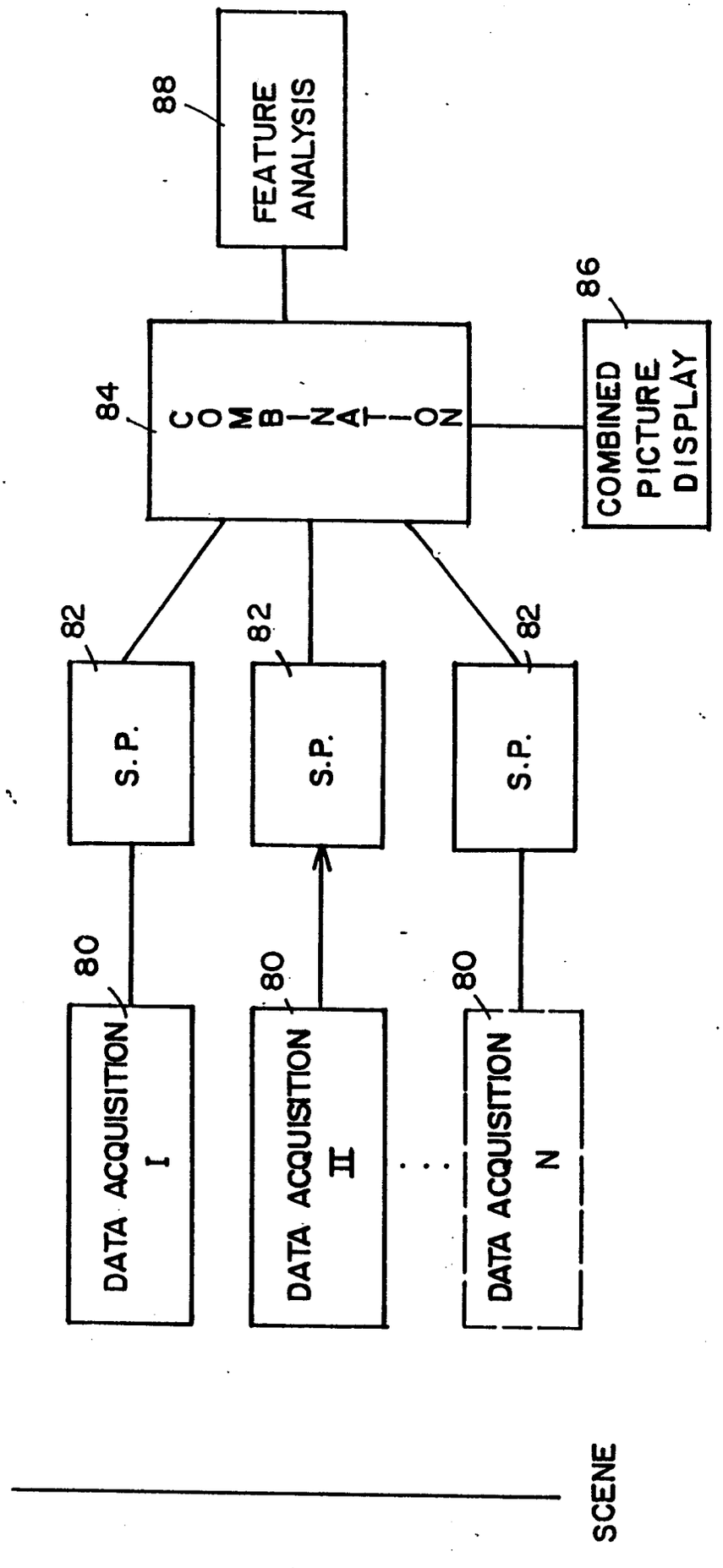
FIG. 3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DATA ACQUISITION II
DATA ACQUISITION N
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COMBINATION
84
FEATURE ANALYSIS
88
COMBINED PICTURE DISPLAY
86

FIG. 4

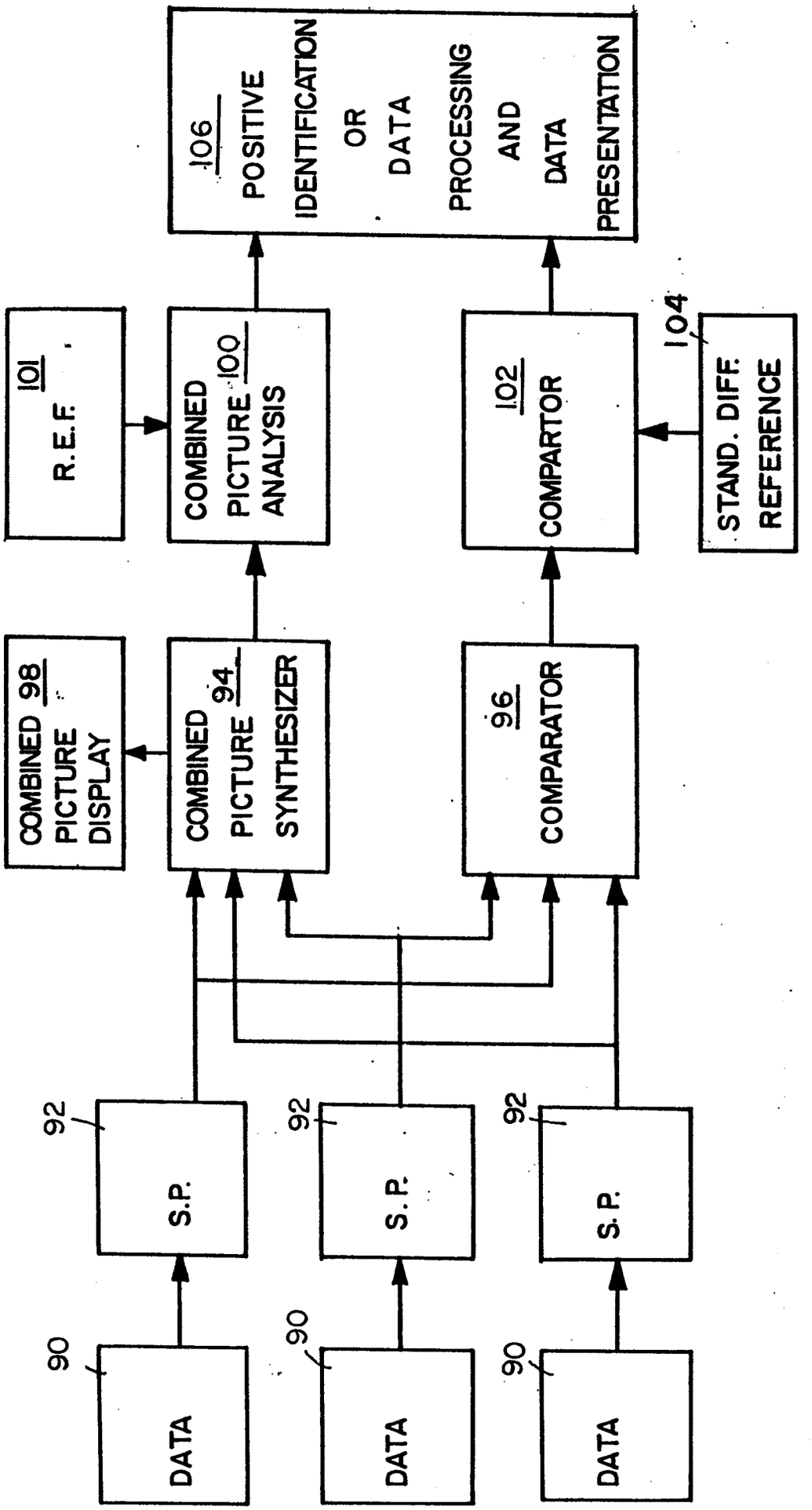
106 POSITIVE IDENTIFICATION OR DATA PROCESSING AND DATA PRESENTATION
101 R.E.F.
COMBINED PICTURE 100 ANALYSIS
102 COMPARTOR
104 STAND. DIFF. REFERENCE
COMBINED 98 PICTURE DISPLAY
COMBINED PICTURE 94 SYNTHESIZER
96 COMPARATOR
92 S.P.
92 S.P.
92 S.P.
90 DATA
90 DATA
90 DATA

FIG. 5A

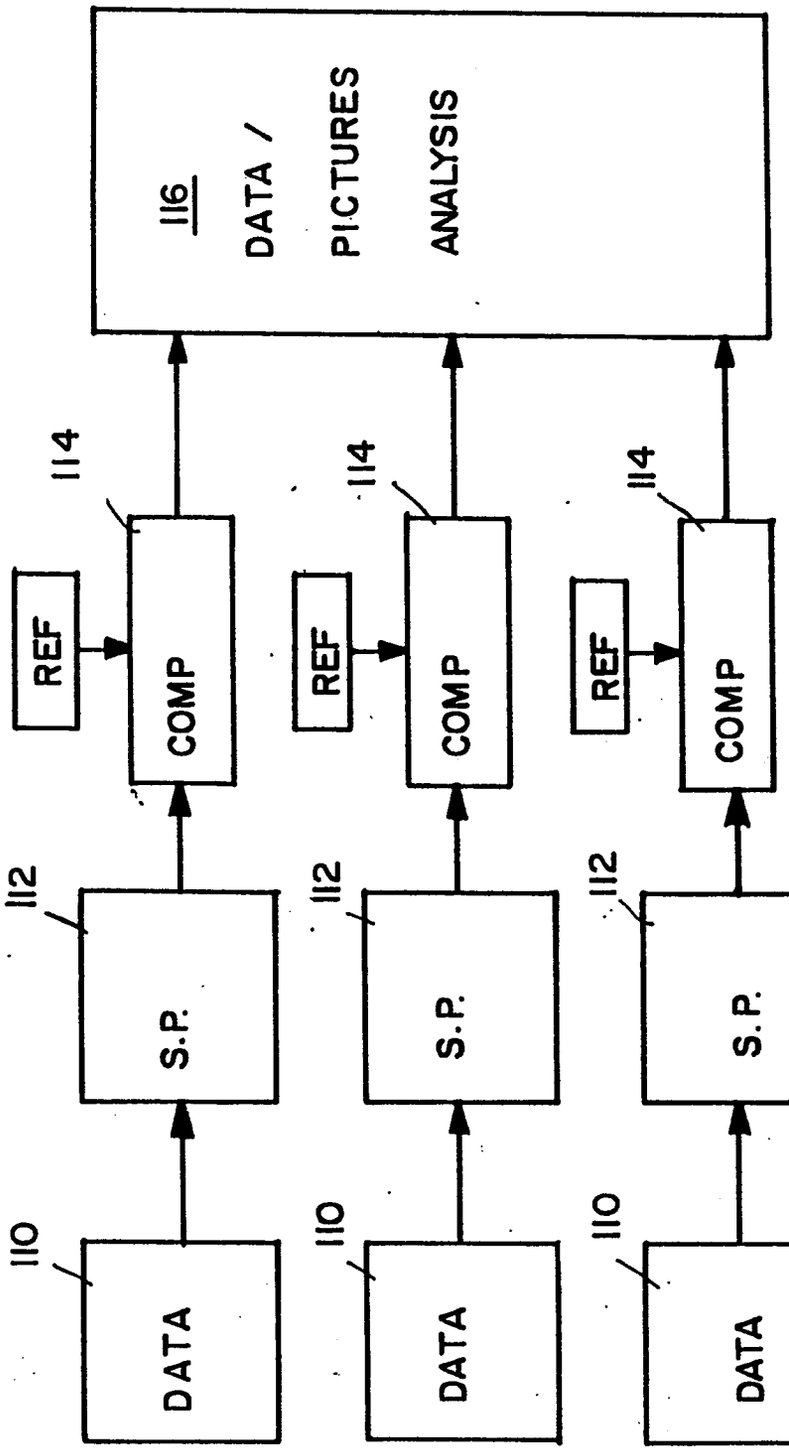
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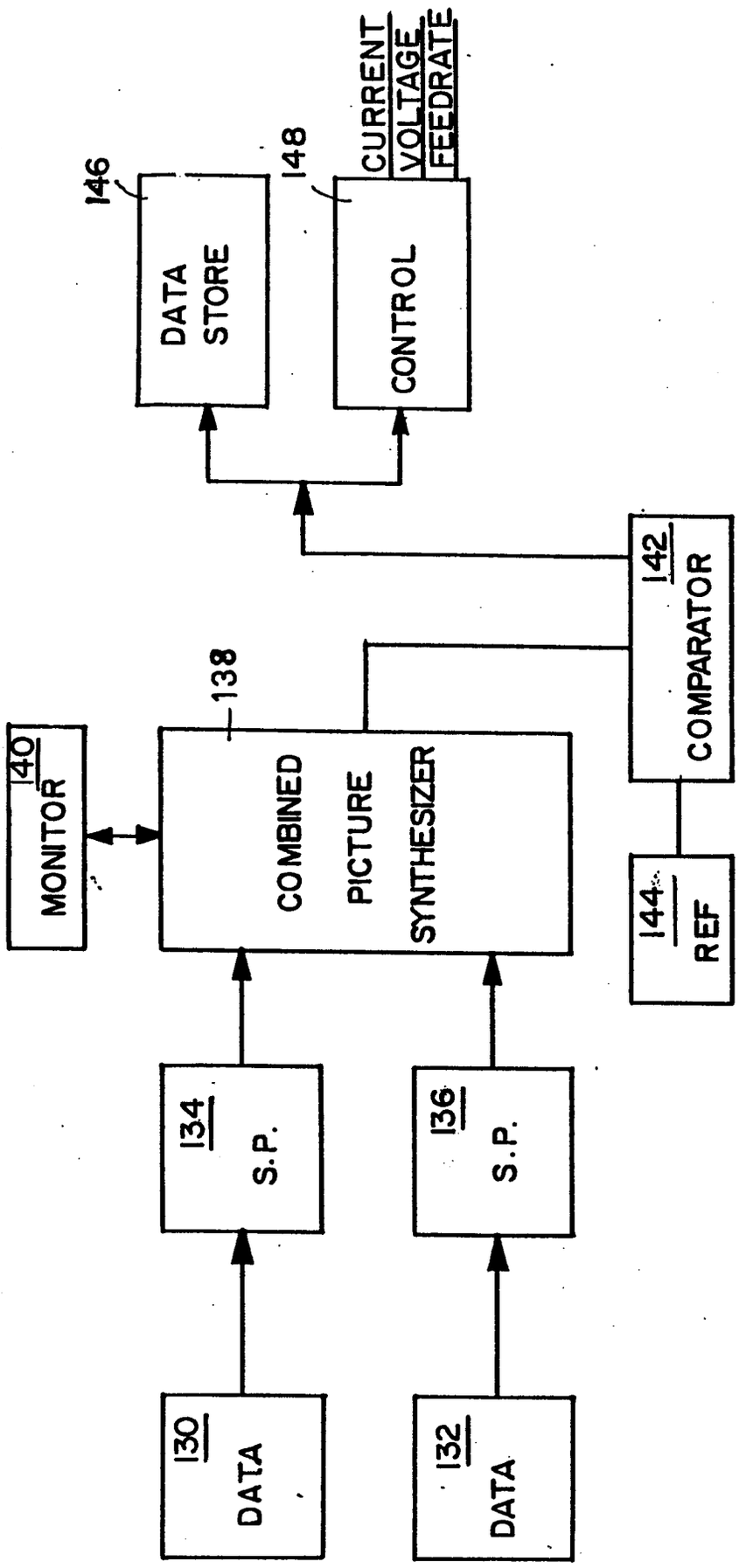
FIG. 5B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COMBINED PICTURE SYNTHESIZER
140
MONITOR
142
COMPARATOR
144
REF
146
DATA STORE
148
CONTROL
CURRENT
VOLTAGE
FEEDRATE

FIG. 6

European Patent Office

EUROPEAN SEARCH REPORT

0126703
Application number

EP 84 63 0080

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. ³)
A	US-A-3 573 817 (A.E. AKERS) * Figure 1; introduction *	1-7	G 08 B 13/00 G 08 B 13/18 // B 23 K 9/00
A	US-A-4 103 293 (L.H. LA FORGE)		
A	DE-A-2 707 181 (FA. COPRELEC)		
A	IEEE TRANSACTIONS ON NUCLEAR SCIENCE, vol. NS-29, no. 1, February 1982, New York, USA; J.L. SCHOENEMAN "A microprocessor CCTV controller for safeguards applications"; pages 874-877	1-19	
A	FUNKSCHAU, no. 11, May 1982, München G. WILHELM et al. "Videotechnik in Sicherheitsanlagen", pages 53-56		TECHNICAL FIELDS SEARCHED (Int. Cl. ³) G 08 B B 23 K
A	CH-A- 496 290 (JACKSON & CHURCH ELECTRONICS CO. INC.)		

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
BERLIN	10-08-1984	BEYER F

CATEGORY OF CITED DOCUMENTS

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EUROPEAN SEARCH REPORT

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A	SCHWEISSEN UND SCHNEIDEN, no. 4, 1982, Düsseldorf;K. SHINADA et al. "Trockenschweissen unter Wasser mit örtlichem Hohlraum - Entwicklung einer vollmechanisierten Schweisseinrichtung und Versuchsergebnisse", pages 193-195 -----	27	

TECHNICAL FIELDS SEARCHED (Int. Cl. ³)

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