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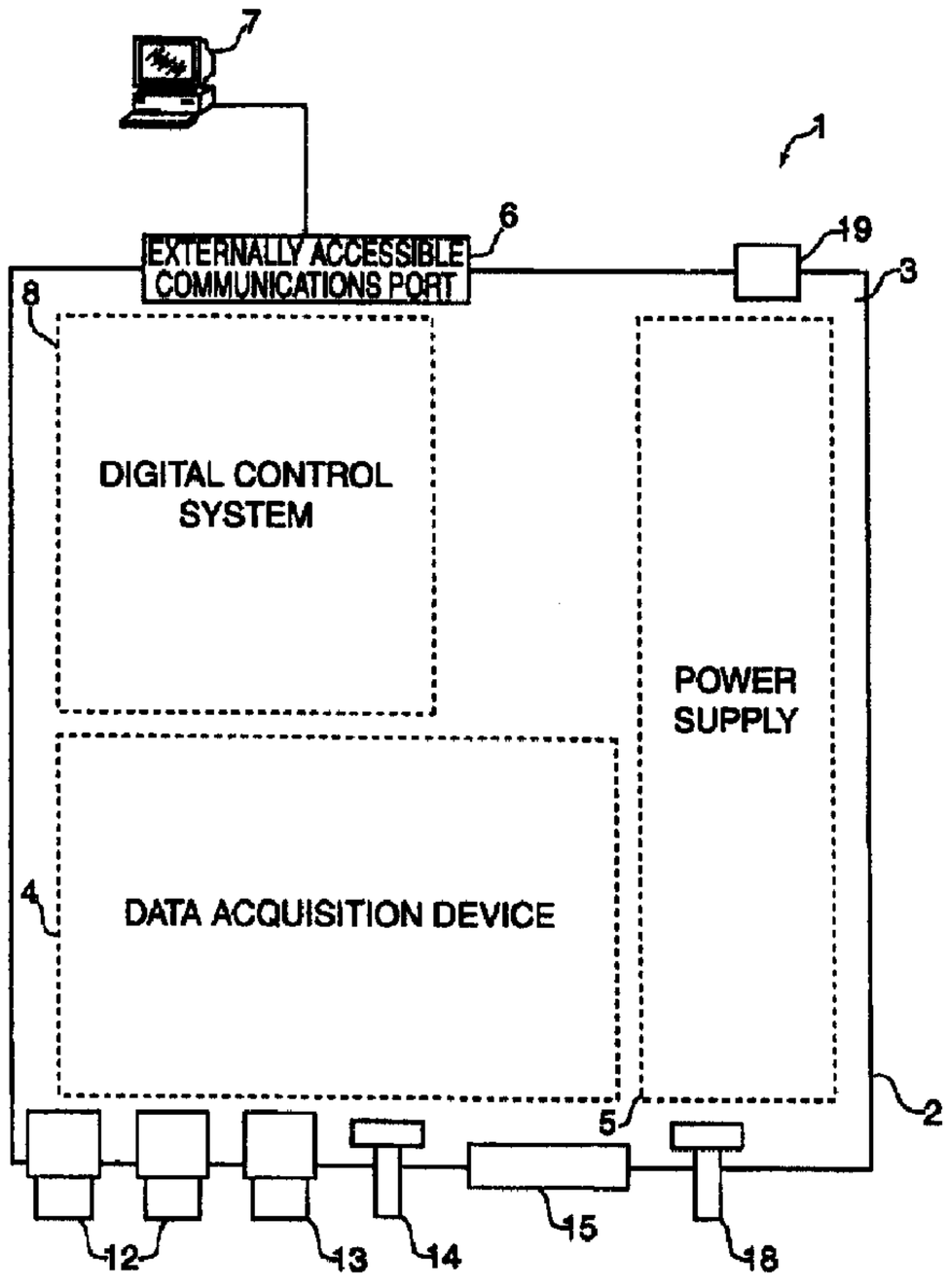
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(54) **DISPOSITION DE PLAQUETTE DE CIRCUIT IMPRIME**
(54) **CIRCUIT BOARD ARRANGEMENT**



(57) L'invention concerne une disposition de plaquette de circuit imprimé permettant de réaliser des essais sur un circuit d'essai (1). Cette disposition comprend une plaquette de circuit imprimé unique, un dispositif d'acquisition de données (4) et un dispositif d'alimentation (5). Le dispositif d'acquisition de données et le dispositif d'alimentation sont placés sur la plaquette de circuit imprimé unique. Cette dernière est couplée au circuit d'essai de telle sorte que le dispositif d'acquisition de données (4) peut recevoir les signaux de sortie d'essai provenant du circuit d'essai. Le dispositif d'alimentation alimente le circuit d'essai.

(57) A circuit board arrangement for testing a test circuit (1). The circuit arrangement includes a single circuit board, a data acquisition device (4) and the power supply device (5). The data acquisition device and the power supply device are disposed on the single circuit board. The single circuit board is coupled to the test circuit so that the data acquisition device (4) can receive test output signals from the test circuit. The power supply provides power to the test circuit.

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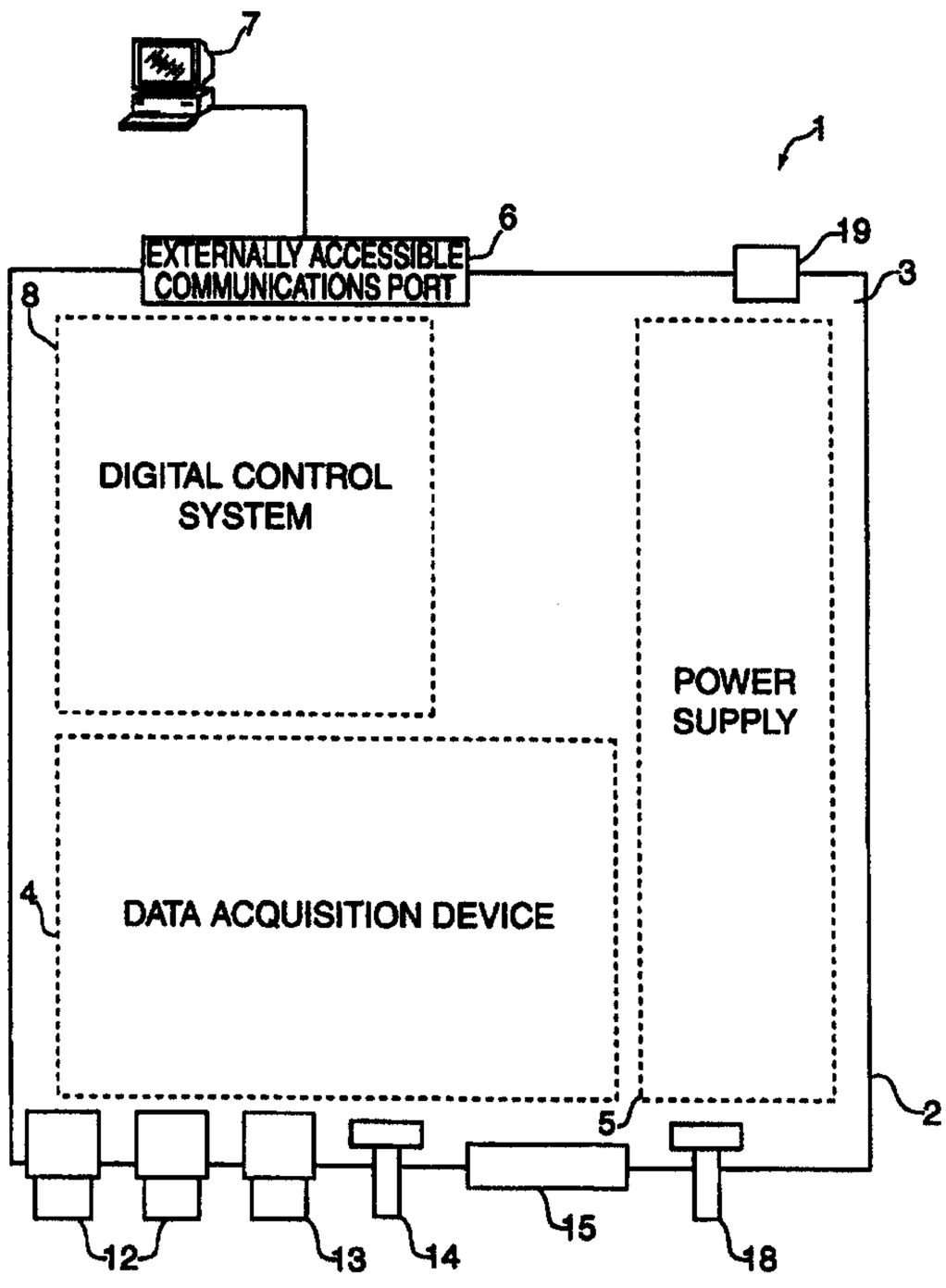
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(54) Title: CIRCUIT BOARD ARRANGEMENT

(57) Abstract

A circuit board arrangement for testing a test circuit (1). The circuit arrangement includes a single circuit board, a data acquisition device (4) and the power supply device (5). The data acquisition device and the power supply device are disposed on the single circuit board. The single circuit board is coupled to the test circuit so that the data acquisition device (4) can receive test output signals from the test circuit. The power supply provides power to the test circuit.



CIRCUIT BOARD ARRANGEMENT

FIELD OF THE INVENTION

The present invention relates to a circuit board arrangement, and in particular the circuit board arrangement disposing at least a data acquisition device and a power supply thereon.

BACKGROUND INFORMATION

A conventional electronics test facility includes three basic instruments - a data acquisition device (e.g., oscilloscopes, multimeters, etc.), a signal generator and a power supply. The signal generator provides test signals to test circuits so that output signals may be generated by the test circuits, in which the data acquisition device measures the output signals from the test circuits, and the power supply supplies power to the test circuits.

It is known to situate a conventional data acquisition device on a single circuit board which can be positioned in a dedicated box to be connected to a personal computer or can be positioned directly in a communication slot of the personal computer. However, the data acquisition devices and power supplies were previously not placed on a single circuit board (along with other desired components).

U.S. Patent No. 5,526,287 describes a portable data collection device capable of sensing voltage, resistance and current data in a digital form or in an analog form. The data collection device includes a housing, a processor for controlling input and output information corresponding to the sensed information, a storage device storing the information, a serial port and an internal power source. There is no indication in this publication, however, that this portable data collection device is disposed on a single circuit board along with a power source.

One of the objects of the present invention is to provide presently available components economically on a single circuit board so that test circuits can be easily tested using a standalone device connected between a digital

computer and the test circuit, or by connecting this arrangement between an internal connection slot of the digital computer and the test circuit.

SUMMARY OF THE INVENTION

A circuit arrangement according to the present invention includes a single circuit board, a data acquisition device and a power supply device. The data acquisition device and the power supply device are each disposed on the single circuit board. The circuit board arrangement is connected to a test circuit so that the data acquisition device can receive test output signals from the test circuit. The power supply provides power to the test circuit. Thus, the test output signals from the test circuit can be analyzed by, e.g., a digital computer. A signal generating device may also be provided on the single circuit to stimulate a generation of the test output signal from the test circuit.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 shows a cross-section of a top view of a first embodiment of a single circuit board arrangement according to the present invention.

Fig. 2 shows a front view of a housing for the first embodiment of the single circuit board arrangement according to the present invention.

Fig. 3 shows a top view of a second embodiment of the single circuit board arrangement according to the present invention.

Fig. 4 shows a cross-section of a top view of a third embodiment of the single circuit board arrangement according to the present invention.

Fig. 5 shows a front view of a housing for the third embodiment of the single circuit board arrangement according to the present invention.

Fig. 6 shows a top view of a fourth embodiment of the single circuit board arrangement according to the present invention.

DETAILED DESCRIPTION OF THE INVENTION

Figs. 1 and 2 show a first embodiment of a circuit board arrangement 1 including a single circuit board 3, a data acquisition device 4 (e.g., a multichannel data acquisition device) and a power supply 5 (e.g, a flexible multiple voltage user power supply). The data acquisition device 4 and the power supply 5 are disposed on the single circuit board 3. Figs. 1 and 2 also show the circuit board arrangement 1 situated in a dedicated housing 2. The data acquisition device 4 and the power supply 5 may, for example, be provided directly on the circuit board 3 or upon a number of daughter boards (e.g., not exceeding three daughter boards) mounted on the single circuit board 3. The daughter boards (not shown) may also be provided on the single circuit board 3. If the daughter boards are utilized, these daughter boards should preferably not exceed a surface area of, for example, approximately six square inches.

The circuit board arrangement 1 further includes an externally accessible communications port 6 (which may be connected to a serial port, a parallel port, or a USB port of a digital computer 7, as are known in the art) for operably coupling the arrangement 1 to the digital computer 7 (e.g., a general purpose computer, dedicated computer, or the like). The communications port 6 is connected to the data acquisition device 4 and the power supply 5 either directly or via a digital control system 8 (e.g., a microprocessor) using, for example, a communications bus or hard-wired connections. The digital control system 8 (which may include discrete circuit elements or an integrated circuit) can be situated on the single circuit board 3 or on the daughter boards. The digital control system 8 may be either a separate circuit element, or may be embedded into the data acquisition device 4 or into the power supply 5.

Conventional data acquisition devices (e.g., oscilloscopes, frequency meters, voltmeters, current meters, digital multimeters, etc.) are well known in the art. The data acquisition device 4 provided on the single circuit board

3 may also be known in the art. The circuit board arrangement 1 also includes a plurality of externally accessible data acquisition channel input ports (A and B) 12, an externally accessible trigger input 13 for a scope mode operation, an externally accessible trigger level control system 14, and a data/power supply output 15. The data acquisition channel input ports 12 and the trigger input 13 can be coupled to an external electrical test circuit. Thus, the data from the external electrical test circuit can be provided to the data acquisition device 4 via the externally accessible data ports 12. The trigger level control system 14 may be coupled to the data acquisition device 4 either directly or via the digital control system 8.

The power supply 5 may be, e.g., a triple output user controlled power supply 17 as shown in Fig 8. The circuit board arrangement 1 includes an externally accessible power supply controller 18 and an externally accessible power supply input 19. The power supply controller 18 may be coupled to the power supply 5 either directly or via the digital control system 8.

Fig. 3 shows a second embodiment of a circuit board arrangement 20 according to the present invention. The circuit board arrangement 20 includes the single circuit board 3, the data acquisition device 4 and the power supply 5 thereon. As described above, the data acquisition device 4 and the power supply 5 are disposed on the single circuit board 3. In this embodiment, the single circuit board arrangement 20 is positioned in a casing of a digital computer (not shown). The single circuit board 3 includes a computer connector 22 operably coupling the single circuit board 3 and circuit elements disposed thereon to the digital computer. The computer connector 22 interfaces with the digital computer via a standard data bus slot (e.g. EISA, ISA, PCI, VXI, etc.) that is connected to the motherboard of the digital computer. The data acquisition device 4 and the power supply 5 may be disposed directly on (or attached directly to) the single circuit board 3 or upon a predetermined number of the daughter

boards (e.g., preferably not exceeding three daughter boards) mounted on the single circuit board 3. If the daughter boards are used, these daughter boards should preferably not exceed an area of, e.g., approximately six square inches. The single circuit board arrangement 20 according to the second embodiment includes similar externally accessible input ports, output ports, control systems, and connection systems as described for the first embodiment above.

Figs. 4 and 5 show a third embodiment of a circuit board arrangement 23 according to the present invention with the data acquisition device 4 and the power supply 5 arranged on the single circuit board 3. The third embodiment of a circuit board arrangement 23 includes the similar elements as described above with respect to the first embodiment shown in Fig. 1 and further disposes a signal generator 24 on the single circuit board 3 or on the daughter boards that may be situated on the single circuit board 3, and may communicate with the digital control system 8, the power supply 5 and/or the data acquisition device 4, either directly or indirectly. The data/power supply output 15 is also included, however, a signal generated output (generated by the signal generator 24) can also be provided using this output port. The signal generator 24 can be used for providing test signals (either analog or digital) to a user-built (or prefabricated) test circuit, that may be powered by, e.g., the power supply 5, in order to stimulate such test circuit to provide a test output signal. This test output signal can then be measured by, e.g., the data acquisition device 4. The signal generator 24 can include, e.g., a conventional signal generator as are known in the art. The circuit board arrangement 23 also includes an externally accessible signal output port 26, which is connected to the signal generator 24, either directly or via the digital control system 8.

Fig. 6 shows a fourth embodiment of a single circuit board arrangement 28 according to the present invention which includes a single circuit board 3, the data acquisition device 4 and the power supply 5. The data acquisition device 4 and

the power supply 5 are disposed on the single circuit board 3. The circuit board arrangement 28 includes the elements described above in the second embodiment as shown in Fig. 3 and further provides a signal generator 24 on the single circuit board 3 or on the daughter boards that can be situated on the single circuit board 3. The circuit board arrangement 28 further includes the same externally accessible signal output port 26 as described for the third embodiment above and shown in Figs. 4 and 5.

The data acquisition device 4 can be configured by manually adjusting the externally accessible trigger level control system 14 which can be electrically coupled directly to the data acquisition device 4 or via the digital control system 8. The power supply 5 can be configured by manually adjusting the externally accessible power supply controller 18 which can be electrically coupled directly to the power supply 5 or also via the digital control system 8. The signal generator 24 can be configured by manually adjusting the externally accessible signal output port 26 which can be electrically coupled directly to the signal generator 24 or via the digital control system 8. The data acquisition device 4, the power supply 5 and/or the signal generator 24 can also be adjusted automatically by using, e.g., the digital computer. In particular, the data acquisition device 4 can be configured by a software program operating in the digital computer or by adjusting the externally accessible trigger level control system 14 to function as, e.g., a dual channel storage oscilloscope, a frequency meter, a digital multimeter, or a spectrum analyzer. The power supply 5 can also be configured by the software program operating in the digital computer and/or by adjusting the externally accessible power supply controller 18 to control the voltage and/or current output. The power supply 5 is capable of generating either a digital voltage and/or current signal or an analog voltage and/or current signal. The type of the signal (i.e., digital or analog) generated by the signal generator can be configured by the software program or manually configured. The data

acquisition device 4, the power supply 5 and/or the signal generator 24 can also be controlled using, e.g., the digital control system 8. One of ordinary skill in the art would readily be able to recognize that the data acquisition device 4, the power supply 5 that ate situated on the single circuit board 3 can also be controlled using other means.

AMENDED CLAIMS

[received by the International Bureau on 18 December 1998 (18.12.98); original claims 1, 5-8, 16, 18 and 19 amended; new claims 21-24 added; remaining claims unchanged (4 pages)]

1. A circuit arrangement for testing a test circuit, comprising:

a single circuit board coupling to the test circuit;

a data acquisition device disposed on the single circuit board, the data acquisition device receiving test output signals from the test circuit; and

a power supply device disposed on the single circuit board, the power supply device providing power to the test circuit for testing an operation of the test circuit.

2. The circuit arrangement according to claim 1, further comprising:

a signal generating device situated on the single circuit board, the signal generator providing at least one test signal to test circuit so that the test output signals are generated by the test circuit.

3. The circuit arrangement according to claim 1, further comprising:

a digital control system disposed on the single circuit board, the digital control system controlling at least one of the data acquisition device and the power supply device.

4. The circuit arrangement according to claim 2, further comprising:

a digital control system disposed on the single circuit board, the digital control system controlling at least one of the data acquisition device, the power supply device and the signal generating device.

5. The circuit arrangement according to claim 1, further comprising:

a digital control system disposed on the single circuit board, the digital control system controlling at least one of the data acquisition device and the power supply device; and

a communications port coupled to the data acquisition device and adapted for connecting to a connection port of a digital computer, the digital control system providing the data corresponding to the test output signals to the digital computer.

6. The circuit arrangement according to claim 2, further comprising:

a digital control system disposed on the single circuit board, the digital control system controlling at least one of the data acquisition device, the power supply device and the signal generating device; and

a communications port coupled to at least one of the data acquisition device and the signal generating device, the communication port being adapted for communicating with a connection port of a digital computer, the digital control system providing the data corresponding to the test output signals to the digital computer.

7. The circuit arrangement according to claim 3, further comprising:

a communications port coupled to the digital control system and adapted for communicating with a connection port of a digital computer, the digital control system providing the data corresponding to the test output signals to the digital computer.

8. The circuit arrangement according to claim 4, further comprising:

a communications port coupled to the digital control system and adapted for communicating with a connection port of a digital computer, the digital control system providing the data corresponding to the test output signals to the digital computer.

9. The circuit arrangement according to claim 1, further comprising:

an externally accessible trigger level controller for configuring the data acquisition device; and

an externally accessible power level controller for configuring the power supply device.

10. The circuit arrangement according to claim 5, wherein at least one of the data acquisition device and the power supply device is configured using a software program operating in the digital computer.

11. The circuit arrangement according to claim 6, wherein at least one of the data acquisition device, the power supply device and the signal generating device is configured using a software program operating in the digital computer.

12. The circuit arrangement according to claim 7, wherein digital control system is configured using a software program operating in the digital computer.

13. The circuit arrangement according to claim 8, wherein digital control system is configured using a software program operating in the digital computer.

14. The circuit arrangement according to claim 5, wherein the data acquisition device and the power supply device are positioned in a casing externally from the digital computer.

15. The circuit arrangement according to claim 5, wherein the data acquisition device and the power supply device are positioned inside a casing of the digital computer.

16. The circuit arrangement according to claim 15, wherein the connection port of the digital computer includes one of an EISA port, an ISA port, a PCI port and a VXI port.

17. The circuit arrangement according to claim 6, wherein the data acquisition device, the power supply device and the

signal generating device are positioned inside a casing of the digital computer.

18. The circuit arrangement according to claim 7, wherein the data acquisition device, the power supply device and the data control system are disposed inside a casing of the digital computer.

19. The circuit arrangement according to claim 8, wherein the data acquisition device, the power supply device, the signal generating device and the digital control system are disposed inside a casing of the digital computer.

20. The circuit arrangement according to claim 1, further comprising:

at least one daughter board situated on the single circuit board, at least one of the data acquisition device and the power supply device being situated on the at least one daughter board.

21. The circuit arrangement according to claim 1, wherein the power supply device includes a multiple voltage power supply device.

22. The circuit arrangement according to claim 1, wherein the power supply device includes a user-variable power supply device.

23. The circuit arrangement according to claim 1, wherein the data acquisition device includes a user-variable data acquisition device.

24. The circuit arrangement according to claim 1, wherein the signal generating device includes a user-variable signal generating device.

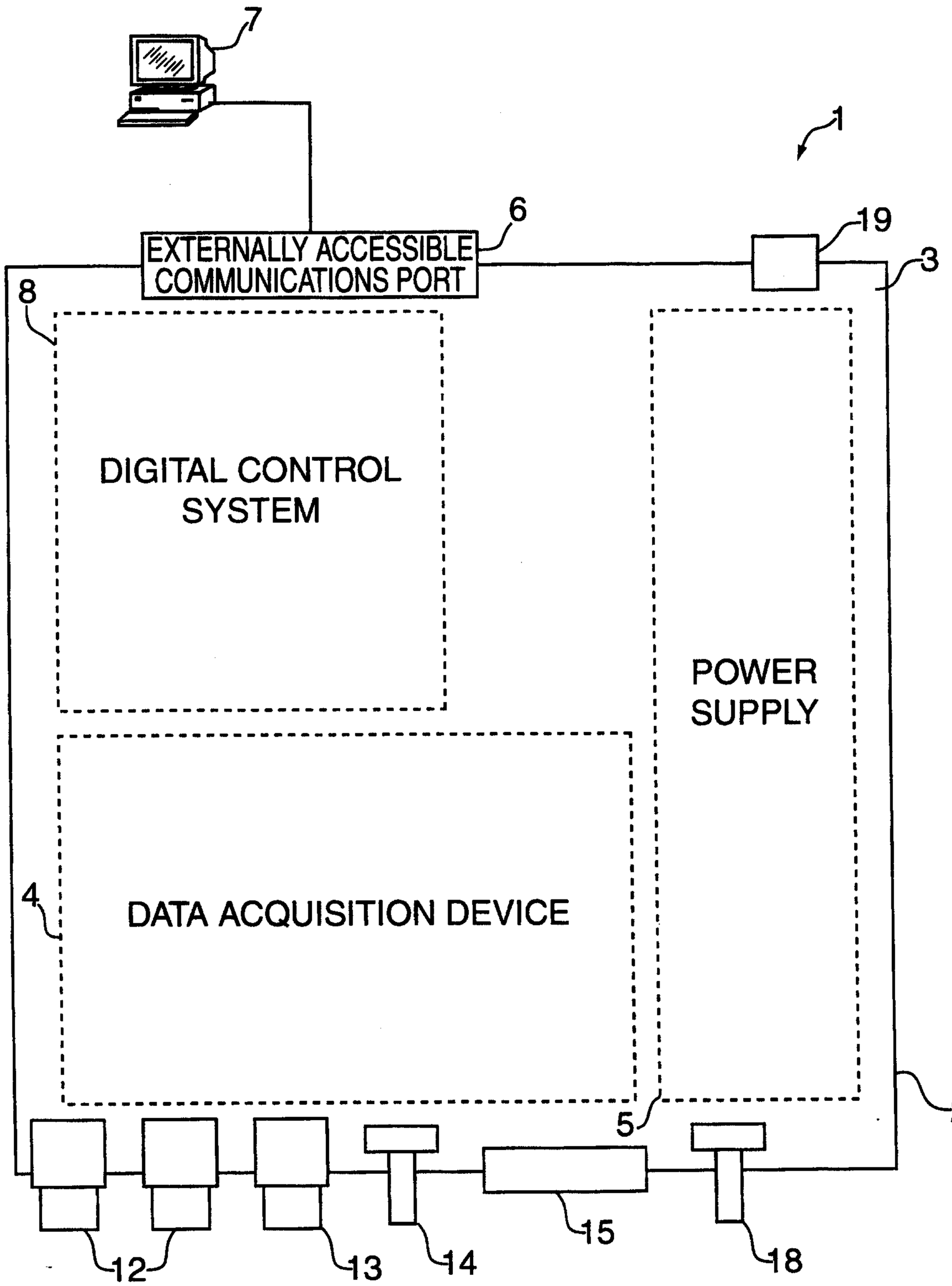

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1
EXTERNALLY ACCESSIBLE COMMUNICATIONS PORT
6
19
3
8
DIGITAL CONTROL SYSTEM
POWER SUPPLY
4
DATA ACQUISITION DEVICE
5
2
12
13
14
15
18

FIG. 1

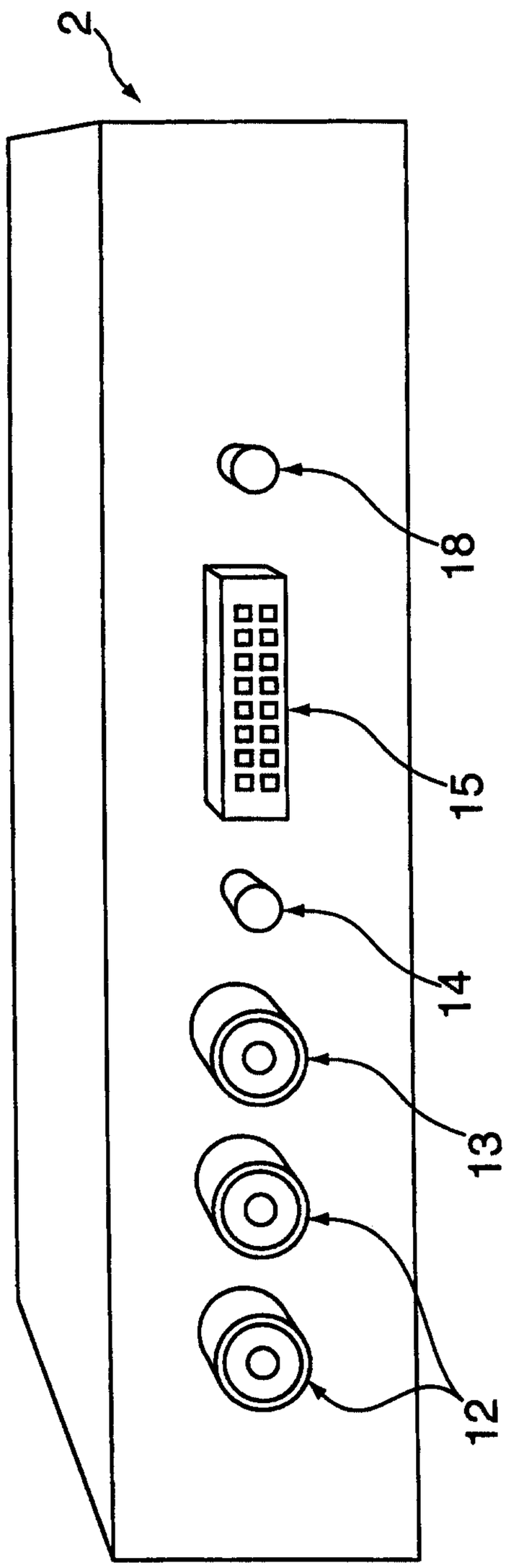


FIG. 2

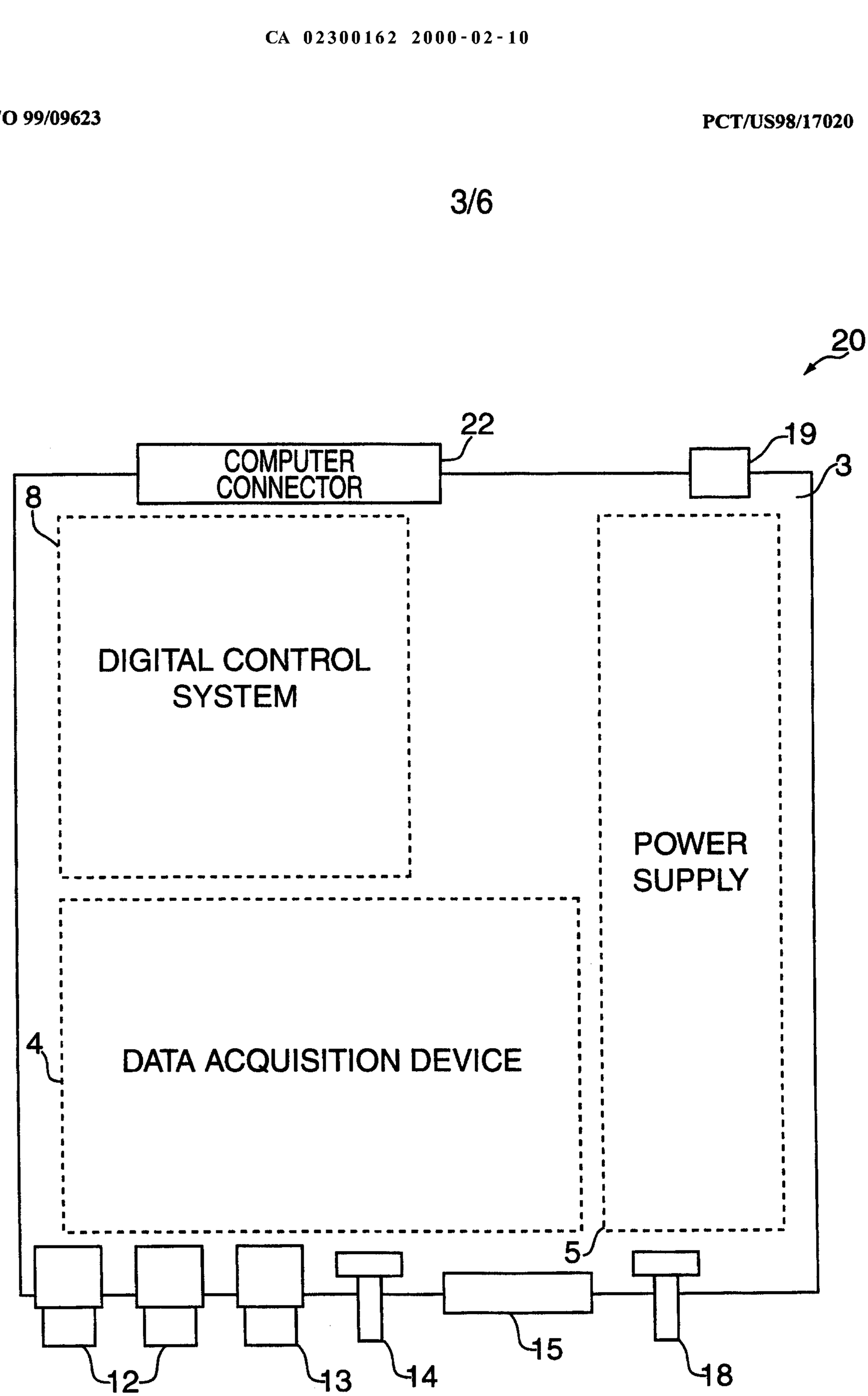

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COMPUTER CONNECTOR
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DIGITAL CONTROL SYSTEM
POWER SUPPLY
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DATA ACQUISITION DEVICE
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FIG. 3

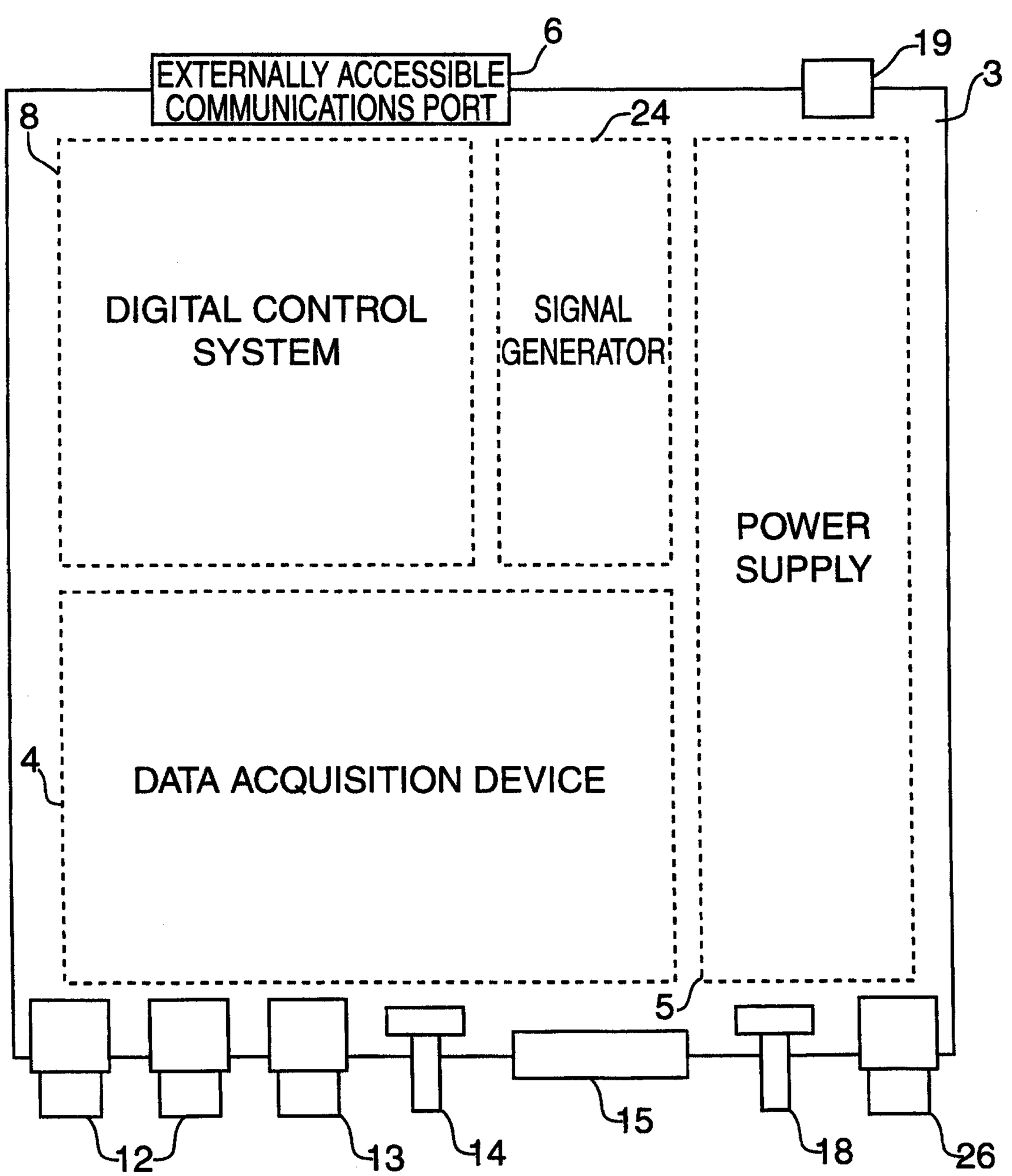

23
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EXTERNALLY ACCESSIBLE COMMUNICATIONS PORT
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DIGITAL CONTROL SYSTEM
SIGNAL GENERATOR
POWER SUPPLY
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DATA ACQUISITION DEVICE
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FIG. 4

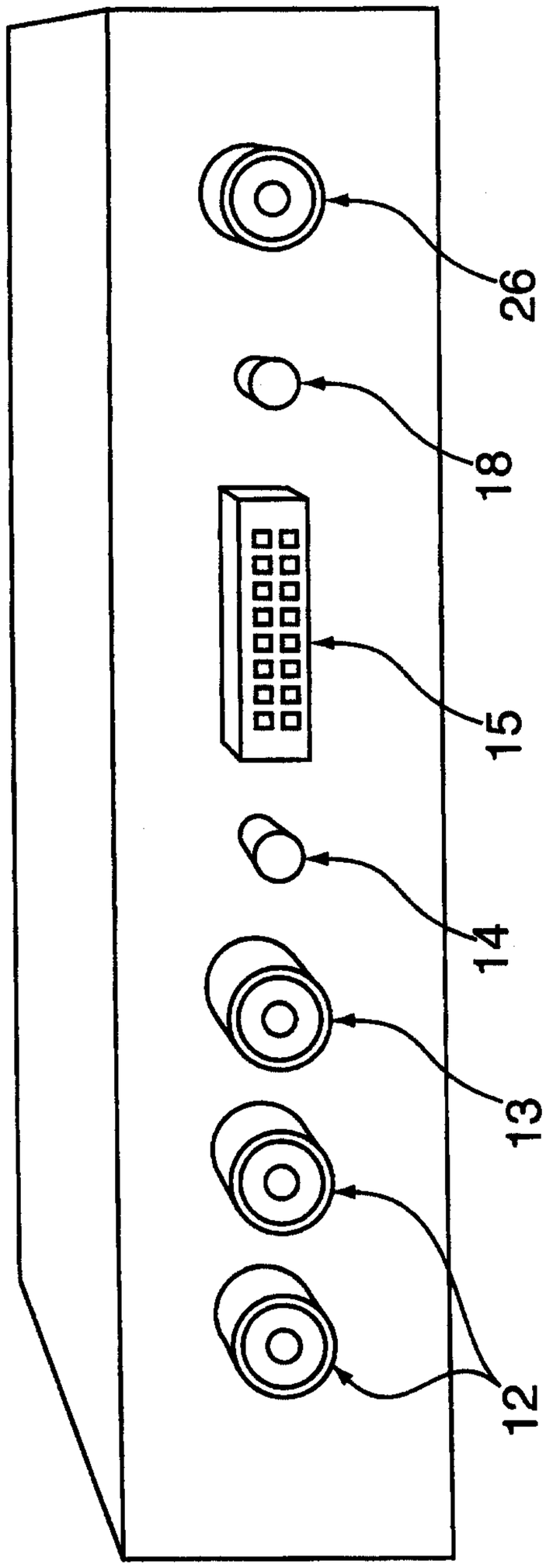


FIG. 5

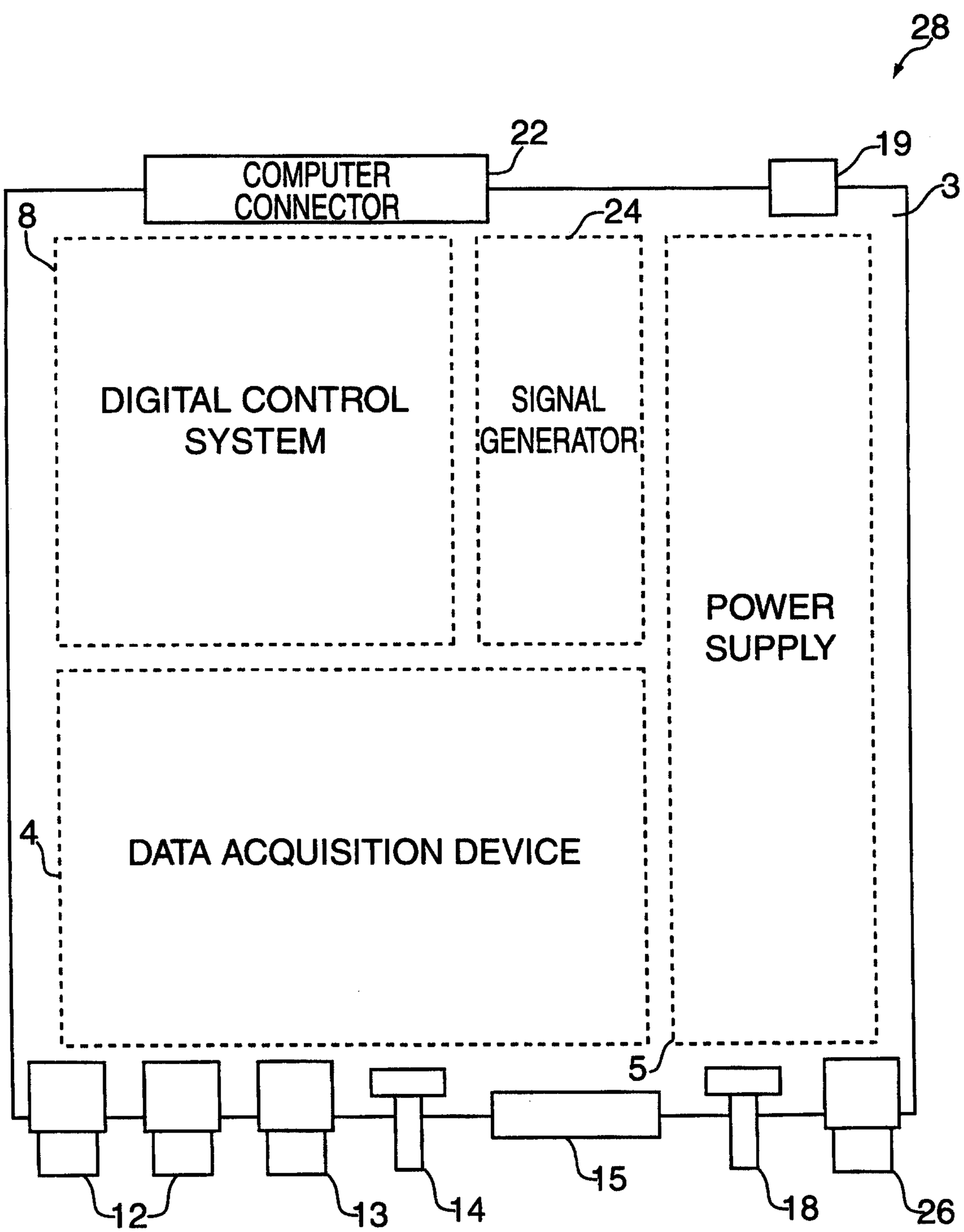

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COMPUTER CONNECTOR
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DIGITAL CONTROL SYSTEM
SIGNAL GENERATOR
POWER SUPPLY
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DATA ACQUISITION DEVICE
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FIG. 6