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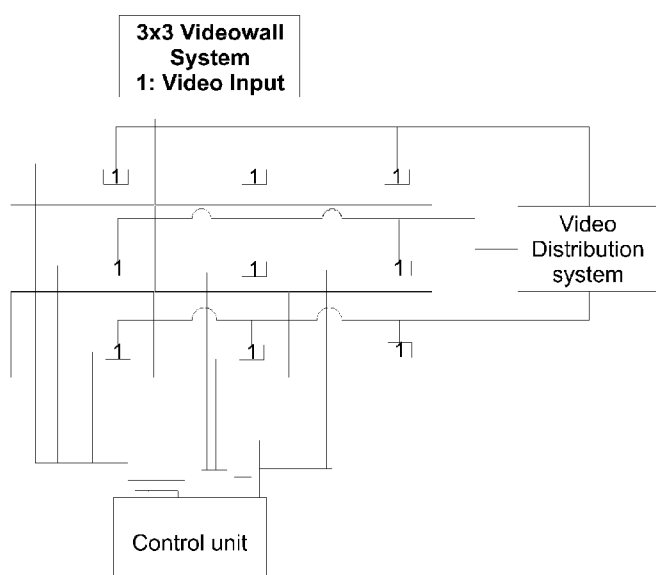
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(54) **Title:** SYSTEM AND METHOD FOR OPERATION OF A VIDEO WALL DISPLAY BY A CONTROL STATION

Fig. 1



(57) **Abstract:** The present invention relates to a system and method for operating a video wall display system which comprises a plurality of display devices in connection with a control unit that process source files to be displayed on a plurality of image display devices. More particularly, the present invention relates to a video wall system having a multitude of image display devices with a serial video transmission line between adjacent image display devices of the video wall system, the plurality of image display devices being in connection with each other through the serial video transmission line transferring an image or video signal to an adjacent image display device by means of at least one input and output connector of each image display device, the video wall system further comprising a control station controlling the operation thereof and the control station in data communication with each image display device.

**Description****SYSTEM AND METHOD FOR OPERATION OF A VIDEO WALL DISPLAY BY A CONTROL STATION**

- [0001] The present invention relates to a system and method for operating a video wall display system which comprises a plurality of display devices in connection with a control unit that process source files to be displayed on a plurality of image display devices.
- [0002] Image display devices present images on screens thereof and combination of multi-display devices in order to form a large screen display environment called a video wall is one of the functions achievable through combination and simultaneous operation of a plurality of individual image display devices. The term video wall generally refers to the generation of a combined image from a single video input by means of a plurality of image display devices as a single video wall image. The video wall may typically be arranged in the form of 1x4, 2x2, 3x3, 4x4 or much larger screen formats.
- [0003] Video walls are basically preferred due to their capability to generate a very large screen whose tile layout can be customized by which a greater screen area and greater pixel density per unit cost can be achieved, which is advantageous due to manufacturing costs of single screens, hence allowing an unusual resolution when combined.
- [0004] Video walls are conventionally used in large public venues such as stadiums. Video walls are driven from multi-monitor video cards, but complex arrangements require special video processors capable to manage large video walls. Software based video wall controllers however use PCs and networking equipment.
- [0005] In video wall applications, each image display device of the system requires individual cable installation for effecting data communication with a central computer.
- [0006] The video distribution is possible through different methods. One of the methods includes a central video distributor system and each image to be displayed on a single image display device is distributed by the central video distributor system. The image is accordingly divided by the central

system. Cable installation must be carried out during the system setup and in case a need for repair emerges, the operation often requires complete maintenance of the overall installation. Video transmission lines are established by connection of all devices to the central video distributor system. Video transfer is typically effectuated by HDMI or DVI-D connections.

- [0007] Another method uses serial connection between separate image display devices through which transfer of the whole video content to an adjacent image display device is performed. Appropriate divisioning of the video content by individual image display devices is ensured by a processor of each image display device. In the case an error occurs in the cable installation of one of the image display devices, it effects video transfer to the adjacent image display device in the manner that no image can be transmitted further along, from the defected device on along the serial video transmission line of the video wall.
- [0008] Among others, one of the prior art disclosures in the technical field of the present invention may be referred to as EP2328073, which discloses a video wall system which includes a plurality of display devices, each of the display devices including: a pair of input and output connectors comprising an input connector connected to a first neighboring display device among the plurality of display devices to input an image signal from the first neighboring display device, and an output connector connected to a second neighboring display device to output the input video signal; a signal processor which processes the input video signal; and a display which displays an image based on the processed video signal.
- [0009] The present invention provides a system and method for providing serial connection between adjacent image display devices of a video wall system such that a plurality of image display devices are in connection with each other through a serial line transferring the video signal to the neighboring image display device.
- [0010] The present invention provides interchangeable input and output connectors functioning through a bidirectional or multi-directional switching system determining the transmission direction of the signals between

neighboring image display devices within the video wall system.

- [0011] The present invention therefore provides a system and method for operating video wall systems as provided by the characterizing features defined in Claim 1.
- [0012] Primary object of the present invention is hence to provide a system and method for operating a video wall system in which input and output connectors of individual image display devices are interchangeably programmable to dynamically change the transmission direction of the video signal between neighboring image display devices in response to an error status in an image display device interrupting the video transmission line.
- [0013] The present invention proposes a video wall system with programmable input and output connectors to ensure transfer of video signal between neighboring image display devices in response to an error status in an image display device interrupting the video transmission line.
- [0014] Accompanying drawings are given solely for the purpose of exemplifying a system and method for effecting serial input/output connector connections in a video wall system whose advantages over prior art were outlined above and will be explained in brief hereinafter.
- [0015] The drawings are not meant to delimit the scope of protection as identified in the claims nor should they be referred to alone in an effort to interpret the scope identified in the claims without recourse to the technical disclosure in the description of the present invention.
- [0016] Fig. 1 demonstrates a schematic view of a 3x3 video wall system with input connectors.
- [0017] Fig. 2 demonstrates a schematic view of a 3x3 video wall system with input and output connectors and a serial video transmission line.
- [0018] Fig. 3 demonstrates a schematic view of a 3x3 video wall system with input and output connectors and while an error status in an image display device interrupts the serial video transmission line in the video wall system.
- [0019] Fig. 4 demonstrates a schematic view of a 3x3 video wall system with programmable input and output connectors according to the present

invention.

- [0020] Fig. 5 demonstrates a schematic view of a 3x3 video wall system with programmable input and output connectors receiving the video signal in a second direction according to the present invention.
- [0021] Fig. 6 demonstrates a schematic view of a 3x3 video wall system with each image display device having a pair of input and output connectors capable of receiving the video signal bidirectionally according to the present invention.
- [0022] Fig. 7 demonstrates a schematic view of a 3x3 video wall system with each display device having a pair of input and output connectors receiving the video signal in a second direction according to the present invention.
- [0023] Fig. 8 demonstrates a schematic view of a 3x3 video wall system with each display device having a pair of input and output connectors while an error status in an image display device interrupts the video transmission line in the video wall system and upon which the video signal is bidirectionally receivable according to the present invention.
- [0024] The present invention proposes a video wall system with a multitude of image display devices, each device comprising at least one input and output connectors. A control station in data communication with each image display device of the video wall system controls the operation of the video wall system as delineated below.
- [0025] The control station effectuates transferring the video content through a video input of the video wall system to a plurality of image display devices, the latter together forming a combined very large screen in the form of a generally rectangular matrix. Each of the combined image display devices then generates and displays a certain dedicated portion of the video content so that the video content can be displayed on a very large combined screen. Each of the image display devices comprises a processor for identification and generation of the dedicated portion of the complete video content. The image display devices receive and then transmit the video content to a neighboring and generally adjacent target image display device.
- [0026] The video wall system therefore operates according to a method of serial

transmission of the video content to obtain an overall image in a much larger size that a single display device cannot display by way of dividing the main image into a plurality of image portions for display on separate image display devices.

- [0027] The image display devices may be connected to each other to establish a video transmission line through respective pairs of input and output connectors. The connectors may typically be in the form of high definition multimedia interface (HDMI) or DVI-D type connectors. The input and output connectors provide simple cable connections allowing serial connection of multiple display devices through the video transmission line.
- [0028] The control station of the video wall system is typically a computer system with video stream processing capabilities. The control station transfers the source images to a first image display device to be transmitted from the first image display device to the immediately neighboring display device through the input and output connectors on the video transmission line. It is to be noted that two neighboring image display devices can be placed vertically or horizontally with respect to each other so that a generally rectangular shape large screen is obtainable. Each image display device within the video wall system is defined to display a certain dedicated portion of the video content and accordingly divides the video content so as to generate a specially adapted portion of the video content corresponding to the specific screen area of the overall combined screen size depending on the number of image display devices on the vertical and horizontal axes.
- [0029] Therefore, each image display device dynamically processes the received image or video content to identify its particular screen portion of the combined screen and transfer the overall image or video content to the target image display device. The overall image transferred to the targeted display device is then processed by the latter to identify its particular screen portion.
- [0030] The method of operation of the video wall system with a certain number of image display devices involves receiving of the video signal by a first display device and displaying of a particular portion thereof as a processed

video signal while at the same time transferring of the complete video signal to a neighboring second image display device. The video signal is then delivered by the second display device to a third display device and subsequent transfer of the image or video content through the video transmission line continues until a final image display device receives the video content and generates its particular screen portion.

- [0031] On the other hand, the present invention ensures that the video transmission line being interrupted by a dysfunctional unit effects the operation of the video wall system in a minimized amount. In a more specific manner, if an error status occurs with an input or output connector of one of the image display devices or the device itself, the video signal transfer to the neighboring target image display devices along the video transmission line will not be effected resulting with the visualization of only a certain portion of the overall image. In other words, no image can be displayed on subsequent image display devices starting from the defected device as demonstrated Fig. 3.
- [0032] In the case described above, the control station according to the present invention, which has at least two video signal transmission connections with a first and second non-neighboring image display devices at both ends of the video transmission line of the video wall system simultaneously initiates video signal transmission through a second video transmission line in the reverse direction so that image display devices subsequent to the defected image display device on the first video transmission line can receive the video signal through the second video transmission line. In sum, the control station dynamically initiates video transmission in an altered second signal input direction in addition to the original video transmission line depending on the circumstances.
- [0033] According to an alternative embodiment of the present invention, instead of using dedicated pairs of input and output connectors in each image display device (Fig. 6), each input and output connector can be interchangeably used such that an input connector can be also used as an output connector (Fig. 4 or 5). The interchangeably usable input and output connectors can be programmed as input or output connectors by

the respective image display devices upon a directional switching signal from the control station. Interchangeable reprogramming of the input and output connectors allows bidirectional image transfer between the image display devices. In other words, in the event that an error status for a certain image display device is observed by the control station, the source image is delivered to the final image display device in a first video transmission line and a second video transmission line in which the latter image display device is the first device is simultaneously created.

[0034] In summary, the present invention proposes a video wall system having a multitude of image display devices with a serial video transmission line between adjacent image display devices of the video wall system, the plurality of image display devices being in connection with each other through the serial video transmission line transferring an image or video signal to an adjacent image display device by means of at least one input and output connector of each image display device, the video wall system further comprising a control station controlling the operation thereof and the control station in data communication with each image display device.

[0035] In one embodiment of the present invention, the input and output connectors of an individual image display device function in the manner that a bidirectional serial video transmission line is achieved by which the transmission direction along the serial video transmission line between neighboring image display devices within the video wall system is adjustable by the control station.

[0036] In a further embodiment of the present invention, the control station communicates with at least two non-neighboring image display devices so as to transfer the image or video signal to at least one of the at least two non-neighboring image display devices such that a bidirectional serial video transmission line is established between a first and a second image display device through the input and output connectors of each image display device thereinbetween.

[0037] In a further embodiment of the present invention, the input and output connectors of the image display devices are interchangeably programmable to dynamically change the transmission direction of the

image or video signal between neighboring image display devices in response to an error status signal received from the control station in an image display device interrupting the video transmission line.

- [0038] In a further embodiment of the present invention, the control station simultaneously effectuates transferring of a received image or video content through a plurality of video inputs of the video wall system to a plurality of image display devices.
- [0039] In a further embodiment of the present invention, each image display device comprises a processor for identification and generation of a dedicated portion of a received complete image or video content.
- [0040] In a further embodiment of the present invention, each image display device placed vertically or horizontally with respect to each other receives and transmits the image or video content to an adjacent target image display device.
- [0041] In a further embodiment of the present invention, each image display device of the video wall system displays a certain dedicated portion of the received image or video content by dividing the image or video content to generate a specially adapted portion thereof corresponding to a specific screen area of the overall combined screen size of the video wall system according to the number of image display devices on the vertical and horizontal axes.
- [0042] In a further embodiment of the present invention, the image display devices of the video wall system dynamically process a received image or video content identifying its particular screen portion of the combined screen and transfer the image or video content to a target image display device.
- [0043] In a further embodiment of the present invention, the control station having at least two video signal transmission connections dynamically initiates video transmission in an altered second signal input direction in addition to a first video transmission line in the event of an error status for a certain image display device.
- [0044] In a further embodiment of the present invention, input and output connectors of an image display device are interchangeably usable

connectors programmable as input or output connectors by the respective image display device upon a directional switching signal from the control station.

- [0045] In a further embodiment of the present invention, the interchangeable reprogramming of the input and output connectors provide transfer of a received image or video content in a bidirectional manner.
- [0046] In a further embodiment of the present invention, a method for operation of a video wall system with a certain number of image display devices comprising the steps of (a) receiving of an image or video signal by a first display device and displaying of a particular portion thereof as a processed video signal while at the same time transferring of the received complete image or video signal to a second image display device adjacent to the first image display device, (b) delivering of the complete image or video signal by the second display device to a third image display device adjacent to the second image display device and (c) subsequent transfer of the image or video content through a video transmission line comprising adjacent pairs of image display devices until a final image display device in the video transmission line receives the image or video content and generates its particular screen portion.
- [0047] In a further embodiment of the present invention, the image or video signal is deliverable in a bidirectional manner.
- [0048] The present invention provides input and output connectors allowing bidirectional data exchange such that the transmission direction of the signals between neighboring image display devices within the video wall system is dynamically changed. Input and output connectors of individual image display devices being optionally are interchangeably programmable in response to an error status in an image display device interrupting the video transmission line advantageously provides that a dysfunctional unit in the video wall system effects the operation thereof in a minimized amount, which is a critically useful function in the case of very large video wall systems comprising hundreds of image display devices.

## Claims

1. A video wall system having a multitude of image display devices with a serial video transmission line between adjacent image display devices of the video wall system, the plurality of image display devices being in connection with each other through the serial video transmission line transferring an image or video signal to an adjacent image display device by means of at least one input and output connector of each image display device, the video wall system further comprising a control station controlling the operation thereof and the control station in data communication with each image display device, **characterized in that**
  - the input and output connectors of an individual image display device function in the manner that a bidirectional serial video transmission line is achieved by which the transmission direction along the serial video transmission line between neighboring image display devices within the video wall system is adjustable by the control station and,
  - the control station communicates with at least two non-neighboring image display devices so as to transfer the image or video signal to at least one of the at least two non-neighboring image display devices such that a bidirectional serial video transmission line is established between a first and a second image display device through the input and output connectors of each image display device thereinbetween.
2. A video wall system as in Claim 1, **characterized in that** the input and output connectors of the image display devices are interchangeably programmable to dynamically change the transmission direction of the image or video signal between neighboring image display devices in response to an error status signal received from the control station in an image display device interrupting the video transmission line.
3. A video wall system as in Claim 1 or 2, **characterized in that** the control station simultaneously effectuates transferring of a received image or video content through a plurality of video inputs of the video wall system to a plurality of image display devices.
4. A video wall system as in Claim 1, **characterized in that** each image display device comprises a processor for identification and generation of a dedicated

portion of a received complete image or video content.

5. A video wall system as in Claim 4, **characterized in that** each image display device placed vertically or horizontally with respect to each other receives and transmits the image or video content to an adjacent target image display device.
6. A video wall system as in Claim 4, **characterized in that** each image display device of the video wall system displays a certain dedicated portion of the received image or video content by dividing the image or video content to generate a specially adapted portion thereof corresponding to a specific screen area of the overall combined screen size of the video wall system according to the number of image display devices on the vertical and horizontal axes.
7. A video wall system as in Claim 6, **characterized in that** the image display devices of the video wall system dynamically process a received image or video content identifying its particular screen portion of the combined screen and transfer the image or video content to a target image display device.
8. A video wall system as in Claim 3, **characterized in that** the control station having at least two video signal transmission connections dynamically initiates video transmission in an altered second signal input direction in addition to a first video transmission line in the event of an error status for a certain image display device.
9. A video wall system as in Claim 2, **characterized in that** input and output connectors of an image display device are interchangeably usable connectors programmable as input or output connectors by the respective image display device upon a directional switching signal from the control station.
10. A video wall system as in Claim 9, **characterized in that** the interchangeable reprogramming of the input and output connectors provide transfer of a received image or video content in a bidirectional manner.
11. A method for operation of a video wall system with a certain number of image display devices comprising the steps of (a) receiving of an image or video signal by a first display device and displaying of a particular portion thereof as a processed video signal while at the same time transferring of the received complete image or video signal to a second image display device adjacent to the first image display device, (b) delivering of the complete image or video

signal by the second display device to a third image display device adjacent to the second image display device and (c) subsequent transfer of the image or video content through a video transmission line comprising adjacent pairs of image display devices until a final image display device in the video transmission line receives the image or video content and generates its particular screen portion.

12. A method for operation of a video wall system as in Claim 11, **characterized in that** the image or video signal is deliverable in a bidirectional manner.

Fig. 1

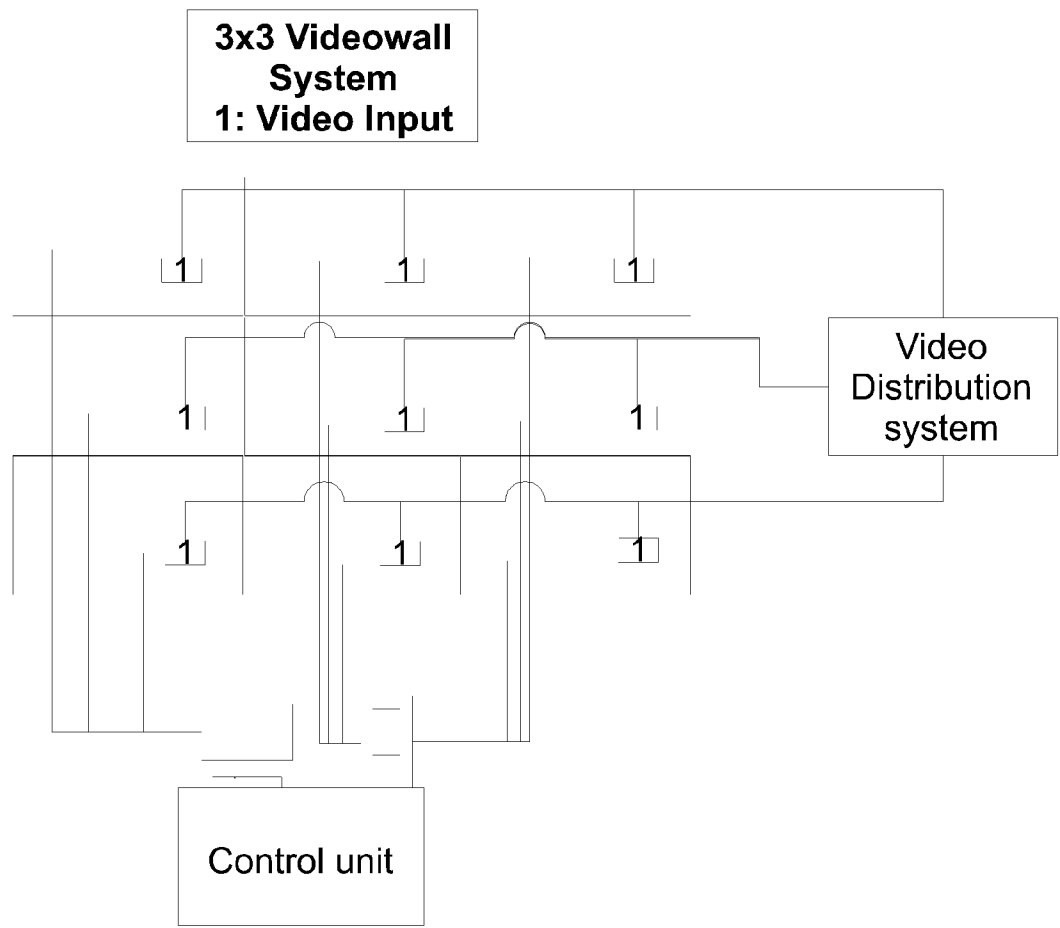


Fig. 2

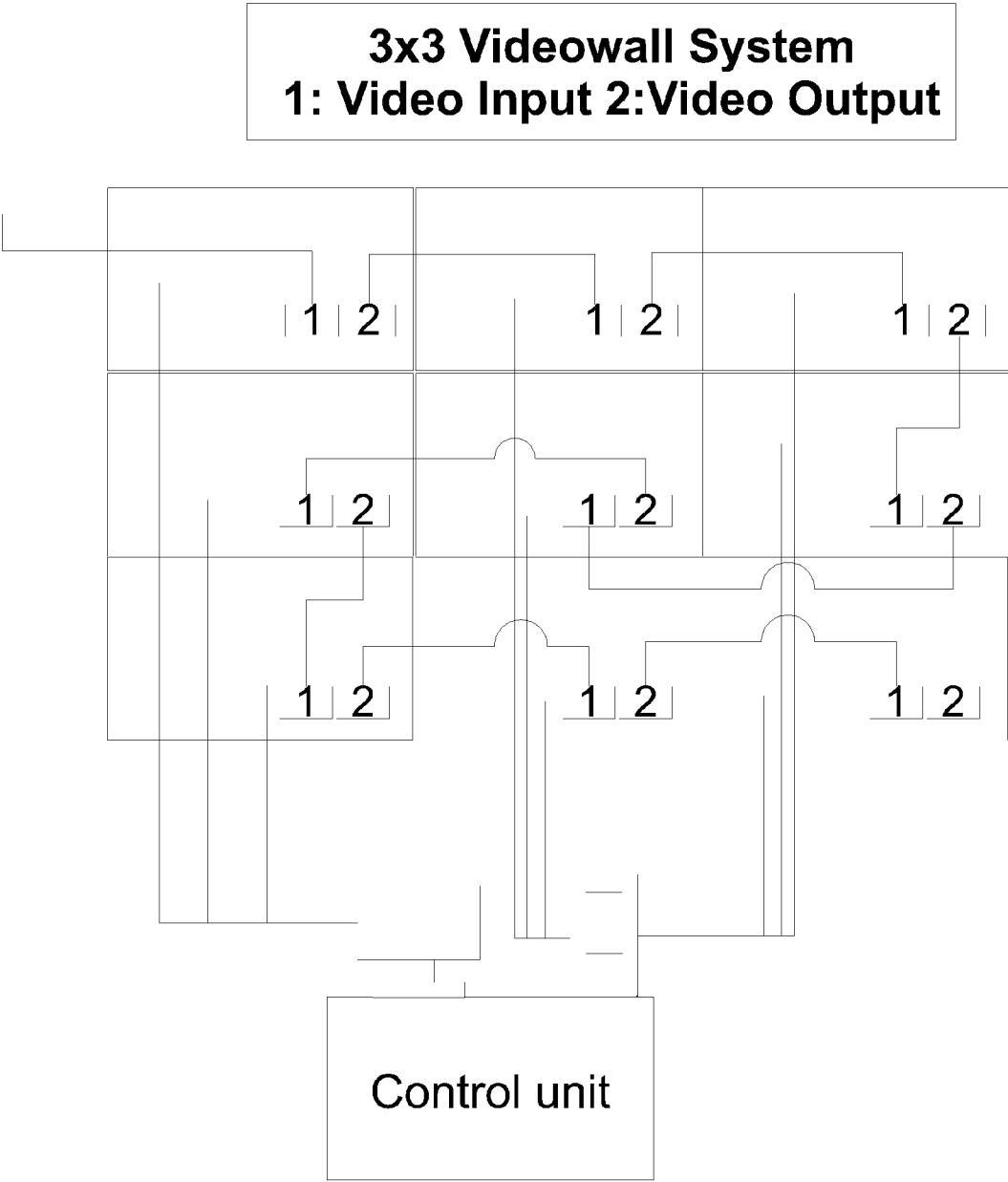


Fig. 3

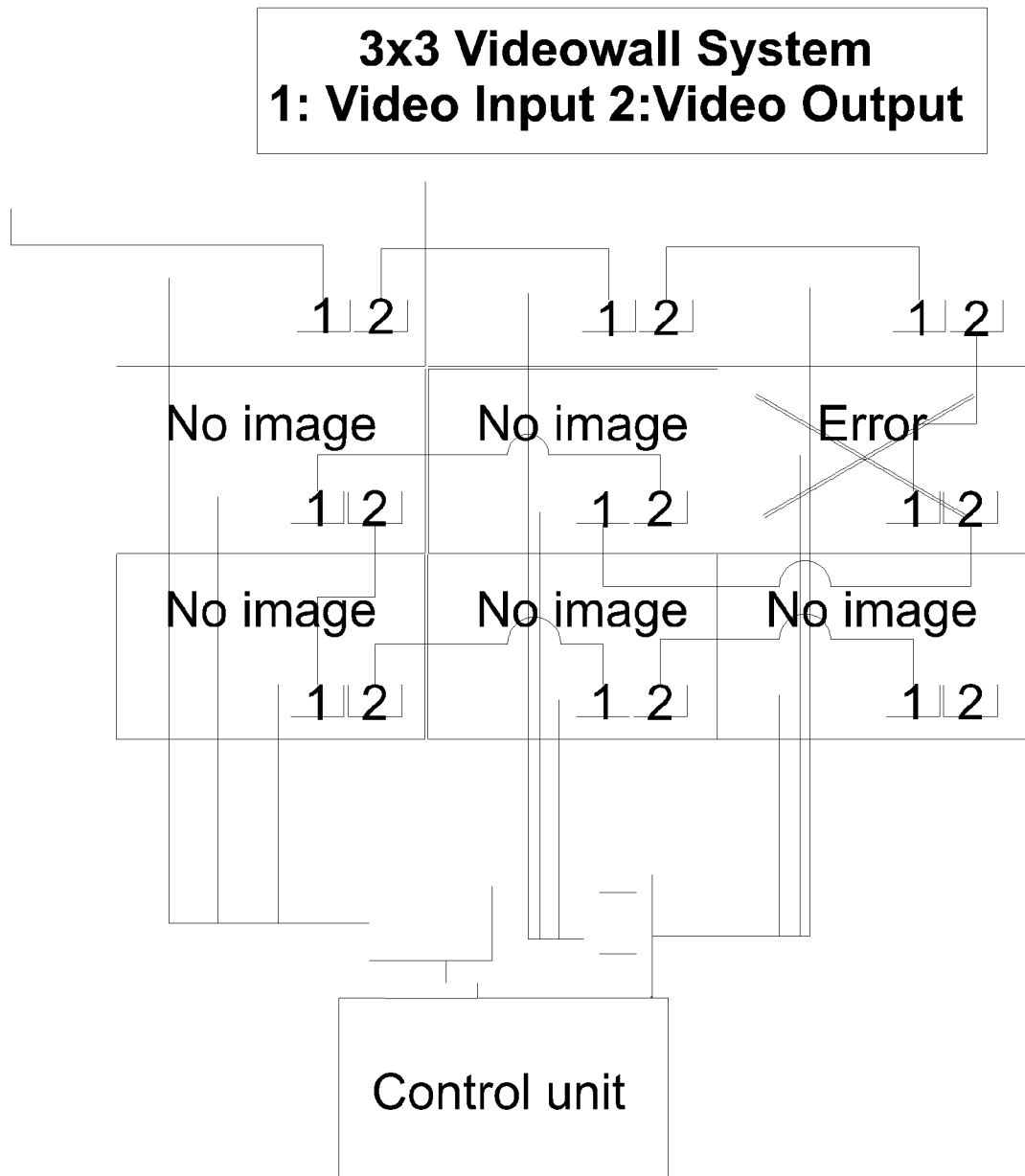


Fig. 4

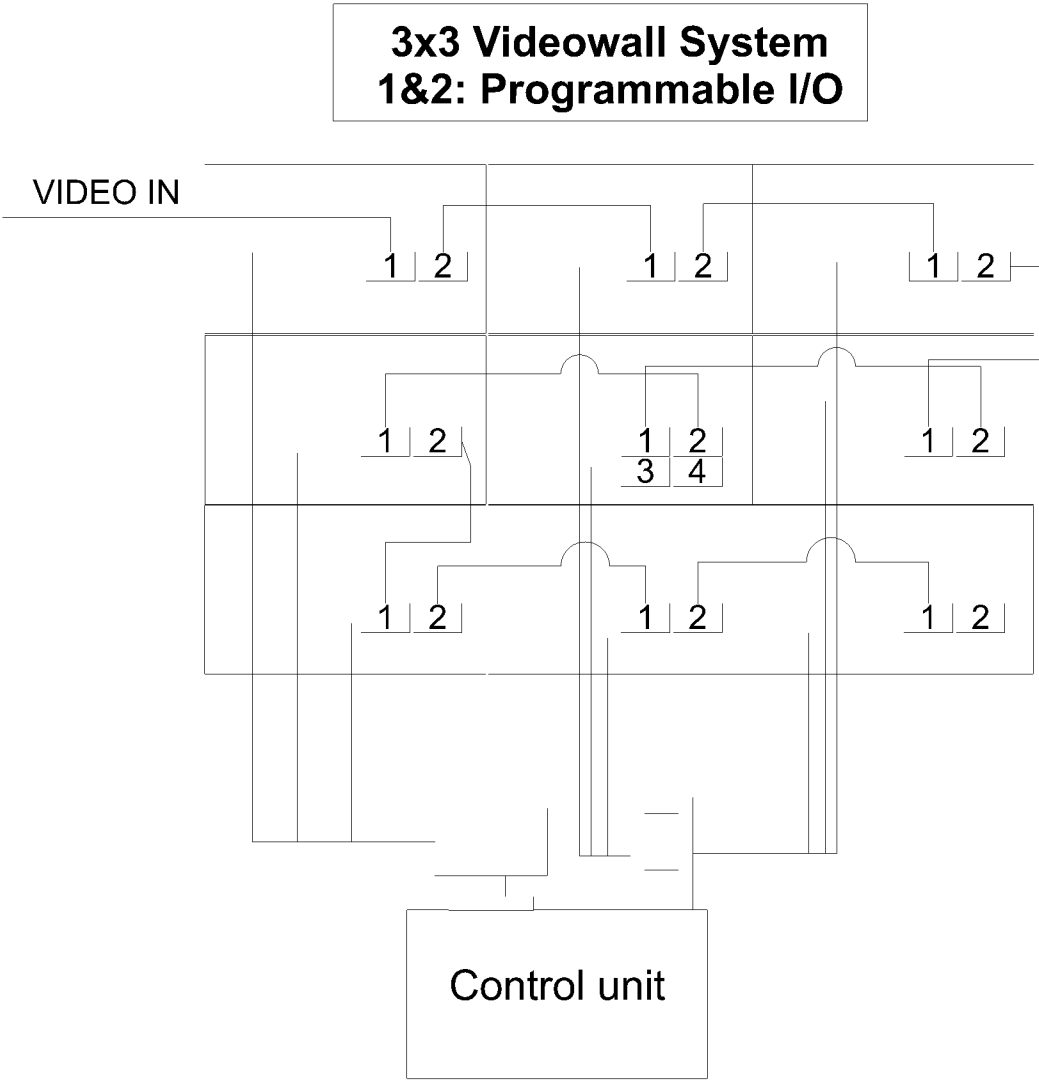


Fig. 5

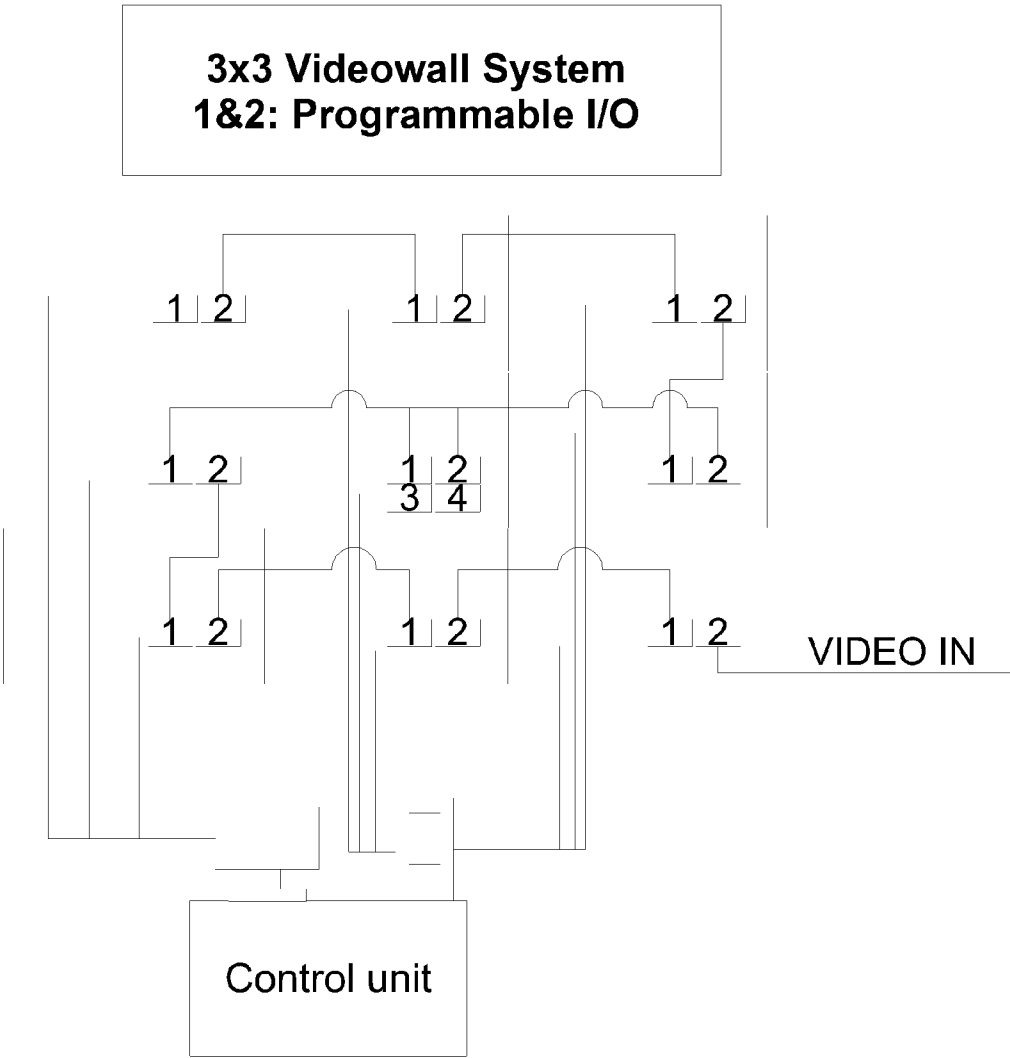


Fig. 6

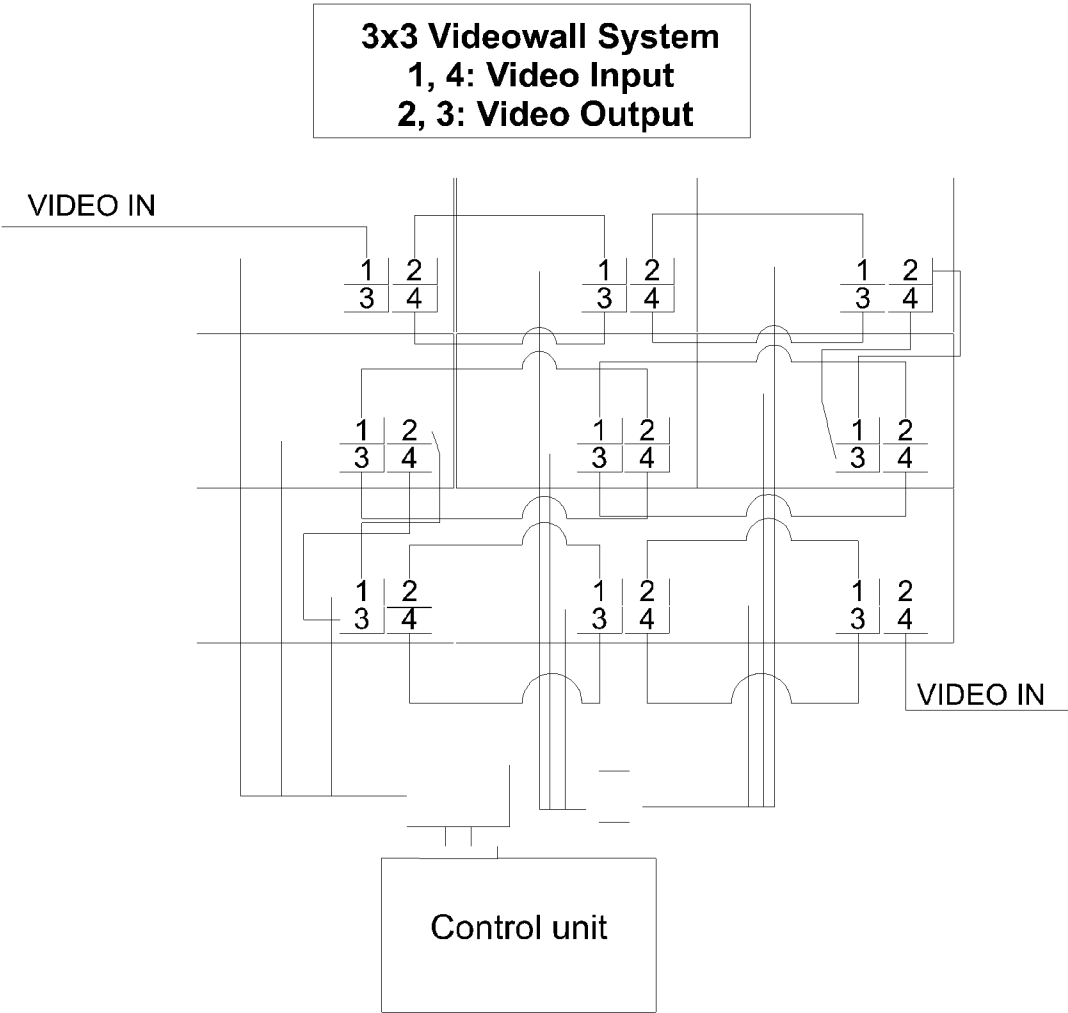


Fig. 7

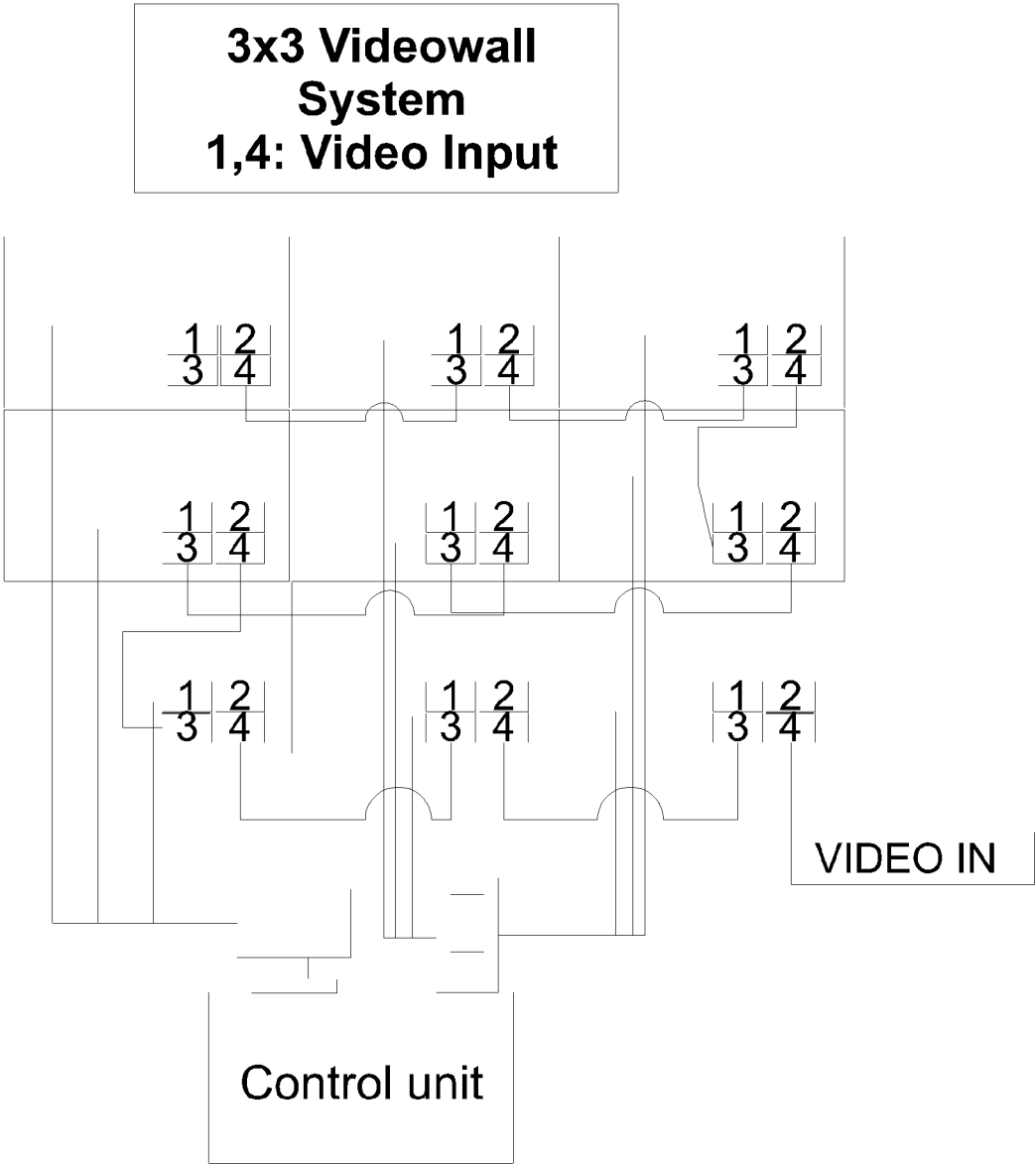
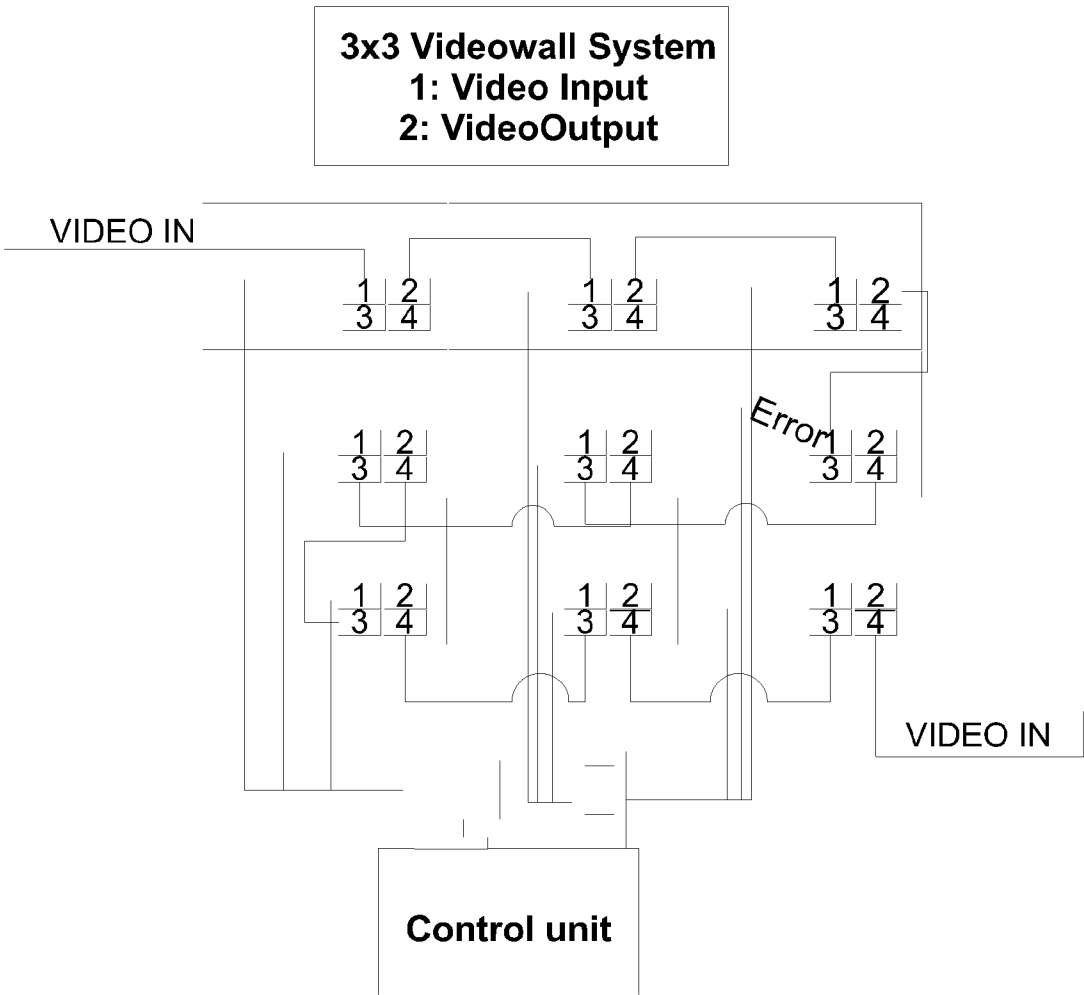


Fig. 8



## INTERNATIONAL SEARCH REPORT

International application No  
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A. CLASSIFICATION OF SUBJECT MATTER  
INV. G06F3/14 G09G3/20  
ADD.

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)  
G06F G09G

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)

EPO-Internal

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages                                                                                                                                                                                                    | Relevant to claim No. |
|-----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|
| X         | US 2013/181884 A1 (PERKINS MICHAEL [CA] ET AL) 18 July 2013 (2013-07-18)<br>paragraphs [0086] - [0129]; figures 1,9,10<br>-----                                                                                                                                                       | 1-12                  |
| X         | WO 03/034396 A1 (IDAPT LTD [NZ]; ELLIOT GRANT ARTHUR JOHN [NZ]; BUTLER BEAU MICHAEL [NZ]) 24 April 2003 (2003-04-24)<br>page 4, line 25 - page 5, line 31; figures 5,7,8,9<br>page 6, lines 22-24<br>page 8, line 12 - page 9, line 11<br>page 9, line 28 - page 11, line 21<br>----- | 11,12                 |
| A         |                                                                                                                                                                                                                                                                                       | 1-10                  |



Further documents are listed in the continuation of Box C.



See patent family annex.

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Date of the actual completion of the international search

24 May 2016

Date of mailing of the international search report

01/06/2016

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# INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2015/072821

| Patent document<br>cited in search report | Publication<br>date | Patent family<br>member(s) | Publication<br>date    |
|-------------------------------------------|---------------------|----------------------------|------------------------|
| US 2013181884                             | A1                  | 18-07-2013                 | NONE                   |
| -----                                     |                     |                            |                        |
| WO 03034396                               | A1                  | 24-04-2003                 | NZ 514866 A 24-09-2004 |
|                                           |                     | WO 03034396 A1             | 24-04-2003             |
| -----                                     |                     |                            |                        |