

(19)



Europäisches Patentamt

European Patent Office

Office européen des brevets



(11)

EP 0 937 854 A2

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:
25.08.1999 Bulletin 1999/34

(51) Int. Cl.⁶: **E05F 15/20**(21) Application number: **99101784.9**(22) Date of filing: **15.02.1999**

(84) Designated Contracting States:
**AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU
MC NL PT SE**
Designated Extension States:
AL LT LV MK RO SI

(72) Inventor: **Menuzzo, Angelo**
31022 Preganziol (IT)

(74) Representative:
Modiano, Guido, Dr.-Ing. et al
Modiano & Associati SpA
Via Meravigli, 16
20123 Milano (IT)

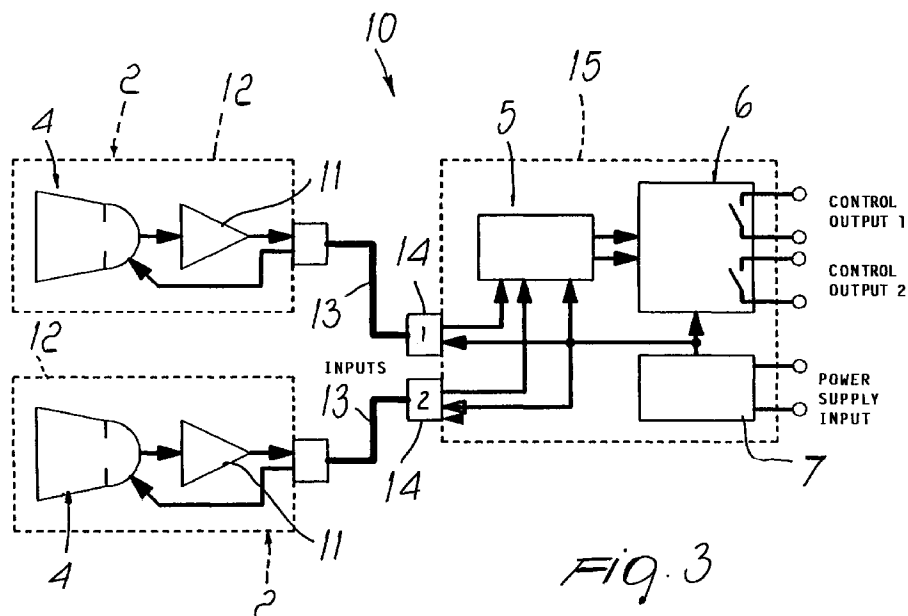
(30) Priority: **18.02.1998 IT TV980005**

(71) Applicant: **Ditec S.p.A.**
21042 Caronno Pertusella (VA) (IT)

(54) Modular device particularly for automatic doors

(57) A modular device particularly usable for automatic doors, constituted by at least one sensor module (2) which can be associated with the door and can be connected by means of a cable (13) to a management module (15). The management module (15) is adapted to power and detect the number and type of the at least one sensor module (2) and the signal that arrives from

it; the signal is processed to transfer it to a suitable actuation unit for moving the door. The separation between the sensor module (2) and the management module (15) allows to considerably reduce costs with respect to the use of conventional motion sensors.

**EP 0 937 854 A2**

Description

[0001] The present invention relates to a modular device particularly for automatic doors.

[0002] Nowadays it is known to use automatic doors, such as those designated by the reference numeral 1 in Figure 1, which illustrates a typical system of an automatic two-leaf sliding door, illustrating the position of the motion sensor 2 and their typical range; the expression "automatic doors" can be applied to any kind of sliding or hinged door with one or more leaves which is actuated by an electric motor controlled by an electric/electronic panel.

[0003] Said electric/electronic panel controls and monitors the various movements or functions of the door, such as opening, closure, safety, speed of motion, actuation force, detection of obstacles in its path, etcetera.

[0004] Some of these movements or functions are managed independently by the electric/electronic panel during operation; others are triggered by means of signals generated by various peripheral devices in response to external stimuli or actions.

[0005] Accordingly it is known to use a particular class of peripheral devices which are known as motion sensors and are designated by the reference numeral 2; these devices are used in doors without access control to start the automatic opening motion of the door when a person, an object, a vehicle etcetera approach the door, presumably to pass through it.

[0006] As regards the location of motion sensors, they are usually placed at a certain distance above the door opening 3 in a central position.

[0007] The motion sensors 2 have a more or less conical sensing region with a range of up to a few meters.

[0008] This cone is directed downward obliquely, so as to adequately cover the area in front of the door.

[0009] Depending on the type of use of the door, motion sensors are installed on both sides of the door or only on one side; in the latter case, opening from the opposite side is operated by means of other devices, such as pushbuttons, key-operated switches etcetera.

[0010] Three basic technologies for providing the motion sensors 2 are currently known: passive infrared sensors, active infrared sensors, and microwave sensors.

[0011] Passive infrared sensors are devices which use the thermoelectric effect, which consists in the fluctuation of a certain electrical signal as a function of minute transient temperature variations detected by a particular detector element 4 and are caused by the incidence thereon of the infrared radiation emitted by the human body and conveyed by means of adapted lenses.

[0012] Although this technology is sophisticated, it is widely used in the industrial, domestic and security field (industrial ovens, boilers, burglar alarms, etcetera).

[0013] For this reason, the detector elements 4 are mass-produced and are commercially available at rela-

tively low costs: moreover, the signal generated by these detector elements does not require intensive processing and therefore the costs of the finished product are very low.

[0014] This technology suffers the drawback of having relatively long response times, of being sensitive to the degree of emissivity of the clothing worn by a person located in the detection region (dark clothing might not be "seen" by the device), of being sensitive to variations in the ambient temperature, and of being subject to false activations due to hot air currents, flames, etcetera in the vicinity of the device.

[0015] Active infrared sensors are instead devices which utilize the reflection, produced by the objects present within their range, of a beam of infrared light emitted by the device: the presence of a moving object within the range of the device causes variations in the reflected signal that reaches the device which are processed appropriately and, when they exceed a certain threshold, determine the release of a command on the part of the sensor.

[0016] This technology has the advantages of being insensitive to external heat sources, of being fairly fast and sensitive, and of using sturdy and relatively simple electronic components.

[0017] Its main disadvantage relates to variations in the reflectance of the various materials to infrared light, which can cause apparent variations in the sensitivity of the device.

[0018] For example, people wearing light colors are detected more easily than people wearing black; from the point of view of cost, this technology is at an intermediate level, since in order to obtain an adequate configuration of the detection region it may be necessary to arrange more or less complicated mirrors or lenses inside the device.

[0019] Microwave sensors instead use the so-called Doppler effect, which consists in measuring the frequency variation of a radio signal in the microwave band reflected by a moving object with respect to the frequency of the incident signal.

[0020] The device emits a beam of microwaves, receives the radiation reflected by the objects that are within the range of the device, determines their difference in frequency and, if this difference exceeds a certain threshold due to the motion of an object, it releases a command toward the automation system of the door.

[0021] This is the technology that offers the best assurances of operation, reliability and uniformity in response, but it entails a relatively high cost.

[0022] From the constructive point of view, the motion sensors 2 are currently provided as a single physical block, shown schematically in Figure 2; conceptually, these devices can be described by four functional blocks which are closely interconnected and are constituted by the actual detector element 4, by the block 5 meant to process the signal that arrives from the detector element 4, by the block 6 that is meant to release the

actuation signals in output, and by the power supply block 7.

[0023] This conventional method therefore generally has considerable disadvantages as regards the cost of the execution of the two sensors, an internal one and an external one, which can be applied at the automatic door, and this increases the overall cost of automation.

[0024] Moreover, the execution of these sensors entails enclosing them in a support whose significant dimensions alter the aesthetics of the door.

[0025] The aim of the present invention is to solve the described problems, eliminating the drawbacks of the cited prior art and thus providing a device which allows to achieve considerable economic advantages with respect to the described conventional solutions.

[0026] Within the scope of the above aim, an important object is to provide a device which allows to reduce the overall cost level of automation.

[0027] A further important object is to provide a device which allows to achieve door automation while allowing to use the most adapted technology according to specific requirements.

[0028] A further important object is to provide a device which allows to maintain a better overall aesthetic appearance for the door, accordingly without bulky containers for accommodating the sensor.

[0029] A further object is to provide a device which is reliable and safe in use.

[0030] This aim, these objects and others which will become apparent hereinafter are achieved by a modular device particularly for automatic doors, characterized in that it is constituted by at least one sensor module which can be associated with said door and can be connected by means of a cable to a separate management module which is adapted to power and/or detect the number and type of said at least one sensor module and the signal that arrives from it, processing it for transfer to suitable actuation means for moving said door.

[0031] Further characteristics and advantages of the device according to the invention will become apparent from the following detailed description of a particular embodiment thereof, illustrated only by way of non-limitative example in the accompanying drawings, wherein:

Figure 1 is a side perspective view of an automatic door according to the prior art;

Figure 2 is a block diagram of the motion sensor according to the prior art;

Figures 3 and 4 are block diagrams of the invention.

[0032] With reference to Figures 3 and 4, 10 generally designates the modular device, which is constituted by at least one sensor module, designated by the reference numeral 2.

[0033] The embodiment with two sensor modules has been chosen in Figures 3 and 4; said modules may be of the passive infrared, active infrared or microwave

type.

[0034] Each one of said sensor modules 2 is in turn constituted by a detector element 4 and by a minimal amount of electronic components 11 for processing the signal that arrives from each detector element 4 and such as to ensure in output a signal which is sufficiently robust and immune to electromagnetic interference.

[0035] Each sensor module 2 thus formed can be accommodated within a suitable container 12, which is very small and can therefore have a pleasant appearance and be easily concealed at a chosen point of the door despite being visible.

[0036] Furthermore each sensor module 2 can be interconnected, by means of an adapted cable 13, to adapted inputs 14 provided in a management module 15.

[0037] Said management module can thus be placed at a different point than the one where the sensor module is applied.

[0038] The management module can thus be constituted by an electronic board which can be inserted in other units or placed inside an adapted independent container; it therefore contains a block 5 for processing the signal that arrives from the various sensor modules, which is able to detect, on the basis of manual settings or automatically, the type of detector element connected to each one of the inputs 14, accordingly applying the suitable method for processing the signal that arrives from it.

[0039] The management module can further contain a control output block 6 and a power supply block 7, both of which can be omitted and included within a generic block 16 which contains the door control logic system and is included, for example, in the electronic control panel of the automatic door itself.

[0040] This eliminates the need to have the blocks 6 and 7, because for the first block the signals in output from the block 5 for processing the signal that arrives from the sensor modules would directly activate the adapted functions in the automation system, and the power supply would be provided directly by the electronic control panel of the door.

[0041] The connection between each sensor module 2 and the management module is provided by means of a sturdy and low-cost cable, such as for example a commercial four-wire flat telephone cable: the connections at the ends of the cable are simple to perform because they use, for example, screwdown terminals or snap-in connectors of the telephone type.

[0042] The length of the various connections can reach a few meters, thus allowing to locate the sensor module differently from the management module.

[0043] It has thus been observed that the invention has achieved the intended aim and objects, since it offers great advantages on an economical level with respect to the conventional solution with two separate sensors.

[0044] The cost of each type of sensor module 2 is

determined almost exclusively by the cost of the detector element 4 located inside it, and the sensor module can be installed in a container which is the same for the three types of technology that can be used (active infrared, passive infrared and microwaves), so as to benefit from economy of scale in production.

[0045] The fact of having a single management module capable of managing two or more mutually identical or different sensor modules achieves an appreciable reduction in terms of the overall cost of the automation system.

[0046] Moreover, the fact of having a single common management module for the various technologies (active infrared, passive infrared and microwaves) allows to achieve large production runs with a consequent financial return.

[0047] Since the modular device can equally use mixed technologies (by utilizing detector elements constituted by an active infrared element, a passive infrared element or a microwave element), it allows to optimize the overall cost of each individual system, using the most suitable technology in each case.

[0048] The fact of being able to integrate the management module in other products with more complex functions entails a further great advantage in terms of costs.

[0049] The modularity and simplicity that arise from simplified and foolproof wiring ensure financial returns at the installation, servicing and technical support level.

[0050] Finally, the miniaturization of the sensor module provides a great advantage from the point of view of aesthetics and installation.

[0051] The materials that constitute the individual components of the invention may of course be the most pertinent according to specific requirements.

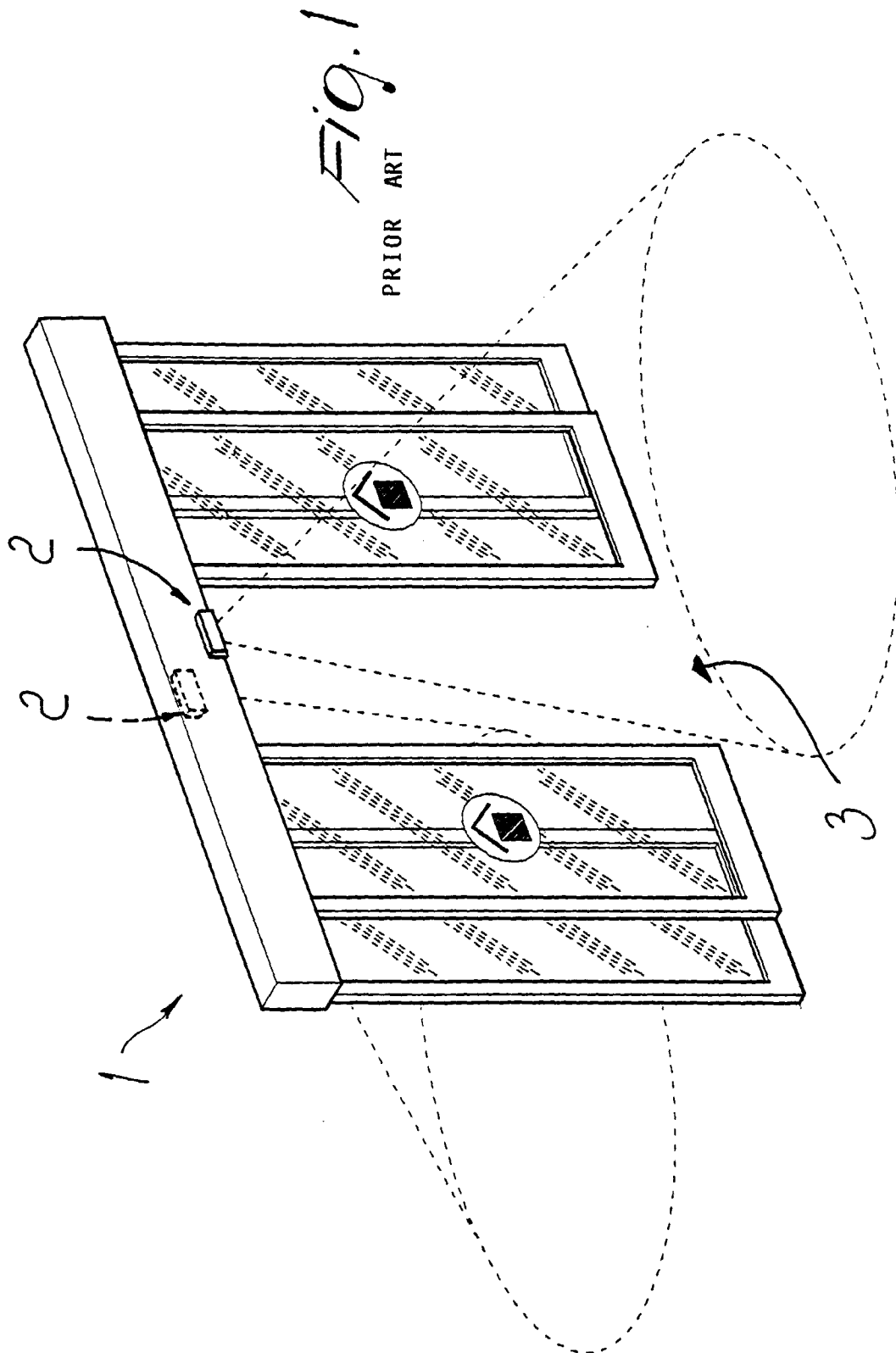
[0052] The disclosures in Italian Utility Model Application No. TV98U000005 from which this application claims priority are incorporated herein by reference.

[0053] Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly, such reference signs do not have any limiting effect on the interpretation of each element identified by way of example by such reference signs.

Claims

1. A modular device particularly for automatic doors, characterized in that it is constituted by at least one sensor module (2) which can be associated with said door and can be connected by means of a cable (13) to a separate management module (15) which is adapted to power and/or detect the number and type of said at least one sensor module (2) and the signal that arrives from it, processing it for transfer to suitable actuation means for moving said door.

2. The device according to claim 1, characterized in that said management module (15) can be integrated in another device such as preferably the electronic control panel of said door, said management module (15) being adapted to detect the number and type of said at least one sensor module (2) and the signal that originates from it, processing it for transfer to a logic system for controlling the movement of said door.
3. The device according to claims 1 and 2, characterized in that each one of said sensor modules (2) is constituted by a detector element (4) and by electronic components for processing the signal that arrives from said detector element (4) and for sending in output a signal which can be transmitted over a cable (13) to suitable inputs (14) provided on said management module (15).
4. The device according to claims 1 and 3, characterized in that each one of said sensor modules (2) can be accommodated within a suitable compact container (12).
5. The device according to one or more of the preceding claims, characterized in that said management module (15) is constituted by an electronic board which can be inserted in other units or can be arranged inside a suitable and separate container.
6. The device according to one or more of the preceding claims, characterized in that said management module (15) comprises a power supply block (7) and is constituted by a block (5) for processing the signal that arrives from said sensor modules (2) and is such as to detect, on the basis of manual settings or automatically, the type of detector element (4) that is connected to each one of said inputs (14), processing the signal that arrives from them to send it to the control logic system (16) of said door or to a control block (6) for said door.



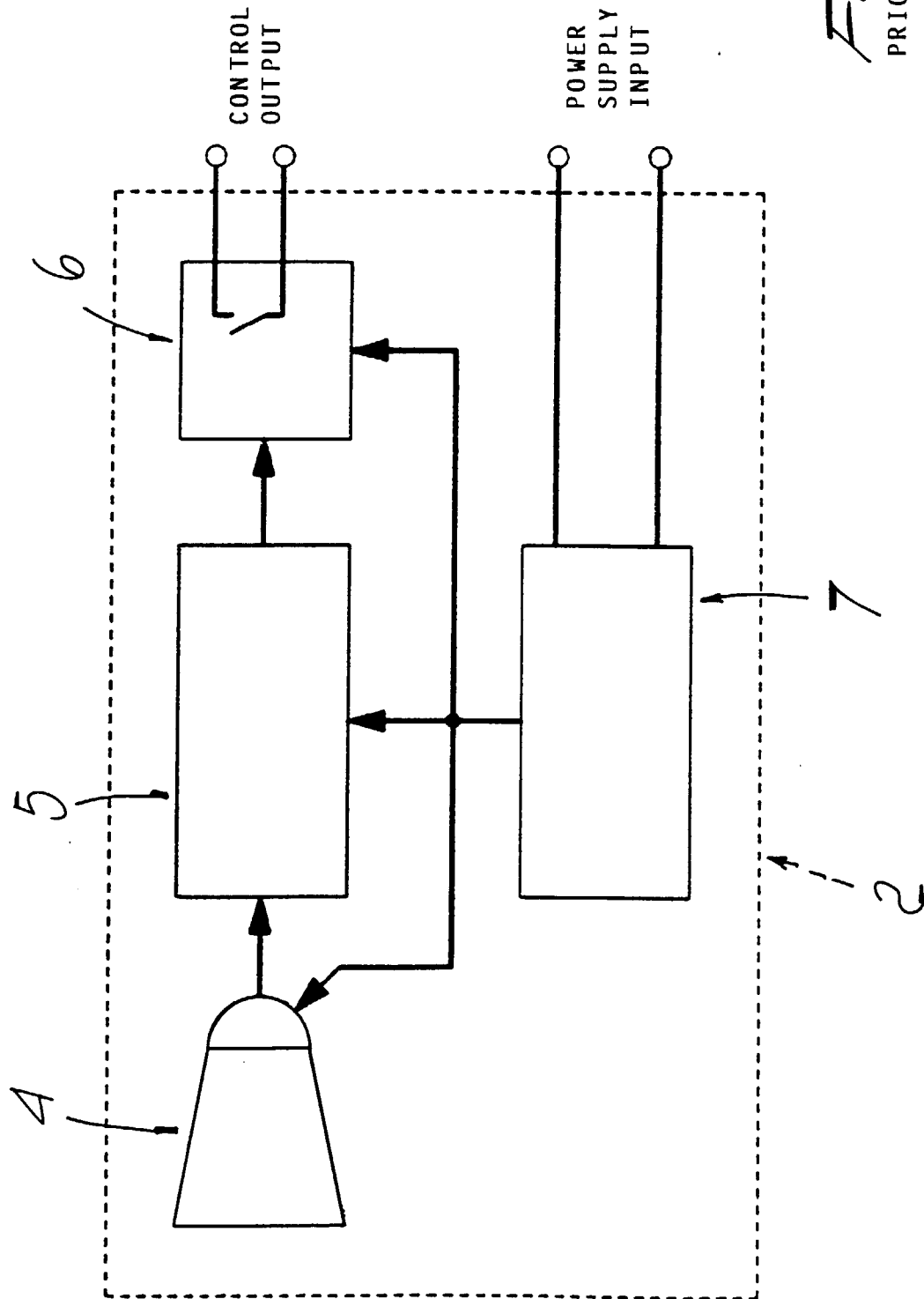
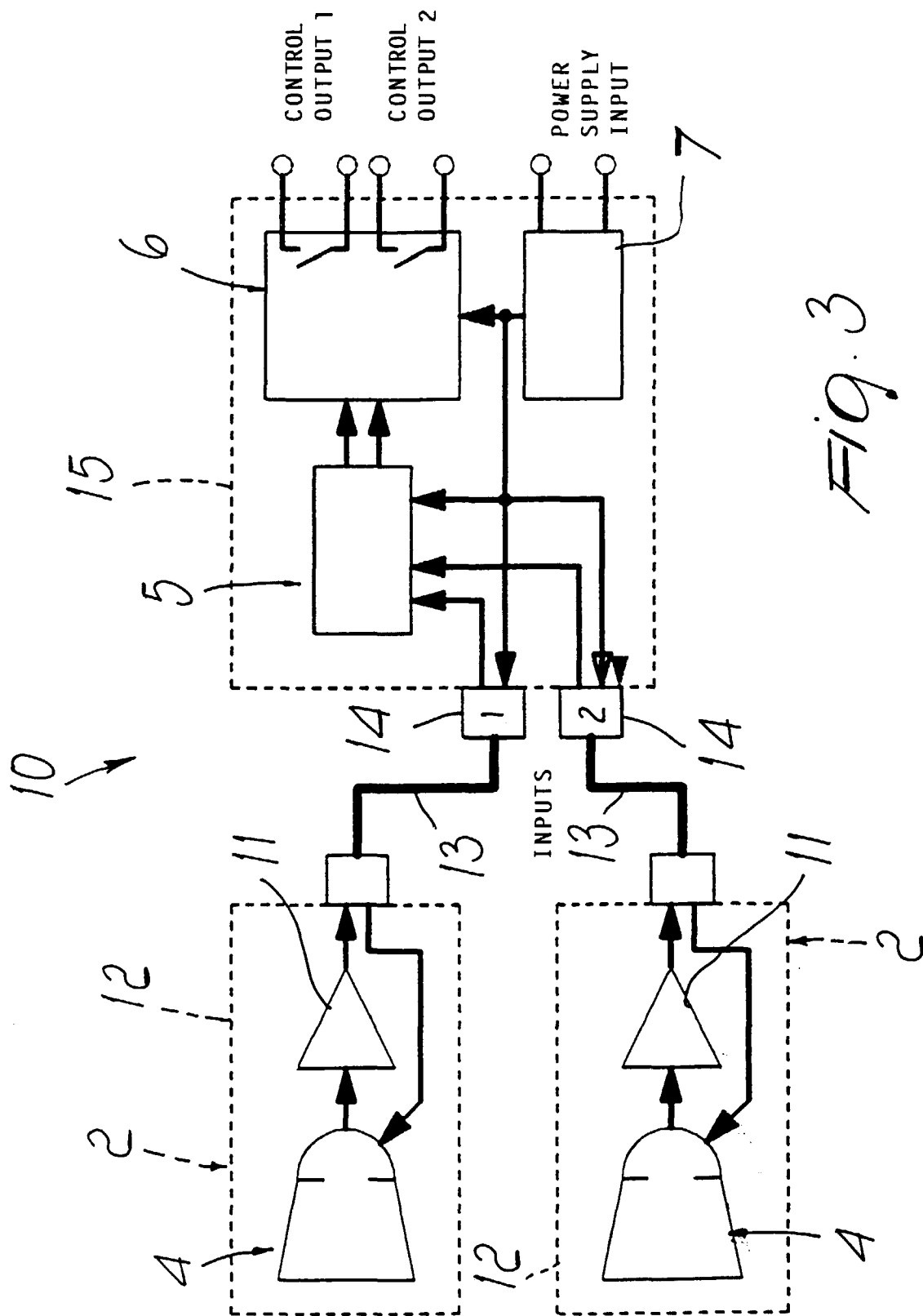


Fig. 2
PRIOR ART



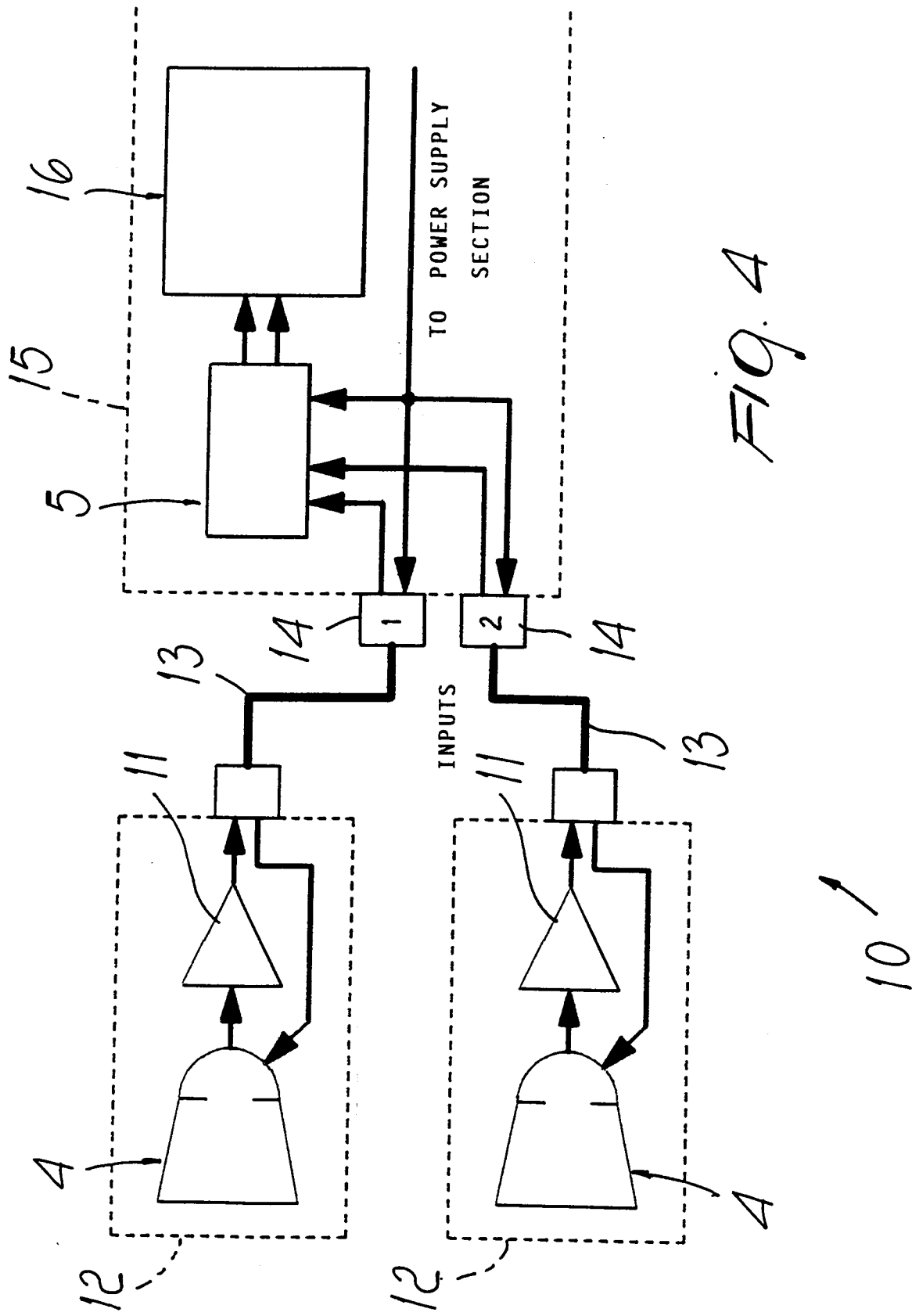


FIG. 4