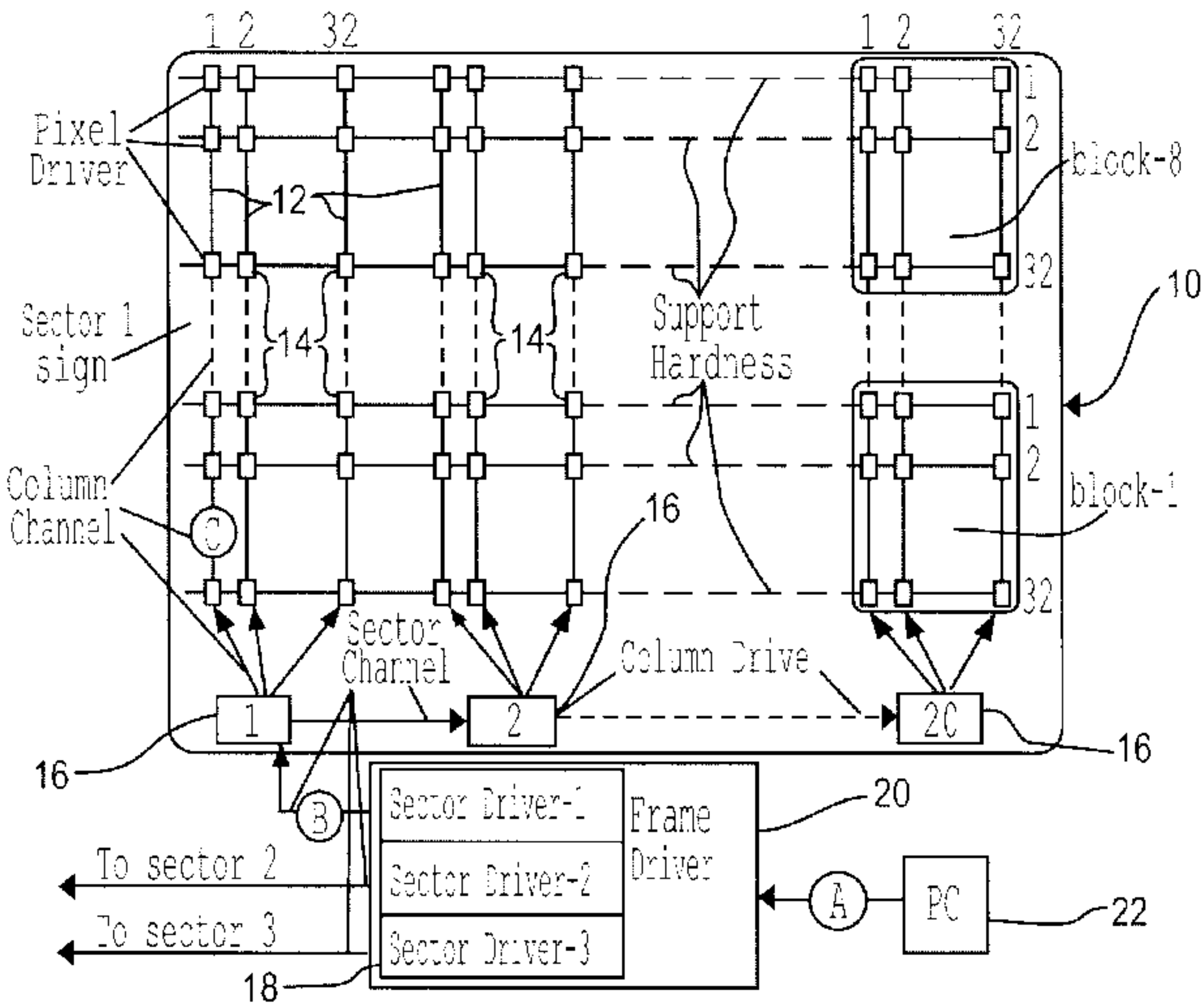


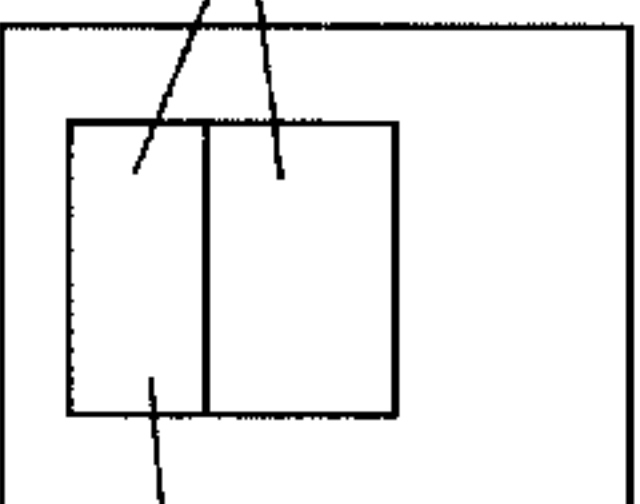
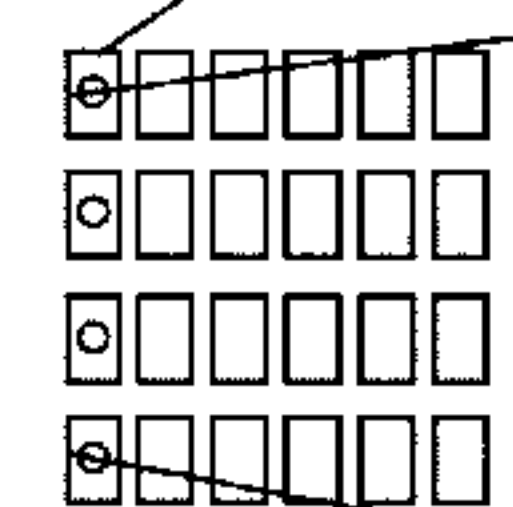


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(54) Title: LARGE SCALE FLEXIBLE LED VIDEO DISPLAY AND CONTROL SYSTEM THEREFOR



Data in Channel "A"	Data in Channel "B"	Data in Channel "C"
Frame Driver Buffer  Sector-1 (m x n blocks) PC graphic card output 1024x768 PC screen	32x32 pixel block  m x n blocks Sector Driver output for sector-1 sign	32x32 block  1xn blocks Column Drive output For column-1

(57) Abrégé/Abstract:
A flexible display for displaying images comprises a plurality of columns of pixel elements, each pixel element having display elements, a pixel driver for processing an output signal from a preceding adjacent pixel element in the same column and generating

(57) **Abrégé(suite)/Abstract(continued):**

and transmitting an output signal to a succeeding adjacent pixel element in the same column; electrical conductors extending between pixel elements of each column for electrically connecting the pixel driver of the preceding adjacent pixel element to the pixel driver of the succeeding adjacent pixel element; an image signal processor for generating and delivering pixel element actuating signals to a first pixel element of each the column; and support connectors extending between adjacent pixel elements in the same column and between adjacent pixel elements of adjacent columns and permitting relative movement of the adjacent pixel elements.

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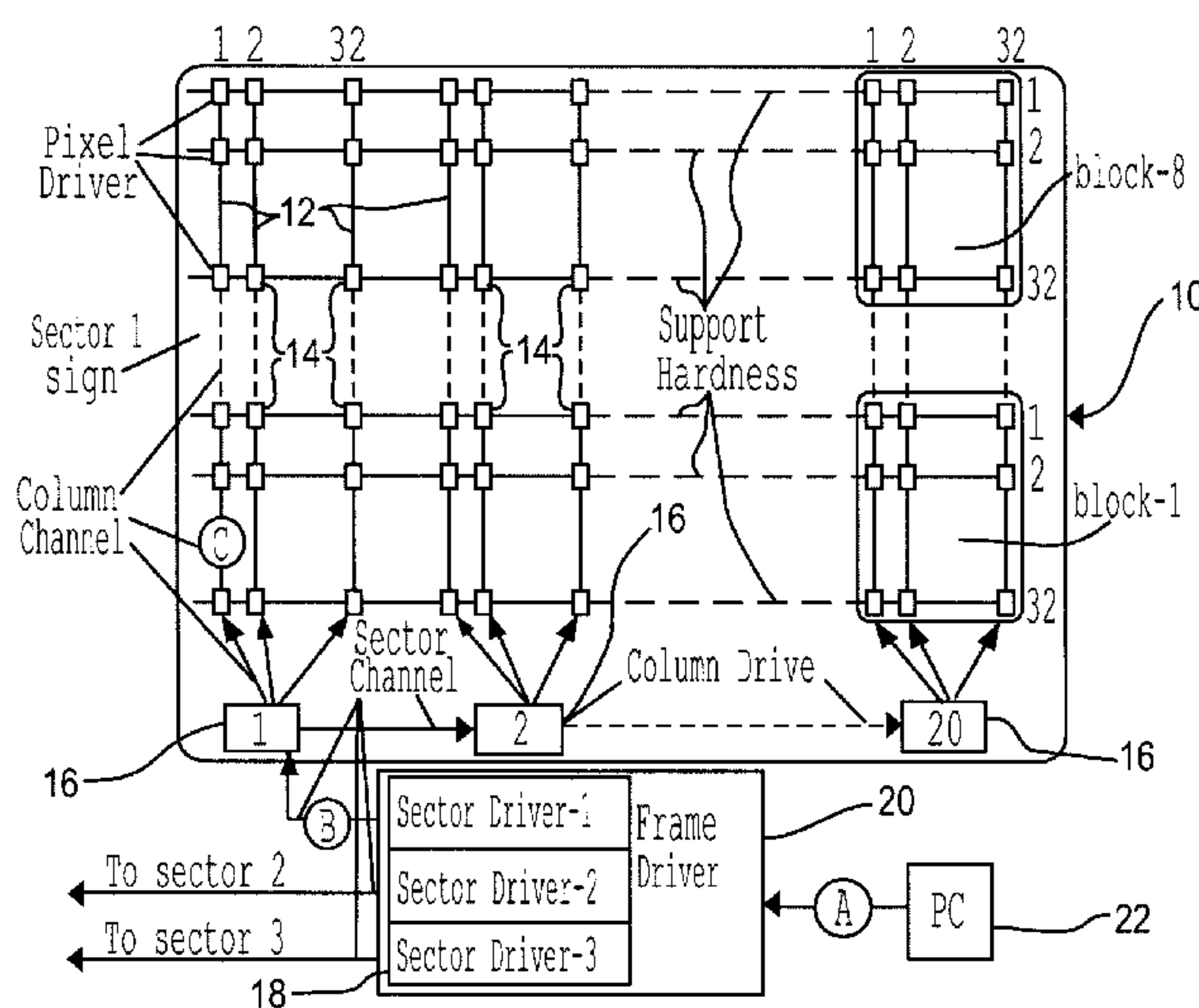
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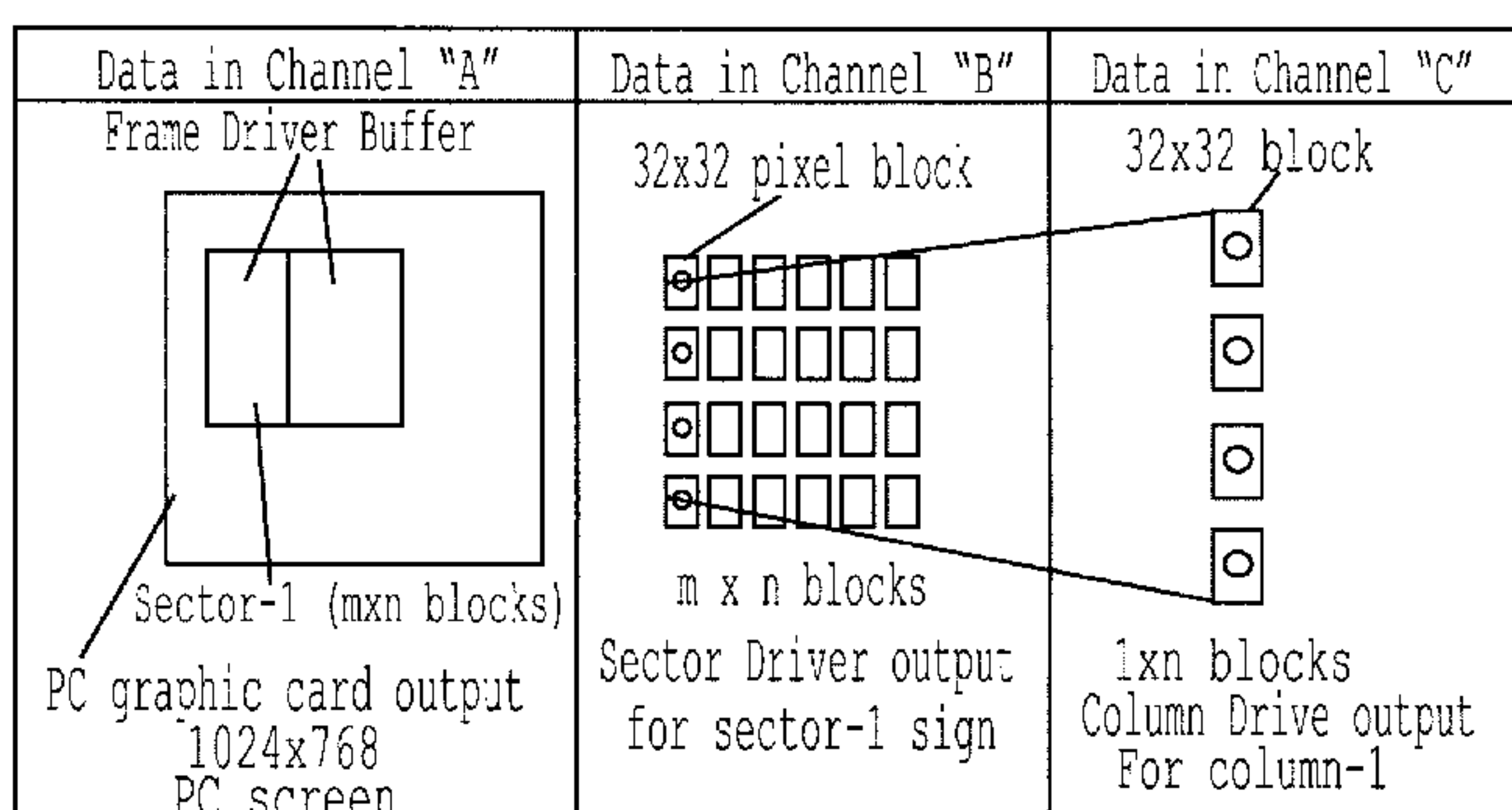
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(54) Title: LARGE SCALE FLEXIBLE LED VIDEO DISPLAY AND CONTROL SYSTEM THEREFOR



(57) Abstract: A flexible display for displaying images comprises a plurality of columns of pixel elements, each pixel element having display elements, a pixel driver for processing an output signal from a preceding adjacent pixel element in the same column and generating and transmitting an output signal to a succeeding adjacent pixel element in the same column; electrical conductors extending between pixel elements of each column for electrically connecting the pixel driver of the preceding adjacent pixel element to the pixel driver of the succeeding adjacent pixel element; an image signal processor for generating and delivering pixel element actuating signals to a first pixel element of each the column; and support connectors extending between adjacent pixel elements in the same column and between adjacent pixel elements of adjacent columns and permitting relative movement of the adjacent pixel elements.



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LARGE SCALE FLEXIBLE LED VIDEO DISPLAY AND CONTROL SYSTEM THEREFOR

CROSS REFERENCE TO RELATED APPLICATION

[0001] This application claims priority from United States Provisional Patent Application No. 60/747,397, filed May 16, 2006 and Canadian Patent Application No. 2,567,113 filed November 3, 2006, both of which are incorporated herein by reference.

FIELD OF THE INVENTION

[0002] The present application generally relates to large scale illuminated video displays, typically for outdoor use, and more specifically to flexible, net-like displays or signs and, more specifically, to a control system and method of displaying images on display signs.

BACKGROUND OF THE INVENTION

[0003] Conventional incandescent lamps, fluorescent lamps and neon tubes have long been used to illuminate large-scale commercial and public signs; however, the market is now demanding larger displays with the flexibility to customize display sizes and colors not possible with the older technologies. Consequently, many displays now use Light Emitting Diodes (LEDs) in their design because LEDs consume less electricity than conventional light emitters and have a longer lifetime with lower maintenance costs.

[0004] LED technology is currently being applied to large-scale display applications, such as outdoor or indoor stadium displays, large marketing advertisement displays, and mass-public informational displays. Many of these large-scale applications are dynamically reconfigurable under computer control. In addition, some large-scale animated displays capable of displaying video imaging are now being produced. Unfortunately, many currently available large-scale LED displays have

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limitations such as, for example, being particularly heavy, capable of being installed on only a limited number of surfaces, or exhibiting inferior performance.

[0005] Heretofore, LED displays were manufactured using a solid, rigid base for mounting pixel elements, and, therefore, had to be installed on a flat supporting structure using a dedicated frame and mounting hardware. The use of metal for construction of such a sign increased the weight of the structure and became a viewing obstacle for anything covered by it.

[0006] Accordingly, it would be advantageous to improve LED displays. One approach to accomplish this is to provide a more lightweight system which would have the further advantage of being at least somewhat flexible, by providing a mesh-like array of pixel elements joined together in a mesh-like arrangement.

SUMMARY OF THE INVENTION

[0007] A display is disclosed consisting of a plurality of columns of pixel elements, each pixel element having display elements and a pixel driver for processing a digital pixel data stream from a preceding adjacent pixel element in the same column, driving its associated light elements in accordance with the first unused pixel datum encountered, marking such datum as used and forwarding it to a succeeding adjacent pixel element in the same column.

[0008] Electrical conductors extend between pixel elements of each column for electrically connecting the pixel driver of the preceding adjacent pixel element to pixel driver of the succeeding adjacent pixel element.

[0009] Columns of pixel elements are driven by one of a series of daisy-chained column drivers, each of which in turn processes and forwards unmodified, a digital data stream, which involves extracting

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those portions of the data stream that correspond to columns with which the column driver is associated.

[0010] Support connectors extend between adjacent pixel elements in the same column and between adjacent pixel elements of adjacent columns and permit relative movement of the adjacent pixel elements.

[0011] The supports and interconnections of the constituent pixel elements permit a lightweight, reconfigurable, flexible and transparent display but preclude the use of conventional direct-addressing control systems for the display. The modular control system provided permits video data to be quickly propagated throughout the display elements without any hardware constraint upon the overall size or configuration of the display and in the absence of embuing any of the display elements with any knowledge of the overall size or configuration of the display.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] These and other features of the invention will become more apparent from the following description in which reference is made to the appended drawings in which:

[0013] **Figure 1** illustrates, a front view of a plurality of pixel elements interconnected by a mesh of wires according to an example embodiment of the present invention;

[0014] **Figure 2** illustrates, in perspective, the interconnected mesh of pixel elements of **Figure 1**;

[0015] **Figure 3** illustrates a back view of the interconnected mesh of pixel elements of **Figure 1**;

[0016] **Figure 4** illustrates a side view of a plurality of pixel elements interconnected by a mesh of short wires according to another example embodiment of the present invention;

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[0017] **Figure 5** illustrates, in rear perspective, the interconnected mesh of pixel element of **Figure 4**;

[0018] **Figure 6** illustrates a front view of the interconnected mesh of pixel element of **Figure 4**;

[0019] **Figure 7** diagrammatically illustrates a mesh sign control system structure for use with the interconnected mesh of pixel elements according to the embodiment of **Figure 1** and/or **Figure 4**;

[0020] **Figure 8** diagrammatically illustrates the structure and functionality of a frame driver for use in the mesh sign control system structure of **Figure 7**;

[0021] **Figure 9** shows an example data structure of a sector data frame for use in the mesh sign control system structure of **Figure 7**;

[0022] **Figure 10** diagrammatically illustrates the structure and functionality of a column driver for use in the mesh sign control system structure of **Figure 7**;

[0023] **Figure 11** shows an example data structure of a column data frame for use in the mesh sign control system structure of **Figure 7**; and

[0024] **Figure 12** diagrammatically illustrates the structure and functionality of a pixel driver for use in the mesh sign control system structure of **Figure 7**.

DETAILED DESCRIPTION

[0025] The present application will now be described for the purposes of illustration only, in conjunction with certain embodiments shown in the enclosed drawings. While preferred embodiments are disclosed, this is not intended to be limiting. Rather, the general principles set forth herein are considered to be merely illustrative of the scope of the present application and it is to be further understood that

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numerous changes covering alternatives, modifications and equivalents may be made without straying from the scope of the present application, as defined by the appended claims.

[0026] In particular, all dimensions described herein are intended solely to be exemplary for purposes of illustrating certain embodiments and are not intended to limit the scope of the invention to any embodiments that may depart from such dimensions as may be specified. Further, directional references such as "horizontal" or "vertical", as well "column" are for convenience of description only. It will be understood that the device may be asserted in any direction.

Overview

[0027] The present application relates to a mesh display structure, shown generally in Figure 1 at **100**, comprising at least one sector. Each sector consists of an array of $m \times n$ blocks, where a block is itself an array of $p \times q$ pixels. Preferably, the maximum image coverage of one sector is 640 x 256 pixels, comprising a 20 x 8 array of 32 x 32 pixel blocks. Within a single structure, different sectors may have different sizes of arrays of blocks, but the block sizes are the same across all sectors.

[0028] Within each sector, pixels spaced apart in the horizontal and vertical directions (assuming a vertical orientation to the display) are interconnected in a mesh of wires in the horizontal and vertical directions. The spacing between adjacent pixels determines the resolution of the display. For example, as shown in **Figure 1**, each of a plurality of pixel elements **110** housing the pixels are physically separated by a short distance that may be, for example, 2 inches.

[0029] Thus, in the example 2 inch resolution embodiment under discussion, a sector may occupy up to a horizontal extent of 1278 inches (106.5 feet) and a vertical extent of 510 inches (42.5 feet). If a greater display size is desired, additional sectors could be added to the mesh

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display structure **100**, either horizontally adjacent thereto, or conceivably, even vertically stacked upon one another.

[0030] As shown in **Figure 1**, the pixel element **110** is housed in a compact and weatherproof self-contained housing **111**, electrically connected to its immediately vertically adjacent neighbours by a network of flexible and visually discreet columnar strands of ribbon cable **120**. Thus, the display structure **100** may be conceptually viewed as a plurality of (in this case columnar) strings of pixel elements **110**. Those having ordinary skill in this art will appreciate that conceivably, a row-oriented structure could be implemented without departing from the spirit and scope of the present application.

[0031] Vertical connector cables **333** tucked in behind (as better seen in **Figure 3**) and immediately adjacent columnar strands **120** are structurally connected by horizontal connector cables **130** to form a sparse, flexible and visually discreet structural mesh.

[0032] This method of interconnection results in each housing **111** forming a small and relatively unobtrusive "knot" spaced apart substantially equally in the horizontal and vertical directions, in accordance with the desired resolution of the display structure **100**, in a mesh structure that may be draped and/or secured to virtually any type, orientation and configuration of underlying surface or structure, such as the exterior vertical wall of an office tower, without blocking the view from behind the display **100**.

[0033] Moreover, the mesh structure **100** allows natural light to pass through the display **100**, permitting installation over glass structures such as windows in an office tower, so that a video image may be outwardly displayed without unduly darkening the office interior.

[0034] Furthermore, such display structure **100** has much less weight per unit area as compared to conventional display structures. Indeed, such display structure **100** provides a small (in terms of

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component size) and light unit, with few mechanical parts and electronic components, without derogating from the survivability of the structure **100** in harsh outdoor environments. The open structure of the net improves its ability to survive high winds and severe weather.

Pixel Elements

[0035] Each housing **111** has provision for interconnection with adjacent housings and enclosing, in a secure and weatherproof fashion, the electronic and electrical components thereof.

[0036] The housing **111** may be a three-part, flame retardant plastic enclosure with a pair of sealing gaskets and at least one opening **112** to accommodate a corresponding viewable light element. Optionally, the opening **112** and the light element **113** housed therein may be shielded by a clear lens which may be dome shaped.

[0037] Preferably, each of the light elements **113** is a light emitting diode (LED). More preferably, each of the pixel elements **110** comprises a plurality of differently coloured light elements **113**, such as red, green, blue (RGB), in order to provide a colour display capability, each with a respective corresponding opening **112**.

[0038] In **Figure 1**, the differently coloured light elements **113** corresponding to a common pixel element **110** are vertically grouped. While such a grouping is shown and may be preferred, those having ordinary skill in this art will appreciate that other groupings may be equally applicable and that the choice of grouping may not be visually significant or differentiable.

[0039] Depending upon the resolution of the display **100**, it may be advantageous, as is shown in example fashion in **Figure 1**, to combine a plurality of pixel elements **110**, suitably spaced apart, into a single housing **111** and sharing a common columnar strand **120**. In **Figure 1**, a two-pixel element housing is shown, each pixel comprising a group of

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three vertically aligned coloured light elements (RGB) and being laterally separated by the resolution of the structure **100**, which is, for example, 2 inches. This multi-pixel element housing **111** is of a sufficient size to accommodate the electronics and control circuitry used to drive and control the LEDs **113** for both pixel elements, and reduces by half, the amount of mechanical and electrical cabling, at a cost of possibly a slightly larger housing **111**.

[0040] The electronics and control circuitry used to drive and control each pixel element **110**, as discussed below, is stored within the housing **111**, preferably on a printer circuit board (PCB) **213** as shown in **Figure 2** on which the various LEDs **113** may be mounted. The PCB **213** is sandwiched between a base **215** and a top component **211** of the housing **111**, separated by gaskets **212**, **214**.

[0041] Preferably, again as shown in **Figure 1**, the housings **111** of adjacent columnar strands **120** may be vertically offset by 50% so as to improve the spacing between proximal pixel elements **110** and thus, the overall transparency of the display structure **100**.

Structural Connectors

[0042] As may be better seen in **Figure 3**, one end of each of the horizontal connectors **130** terminates in a C-shaped hook element **331** adapted to engage a vertical connector **333** in a pivotable removable snapping fit at one end, and a four connector bracket **332** secured to the base **215** of the housing **111** by a screw **334**. Vertical connectors **333** extend between and securely engage the connector bracket **332** of vertically adjacent pixel elements **110**. Preferably, the vertical connectors **333** are collinear with the columnar strands **120** so as to be obscured thereby when viewed from the front and to present a neat appearance.

[0043] The horizontal connectors **130**, vertical connectors **333** and the hook elements **331** and connector brackets **332** combine to form a supporting mesh structure for the display structure **100** and especially the

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housings **111** thereof. Preferably, the horizontal connectors **130** and vertical connectors **333** are composed of aviation-quality cable wire, which has been shown to provide sufficient strength and support, while at the same time being lightweight, unobtrusive, relatively impervious to the outdoor elements and providing some degree of flexibility.

[0044] The use of C-shaped hook elements **331** to engage the vertical connectors **333** permit the housings **111** corresponding to one columnar strand **120** to pivot relative to the housings **111** corresponding to an adjacent columnar strand **120** and thus be easily configurable to be draped around angular and circular structures, such as corners and bends of a building structure.

[0045] Those having ordinary skill in this art will readily appreciate that where the housings **111** of adjacent columnar strands **120** are not offset, the hook elements **331** may be dispensed with and each horizontal connector **130** will terminate at and securely engage the connector brackets **332** of horizontally adjacent elements (not shown). However, such configuration will reduce the ability of the mesh structure **100** to be conveniently draped across non-planar structures because of the absence of any pivoting capability.

[0046] Turning now to **Figures 4** through **6**, there is shown an example embodiment of a housing **410** for use in the mesh display structure **100**. Housing **410** comprises two portions, namely a top portion **411** and a bottom portion **415**. The two housing portions **411**, **415** may be secured together by means of a hook element **417** that extends from the bottom portion **415** to engage a receptor **418** in the top portion **411**. Again, two groups **114** of light elements **113** project from an outer face of the top portion **411**.

[0047] However, rather than a multi-conductor ribbon cable columnar strand **120**, a plurality of separate electrical wires (in the example of **Figure 5**, 4 wires (power, ground, serial data and serial clock respectively) emanating from the next lower vertically adjacent housing

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410 enter the bottom portion **415** through corresponding openings and a further plurality of separate electrical wires emanate from corresponding openings in the bottom portion **415** and extend to the next higher vertically adjacent housing **410**. Those having ordinary skill in this art will appreciate that the separate wires may be optionally enclosed by a cable harness (not shown).

[0048] In this example embodiment, longitudinal structural wires **433** are provided for supporting the housing **410**. Hook elements **431** are secured to the wires **433** and to a bracket **432** which is detachably secured to the back side of bottom portions **415** by a pin **434** extending from the back of bottom portion **415**. Transverse structural wires **430** extend through hooks **435**, which are secured to bracket **432**.

[0049] By this arrangement, the housing **410** is free to pivot about both longitudinal wires **433** and transverse wires **430** to provide a relatively freely flexible configuration. In this example embodiment, housings **410** in horizontally adjacent columns are not offset relative to one another.

Electrical Connectors

[0050] With a maximum sector size of 640 pixels wide by 256 pixels high, there is a plurality of sets of columnar strands **120** interconnecting a vertically oriented serial string of housings **111**. In the embodiment shown in **Figure 1**, wherein each housing **111** comprises two pixel elements **110**, there would be a total of 320 sets of columnar strands **120**.

[0051] Each of these sets of columnar strands **120** may have associated therewith up to 256 pixel elements **110**, the maximum height of a sector in the example embodiment of **Figure 1**.

[0052] Pixel elements **110** corresponding to a given set are daisy-chained together by columnar strands **120** that extend between

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consecutive pixel elements **110**, entering the housing **111** at a bottom opening and exiting the housing **111** at a top opening. As discussed below, the columnar strand **120** entering the lowest pixel element **110** in a given portion of a given vertical column may exit from a column driver module. While the example embodiments herein describe the column driver module **730** (**Figure 7(a)**) as being situated below the pixel elements in a given vertical column, those having ordinary skill in the art will appreciate that the column driver module **730** could conceivably be situated anywhere relative to the pixel elements in the portion of the column other than the bottom, for example, the top, or at a point intermediate the top and the bottom, without departing from the spirit and scope of the present invention.

[0053] Each of the columnar strands **120** comprises a ribbon or similar cable comprising conductors for power and serial data for propagation throughout the pixel elements **110** associated therewith.

[0054] A power distribution unit is part of a Column Driver (as is shown in **Figure 7**). It is located along the bottom extremity of the display structure **100** in a watertight enclosure, provides power for distribution to all of the components, including 32 columns of pixel elements **110**, by power cables that form part of the ribbon cable.

[0055] The power cable is daisy-chained between successively vertically adjacent pixel elements **110** in a portion of a vertical column, and will drive each circuit contained therein and associated with one of the plurality of constituent light elements **113**. In this way, power may be distributed through the display structure **100**, without significantly obscuring the display **100** or its transparency.

[0056] Every power cable for a column of pixel elements **110** is protected by an in-line fuse inside a column driver.

[0057] Each of the pixel elements **110** also has an associated serial data line. Thus, in the example embodiment of **Figure 1**, the four wires

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are power, ground, serial data and serial clock. Successively vertically adjacent pixel elements **110** in a portion of a vertical column are serially daisy-chained.

Control Structure

[0058] Because of the sparse, flexible and visually transparent nature of the mesh display structure **100**, conventional mechanisms for controlling large display structures by way of direct pixel addressing are not implemented herein. To provide direct pixel addressing in a display structure, a plurality of row and column address buses would be called for, which would introduce a plethora of additional cables. Such additional cables would not only detract from the sparse, transparent and visually clean appearance of the mesh display structure, but would significantly increase the weight of the structure and degrade the flexibility thereof, thus limiting the scope of structures on which the mesh display structure **100** may be draped or installed.

[0059] In conventional, modular rigid displays, power supplies and controlling circuits are evenly distributed throughout the surface of the sign.

[0060] Furthermore, the use of direct pixel addressing imposes limitations on the expandability of the display structure resolution. As discussed below, a number of DSP (Digital Signal Processor) controllers process, transmit and receive digital picture or video data. These circuits are located in such a way as to be "invisible" in the mesh of pixels without altering the flexibility of the system. Preferably, they are situated at one extremity of the display structure **100**. In the example embodiment of **Figure 7**, both the DSP controllers and the power distribution unit (not shown), forming a Column Driver, are located along the bottom extremity of the display structure **100**, in watertight enclosures.

[0061] Rather than provide direct pixel addressing, the mesh display structure **100** implements display control by serial data transfer of display

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and control data in a daisy-chain fashion. In so doing, only a small number of cables are called for (4 in the example embodiment of **Figure 1**) and the display structure **100** may be easily increased in size and/or resolution by addition of further modular sectors without increasing the number of cables.

[0062] However, to reduce the propagation time for transmitting display and control data serially across each pixel of the mesh display structure, some parallelism is introduced at some stages in accordance with the structure of the display **100**.

[0063] In the case of the example embodiment of **Figure 1**, the display structure **100** is organized into one or more sectors, each comprising a maximum of 640 pixels wide by 256 pixels high. It can also be a curved or other non-rectangular shape.

[0064] Each sector is divided into a plurality of strings. In the example embodiment of **Figure 1**, the strings are vertically oriented and correspond to columns. In a sector of maximum size of 640 pixels wide by 256 pixels high, there may be as many as 640 columns.

[0065] Each column represents a number of serially connected pixel elements **110**. In the embodiment of **Figure 1**, each of the columns comprises 256 pixel elements **110**.

[0066] The control structure corresponds roughly to the structure of the display **100**. As shown in an example embodiment in **Figure 7(a)**, it comprises a frame driver **710**, a plurality of sector drivers **720a**, **720b**, **720c**, corresponding to the number of sectors in the display **100**, a plurality of string drivers (in this case column drivers) **730a**, **730b**, **730c** corresponding to the number of columns of blocks in the display **100** (that is to say, in the embodiment of **Figure 7(a)**, in which a sector of 20 x 8 blocks is shown, there are 20 column drivers **730a**, **730b**, **730c**) and a plurality of pixel drivers **740** corresponding to the number of pixels in the display **100**.

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Frame Driver

[0067] The frame driver **710** is connected to a personal computer **701** or other image data generating device by a video cable **702**. As will be discussed below, the sector drivers **720** form part of the frame driver **710** and have suitable connections therewith by which video data may be passed from the frame driver **710** to each buffer of the sector driver **720**.

[0068] The frame driver **710** accepts as input along video cable **702**, a plurality of frames of display data for display on the display structure **100**. As shown by way of example in **Figure 7(b)**, each frame represents a visual image to be displayed on the entirety of the display structure **100** at a given point in time. Video images may be represented as a series of frames that are displayed in quick succession to convey the sense of movement in well known fashion.

[0069] The source image frame data received by the frame driver **710** from the PC **701** may be in analog or digital form. As shown in **Figure 8**, the frame driver **710** comprises one or both of an RGB digitizer **810** and a digital visual interface (DVI) receiver **820**. The RGB digitizer **810** accepts an analog output signal (for example a VGA signal) from a graphics card on the PC **701** and converts it into digital RGB signals, while the DVI receiver **820** accepts a DVI signal from a graphics card on the PC **701** and decodes it to digital RGB signals. If both the RGB digitizer **810** and the DVI receiver **820** are present, their respective outputs are multiplexed together at a multiplexer **830**.

[0070] In addition, the frame driver **710** comprises a micro-controller **840**, one or more sector drivers **720**, and a real time clock (RTC) **850** to provide calendar and real time features. The micro-controller **840** communicates with the PC **701** through a RS232 port to control the operation of the display. The micro-controller **840** stores all configuration data in its non-volatile memory. These data describe the properties and the operation of the display, such as the pixel pitch; the brightness and contrast of the display; the size and location of the image

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a particular sector driver should buffer; the configuration data for the RGB digitizer and the real time clock, etc.

[0071] The RGB digitizer **810** accepts an input analog signal from the PC **701** and outputs a digital output signal to a first input of the multiplexer **830**. The DVI receiver **820** accepts an input digital signal from the PC **701** and outputs a digital output signal to a second input of the multiplexer **830**. The multiplexer **830** receives digital inputs from the RGB digitizer **810** and the DVI receiver **820** respectively and forwards one of them to the sector driver **720**. It also receives a control signal from the micro-controller **840** by which it determines which signal is forwarded to the sector driver **720**. The micro-controller **840** uses time and date information read from the real time clock **850** to perform brightness adjustment automatically. The micro-controller **840** provides the configuration data to the RGB digitizer **810**, the DVI receiver **820** and the real time clock **850**.

[0072] There is one uniquely addressable sector driver **720** for every sector of the display structure **100**. In the example embodiment of **Figure 7(a)**, a three sector display is envisaged, with sectors 1 and 2 comprising the maximum size of 20 x 8 blocks of 32 x 32 pixels each and sector 3 comprising a smaller size of 8 x 8 blocks of 32 x 32 pixels each.

[0073] The frame driver **710** receives a complete frame of a data source image to be displayed on the display structure **100**, if necessary converts it from analog to digital form, sends the data of a complete frame to all of its constituent sector drivers.

Sector Driver

[0074] Each sector driver **720a**, **720b**, **720c** is connected to and preferably forms part of the frame driver **710**, and is connected to a corresponding first column driver in each sector (the first column driver **720a** in sector 1 is shown in **Figure 7(a)**) by a corresponding serial line **721a**, **721b**, **721c**.

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[0075] The streams of data from the source frame image are directed by the frame driver **710** to the sector drivers **710a**, **710b**, **710c** of the sectors with which they are associated. The data are sent in RGB 24 bit format, (red, green and blue, 8 bits per colour), in progressive scan order, that is, top to bottom and left to right.

[0076] As shown in Figure 8, each sector driver **720** comprises a sector buffer **860**, a sector controller **865**, a plurality of sector ID switches **870**, a block address generator **875**, a gamma correction module **880**, a block brightness module **885**, an adder **890** and a sector transmitter **895**.

[0077] The sector controller **865** controls the sector buffer **860** to buffer a portion of the frame data from the multiplexer **830**.

[0078] The size and origin of the buffered portion within a frame are determined by the sector's configuration parameters. For example, if a sector driver is configured with the size of width=20 blocks, height=15 blocks and the origin of X0=100 and Y0=50, since a block size is 32x32, it only buffers the data belonging to the portion of line from 50 to 50+32x15 and column from 100 to 100+32x20.

[0079] The sector driver **720** re-organizes the buffered image data into blocks of (in the case of the example embodiment of **Figure 7**), 32 x 32 pixels each by calculating proper offsets both horizontally and vertically and applying these offsets to generate the memory addresses when reading the buffered data.

[0080] The sector controller **865** generates timing signals to control the sector buffer **860**, the block address generator **875**, the gamma correction module **880**, the block brightness module **885** and the sector transmitter **895**.

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[0081] The sector ID switches **870** set the sector ID. All sector configuration parameters are encoded with an ID. A sector controller **865** only stores the parameters with a matching ID.

[0082] The block address generator **875** accepts as input an address timing signal from the sector controller **865** and generates a two-dimensional block address (x,y) reflecting the horizontal and vertical coordinates of the block relative to a reference position within the sector (in the example embodiment of **Figure 7**, the lower left corner thereof) to the adder **890** to be added to the block of data.

[0083] The sector controller **865** stores three gamma correction look-up tables, one for each colour in the gamma correction module **880** and uses these tables to apply gamma correction to every colour value of an input pixel and outputs the gamma corrected data to the adder **890**. The gamma correction module **880** forwards the corrected pixel data to the adder **890**.

[0084] Each block in a display can be white-balanced individually. The sector controller **865** stores these block-white-balance parameters in the block brightness module **885**. The block brightness module **885** accepts as input the timing signal from the sector controller **865** and outputs the selected block brightness value to the adder **890**.

[0085] The adder **890** accepts as input and combines the gamma corrected pixel data from the gamma correction module **880**, the block address from the block address generator **875** and the block brightness value from the block brightness module **885** and forwards the resulting data stream to the sector transmitter **895**.

[0086] The sector transmitter **895** accepts the data stream from the adder **890**, serializes and forwards it to the column drivers **730** of the sector through serial communication.

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[0087] An example data format of the sector data frame **1000** transmitted by the sector transmitter **895** is shown in **Figure 9**. It comprises a series of block data frames **910**, corresponding to each of the blocks in the sector. In the example embodiment of **Figure 7(a)**, where sector 1 is of dimension 640 pixels wide by 256 pixels high and the block size is 32 pixels by 32 pixels, there are 20 rows and 8 columns of blocks, or 160 blocks in total.

[0088] Each block data frame **910** comprises a series of 3 byte symbols, called "pxls" **911**, which may be categorized into one of three types, namely command pxls, brightness pxls and pixel pxls.

[0089] There are four command pxls **911** in a block data frame, namely "brt_st" **921**, "brt_end" **923**, "pxl_st" **924** and "pxl_end" **925**. The "brt_st" **921** denotes the start of a series of three brightness pxls **911** and the "brt_end" **923** denotes the end of this series. Similarly, the "pxl_st" **924** denotes the start of a series of pixel pxls **911** and the "pxl_end" **925** denotes the end of this series. In the example embodiment of **Figure 7(a)**, in which each block is 32 by 32 pixels, there would be 1024 pixel pxls **911** in a block data frame **900**.

[0090] Preferably, the "brt_st" **921**, "brt_end" **923**, "pxl_st" **924** and "pxl_end" **926** pxls have unique and recognizable data patterns, for example: brt_st = (9,x,y), brt_end = (9,255,255), pxl_st = (8,x,y), and pxl_end = (8,255,255), where the two-byte (x,y) is a zero-offset (x,y) block address **942**, **943** marking the position of the block within the sector relative to a reference point (in the example embodiment of **Figure 7(a)**, the bottom left corner of the sector).

[0091] For example, when a column driver receives a command pxl, it examines the block address (x,y) embedded inside the pxl. If the block address (x) matches the column driver's corresponding ID switch, the column driver opens its data buffer to store the following pxls. If the command pxl is brt_st **921**, the following pxls will be saved as brightness values. If the command pxl is pxl_st **924**, the following pxls will be saved

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as pixel values. When either brt_end or pxl_end command are received, a column driver closes its data buffer and ignores any subsequent pxls

[0092] The brightness pxls **911** comprise three bytes of brightness values, one byte for each of the red **931**, green **932** and blue **933** colours. The values of the brightness levels represent the relative intensity of the entire block of pixels as against the intensity of other blocks. Individual intensity values within a block are represented by pxl values for individual pixels.

[0093] Each of the pixel pxls **925** comprise three bytes of intensity values, again corresponding to each of the red **951**, green **952** and blue **953** colours. The individual intensity value multiplies the corresponding block intensity value to arrive at the overall intensity value.

[0094] Those having ordinary skill in this art will readily appreciate that a 24-bit gray scale intensity value could be stored as the block brightness pxl **911** and/or the individual pixel pxl **911** for monochrome display embodiments.

[0095] The pixel pxls **911** are preferably organized in a sequence that facilitates decoding into columns. For example, in the example embodiment of **Figure 7(a)**, a suitable sequence consists of each of the pxls in the block, moving from left to right and by rows, bottom to top.

[0096] Preferably, the data both within and between blocks is organized in a column-wise fashion. In the example embodiment of **Figure 7(a)**, in which block numbering is shown as being from a bottom to top and left to right direction, the data may be conveniently organized in a similar manner.

Column Driver

[0097] Each of the pixel columns in a sector of the display structure **100** is controlled by a string or column driver **730**. Preferably, the column driver **730** is located at an extremity (in the example embodiment

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of **Figure 7(a)**, the bottom extremity) of the set of columnar strands 120 interconnecting a vertical series of pixel elements housings **111**.

[0098] As shown in the example embodiment of **Figure 7(a)**, the first column driver **730a** in sector 1 is connected to sector driver **720a** by serial line **721a** and to the second column driver **730b** in sector 1 by a serial line **731a**. Each column driver **730b**, **730c** is in turn connected to its immediately previous column driver **730a**, **730b** in daisy-chain fashion by corresponding serial lines **731a**, **731b**.

[0099] Moreover, each column driver, for example **730a** is connected to each of a plurality of pixel drivers **740a** **740b** **740c** by corresponding serial cables **732a**, **732b**, **732c**. Thus, in the embodiment of **Figure 7(a)**, each of the 20 column drivers for sector 1 will be connected to 32 pixel drivers **740**. Preferably, the pixel drivers **740** so connected to their associated column driver **730** are located at one extremity (in the example embodiment of **Figure 7(a)**, the bottom) of the vertical serial string of pixel elements **740**.

[00100] A block diagram of an example column driver **730** is shown in **Figure 10**. It comprises a sector receiver **1010**, a blocks buffer **1020**, a column builder module **1030**, a column transmitter **1040**, a control logic module **1050**, a plurality of ID switches **1060** and a sector transmitter **1070**.

[00101] The sector receiver **1010** accepts a serial sector data frame from a source, which may be the sector transmitter **895** of the sector driver **720** or may be a sector transmitter **1070** of an upstream column driver **730**.

[00102] The sector receiver **1010** determines from the appended block address whether or not it is to be processed by it. It makes this determination from the column driver ID, which it obtains from the control logic module **1050**.

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[00103] The column driver ID is a pair of zero offset integer values in the range from 0 to one less than the maximum number of row or column blocks in a sector (in the example embodiment of **Figure 7(a)**, 20) generated by the ID switches **1060**.

[00104] The control logic module **1050** compares the x coordinate of the column driver ID with the x coordinate **943** of the block address found in the "pxl_st" command pxl **924** of the block data frame. If there is a match, it forwards that block data frame **910** to the blocks buffer **1020** for processing.

[00105] The sector receiver **1010** concurrently forwards the entire sector data frame **900** to the control logic module **1050** for forwarding on to the sector transmitter **895** and thence to another downstream column driver **730**. Thus, the sector data frame **900** is propagated in turn to each of the column drivers **730** in the daisy chain corresponding to a given sector, and each column driver **730** extracts those block data frames **910** corresponding thereto.

[00106] The blocks buffer **1020** accepts the block data frames **910** corresponding to a given column driver **730** from the sector receiver **1010** and buffers the blocks in increasing order of y-coordinate **942** of block address. The data in the blocks buffer, comprising not only the pixel pxls **911**, but also the block brightness pxls **911**, are accessible by the column builder **1030**.

[00107] The column builder **1030** accesses data corresponding to a single column of pixels from the blocks buffer **1020**. In a structure having a block size of $p \times q$ pixels, in which each block is encoded from left to right and then bottom to top, this consists of counting off the pixel pxls **911** of the block data frame **1010** a number of times corresponding to the column number **943** and taking a single pixel pxl **911**, and then selecting every p th pixel pxl **911** thereafter.

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[00108] The column builder **1030** thereafter processes the selected pixel pxls **925** into a stream of pixel data and forwards the resulting data stream as a string or column data frame **1100** to the column transmitter **1040**.

[00109] An example data format of the column data frame **1100** is shown in **Figure 11**. Each column data frame **1100** comprises a series of 4 byte "bricks", which may be categorized into one of three types, namely "syn" bricks **1110**, "brt" bricks **1120** and "pxl" bricks **1130**. A column data frame **1100** consists of a single "syn" brick **1110**, followed by a single "brt" brick **1120**, followed by a series of "pxl" bricks **1130**, the number of which corresponds to the number of pixels in a column. For a sector of size $m \times n$ blocks and a block of size $p \times q$, the number of pixels in a column is $n \times q$. In the example embodiment of **Figure 7(a)**, there are $n = 8$ block rows and $q = 32$ pixel rows per block for a total of 256 pixels in a column of a sector. Consequently, in a column data frame suitable for use in such an example embodiment, there would be 256 "pxl" bricks **1130**.

[00110] The "syn" brick **1110** acts as a synchronizing element and consists of a unique identifying pattern, for example, all 0s, to denote the start of a column data frame.

[00111] The "brt" brick **1120** contains three data bytes; corresponding to the three sets (for red **1125**, green **1126** and blue **1127**) of 8 bit block brightness values. Only the brightness values of the bottom block are saved and used. The remaining byte, preferably the first byte, contains a unique identifying pattern, for example, a "1" start bit **1121**, a "0" stop bit **1122**, followed by six dummy "0" bits **1123**, **1124** to denote the start of the "brt" brick **1120**.

[00112] Each "pxl" brick **1130** also contains three data bytes, corresponding to the three sets (for red **1135**, green **1136** and blue **1137**) of 8 bit pixel intensity values to be multiplied to the corresponding

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block brightness value. The remaining byte, preferably the first byte, contains a unique identifying pattern, for example, a "1" start bit **1131**, a "0" stop bit **1132**, a "mark" bit **1133**, and five dummy "0" bits **1134** to denote the start of the "pxl" brick **1130**.

[00113] The mark bit **1133** is a usage indicator that denotes whether the corresponding pixel intensity values have been used before (for example, "0") or are fresh and available for use (for example, "1"). When the column data frame **1100** is initialized by the column driver **730**, each of the mark bits **1133** are initialized to "fresh" ("1").

[00114] The column transmitter transmits the column data frame **1100** to the first pixel driver **740** in a daisy-chained string of pixel drivers **740** corresponding to the column. If, as postulated in the example embodiments shown and being described, the blocks buffer is organized in order of ascending x-coordinate of block address, and each block is organized in left to right and top to bottom order, then the pixel data in a corresponding column of the blocks buffer **1020** will represent in order, the pixel data to be displayed by a single column of a given sector of the display structure **100**.

Pixel Driver

[00115] Each of the pixel drivers **740** is housed in one of the pixel elements **110**. There is one pixel driver in each pixel element. The pixel driver **740** connected to the column driver correspond to the first in a columnar string of pixels (in the embodiment of **Figure 7(a)**, the lowermost pixel in each column).

[00116] Each column driver **730a**, **730b**, **730c** transmits a serial stream of pixel data to each of its associated first pixel drivers **740a**, **740b**, **740c** along its associated serial cable **732a**, **732b**, **732c**. The serial stream of pixel data in each case corresponds to an ordered (in the embodiment of **Figure 7(a)**, from the bottom of the column to the top)

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listing of pixel data corresponding to that column of pixels for the frame to be displayed.

[00117] Each of the first pixel drivers **740a, 740b, 740c** is connected to its corresponding column driver **730a**, by corresponding serial cables **731a, 731b, 731c** and to the second pixel driver **742a, 742b, 742c**, respectively, by corresponding serial cables **741a, 741b, 741c**. Each pixel driver **742a, 742b, 742c** is in turn connected to its immediately previous pixel driver **740a, 740b, 740c** in daisy-chain fashion by corresponding serial lines **741a, 741b, 741c** and so on.

[00118] Each pixel driver **740** is an intelligent, self-contained device, which retrieves data from a previous, adjacent pixel driver **740** in the same column and sends data to the next adjacent pixel driver **740** in the column. While power and signals are generally described herein as traveling upwardly of a column, it is to be understood that power and signals could be distributed across rows, top down, or bottom up.

[00119] Referring now to **Figure 12**, each pixel driver **740** comprises a column data stream receiver **1210**, a pixel marker module **1220** and a column data stream transmitter **1230**.

[00120] The column data stream receiver **1210** receives a column data frame **1100** from either a column driver **730** or the previous pixel driver **740** in the column and passes it on to the pixel marker module **1220**.

[00121] The pixel marker module **1220** parses the "pxl" bricks **1025** in turn until it encounters a "fresh" ("1") mark bit **1133**. This signifies that the corresponding "pxl" brick **1130** has not been used. It then retrieves the corresponding block brightness brick and stores it in the block brightness buffer **1240** and retrieves the pixel data in the "pxl" brick **1130** and stores it in the pixel value buffer **1250**. Thereafter, the pixel marker module **1220** marks the "pxl" brick as having being used ("0")

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and forwards the entire column data stream **1100**, suitably updated, to the column data stream transmitter **1230**.

[00122] The column data stream transmitter **1230** in turn forwards the column data frame **1100** to the next immediately downstream pixel driver **740**, if any still exist.

[00123] In the meantime, the Pulse-Width-Modulator (PWM) **1260** retrieves the RGB intensity values from the pixel value buffer **1250**, multiplies them to their corresponding block brightness values from the block brightness buffer **1240** and generate control signals for the Red, Green and Blue LED display elements in accordance therewith.

[00124] Thus, each pixel driver **740** is responsible for performing three functions: (1) buffering a 24 bit RGB value and a 24 bit brightness value of the pixel; (2) adjusting the pixel colour and brightness of the LEDs to match these saved values in the column data stream; and (3) re-transmitting the received data to the next pixel driver **740** downstream in the same column.

[00125] Since pixel drivers **740** are not directly addressable, for the reasons set out above, they rely on the protocol to the effect that the "pxl" brick corresponding thereto will be the first in the column data frame **1100** with a fresh marker bit **1133**.

[00126] The present application can be implemented in digital electronic circuitry, or in computer hardware, firmware, software, or in combination thereof. Apparatus of the application can be implemented in a computer program product tangibly embodied in a machine-readable storage device for execution by a programmable processor; and methods actions can be performed by a programmable processor executing a program of instructions to perform functions of the application by operating on input data and generating output. The application can be implemented advantageously on a programmable system including at least one input device, and at least one output device. Each computer

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program can be implemented in a high-level procedural or object-oriented programming language, or in assembly or machine language, if desired; and in any case, the language can be a compiled or interpreted language.

[00127] Suitable processors include, by way of example, both general and specific microprocessors. Generally, a processor will receive instructions and data from a read-only memory and/or a random access memory. Generally, a computer will include one or more mass storage devices for storing data file; such devices include magnetic disks and cards, such as internal hard disks, and removable disks and cards; magneto-optical disks; and optical disks. Storage devices suitable for tangibly embodying computer program instructions and data include all forms of volatile and non-volatile memory, including by way of example semiconductor memory devices, such as EPROM, EEPROM, and flash memory devices; magnetic disks such as internal hard disks and removable disks; magneto-optical disks; CD-ROM and DVD-ROM disks; and buffer circuits such as latches and/or flip flops. Any of the foregoing can be supplemented by, or incorporated in ASICs (application-specific integrated circuits), FPGAs (field-programmable gate arrays) and/or DSPs (digital signal processors).

[00128] Examples of such types of computer are programmable processing systems contained in the PC **701**, RGB digitizer **810**, the DVI receiver **820**, the micro-controller **840**, the sector buffer **860**, the sector controller **865**, the block address generator module **875**, the gamma correction module **880**, the block brightness lookup module **885**, the sector transmitter **895**, **1070**, the sector receiver **1010**, **1210**, the column builder **1030**, the column transmitter **1040**, **1230**, the control logic module **1050**, the pixel marker **1220**, and the PWM **1260**, suitable for implementing or performing the apparatus or methods of the application. The system may comprise a processor, a random access memory, a hard drive controller, and/or an input/output controller, coupled by a processor bus.

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[00129] It will be apparent to those having ordinary skill in this art that various modifications and variations may be made to the embodiments disclosed herein, consistent with the present application, without departing from the spirit and scope of the present application.

[00130] Other embodiments consistent with the present application will become apparent from consideration of the specification and the practice of the application disclosed herein.

[00131] Accordingly, the specification and the embodiments disclosed therein are to be considered exemplary only, with a true scope of the invention being disclosed by the specification as a whole, including the following claims.

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WHAT IS CLAIMED IS:

1. A video display for displaying at least one video image portion provided thereto, comprising:

a plurality of strings, each comprising a plurality of pixel elements, each pixel element containing a corresponding pixel driver and at least one light element, each of the pixel elements being electrically connected to a previous pixel element in the string and/or a subsequent pixel element in the string, each of the plurality of strings being interconnected with another of the plurality of strings by at least one transverse structural connector to form a lightweight flexible mesh adapted to be secured to a structure; and

a plurality of string drivers, each of the string drivers being electrically connected to a previous string driver and/or a subsequent string driver, each of the strings of pixel elements being electrically connected to one of the plurality of string drivers, the at least one video image portion being provided to a first of the plurality of string drivers;

wherein each of the plurality of string drivers is adapted to receive the at least one video image portion, extract at least one video image sub-portion corresponding to each of those strings of pixel elements electrically connected thereto, transmit the at least one video image sub-portion to the pixel driver of a first of the plurality of pixel elements in the corresponding string of pixel elements, and forward the entire at least one video image portion to its subsequent string driver, if any; and

wherein the pixel driver of each of the plurality of pixel elements in a string thereof is adapted to receive the at least one video image sub-portion, scan a usage indicator corresponding to each of a sequential series of image data contained therein until a first image datum having an unused status is identified, drive the at least one light element in accordance with the information contained in the first image datum having an unused status, modify the usage indicator of the first image datum having an unused status to reflect a used status and forward the entire video image sub-portion, so modified, to its subsequent pixel element, if any;

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whereby the at least one light element in each of the plurality of pixel elements may be driven in accordance with the image data contained in the at least one video image portion, without having any knowledge as to its location in the plurality of strings.

2. A video display according to claim 1, wherein at least one of the pixel elements comprises a plurality of light elements.

3. A video display according to claim 2, wherein at least one of the pixel elements comprises a plurality of different coloured light elements.

4. A video display according to claim 1, wherein at least one of the light elements is a light emitting diode.

5. A video display according to claim 1, wherein at least one of the pixel elements is housed in a waterproof housing.

6. A video display according to claim 5, wherein each of the at least one pixel elements is associated with adjacent strings.

7. A video display according to claim 1, further comprising a plurality of structural connectors interconnecting at least two pixel elements of a string and substantially parallel with the string.

8. A video display according to claim 7, wherein at least one of the plurality of parallel structural connectors is disposed behind the string relative to a viewing surface of the display.

9. A video display according to claim 7, wherein one of the at least one transverse structural connectors is adapted to engage at least one of the plurality of parallel structural connectors.

10. A video display according to claim 9, wherein the one of the at least one transverse structural connectors is adapted to pivotally engage the at least one of the plurality of structural connectors.

11. A video display according to claim 9, wherein the one of the at least one transverse structural connectors is adapted to releasably engage the at least one of the plurality of parallel structural connectors.

12. A video display according to claim 1, wherein the pixel elements of one of the plurality of strings are horizontally offset relative to the pixel elements of a second one of the plurality of strings and immediately adjacent thereto.

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13. A system for controlling a video display for displaying at least one video image portion provided thereto and comprising a plurality of strings, each comprising a plurality of pixel elements, each pixel element containing at least one light element, each of the pixel elements being electrically connected to a previous pixel element in the string and/or a subsequent pixel element in the string, each of the plurality of strings being interconnected with another of the plurality of strings by at least one transverse structural connector to form a lightweight flexible mesh adapted to be secured to a structure, the system comprising:

a plurality of pixel drivers in each of the pixel elements; and

a plurality of string drivers, each of the string drivers being electrically connected to a previous string driver and/or a subsequent string driver, each of the strings of pixel elements being electrically connected to one of the plurality of string drivers, the at least one video image portion being provided to a first of the plurality of string drivers;

wherein each of the plurality of string drivers is adapted to receive the at least one video image portion, extract at least one video image sub-portion corresponding to each of those strings of pixel elements electrically connected thereto, transmit the at least one video image sub-portion to the pixel driver of a first of the plurality of pixel elements in the corresponding string of pixel elements, and forward the entire at least one video image portion to its subsequent string driver, if any; and

wherein the pixel driver of each of the plurality of pixel elements in a string thereof is adapted to receive the at least one video image sub-portion, scan a usage indicator corresponding to each of a sequential series of image data contained therein until a first image datum having an unused status is identified, drive the at least one light element in accordance with the information contained in the first image datum having an unused status, modify the usage indicator of the first image datum having an unused status to reflect a used status and forward the entire video image sub-portion, so modified, to its subsequent pixel element, if any;

whereby the at least one light element in each of the plurality of pixel elements may be driven in accordance with the image data contained in the

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at least one video image portion, without having any knowledge as to its location in the plurality of strings.

14. A system according to claim 13, wherein the at least one video image portion is transmitted as a sector data frame.

15. A system according to claim 13, wherein the at least one video image sub-portion is transmitted as a string data frame.

16. A system according to claim 13, further comprising a frame driver for formatting a source video image into a digital pixel stream for distribution to the display.

17. A system according to claim 14, wherein the frame driver comprises a controller and at least one module for formatting the source video image, selected from a group consisting of an RGB digitizer and a DVI receiver.

18. A system according to claim 16, further comprising a plurality of sector drivers each for receiving a portion of the digital pixel stream and forwarding it to a first of a subset of the string drivers each connected one to another for distribution to the display as one of the at least one video image portions.

19. A system according to claim 18, wherein the portion of the digital pixel stream is divided into blocks.

20. A system according to claim 19, wherein the digital pixel stream is ordered so that the blocks are ordered in row-wise fashion in a left to right and bottom to top sequence relative to the display.

21. A system according to claim 19, wherein the digital pixel stream is ordered so that within a block, pixels are ordered in row-wise fashion in a left to right and bottom to top sequence relative to the display.

22. A system according to claim 19, wherein one of the plurality of sector drivers comprises a block address generator for annotating a block of pixels in the portion of the digital pixel stream with an address value whereby the block may be identified before forwarding it.

23. A system according to claim 19, wherein one of the plurality of sector drivers comprises a block brightness module for specifying a block brightness level to a block of pixels in the portion of the digital pixel stream before forwarding it.

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24. A system according to claim 19, wherein one of the plurality of sector drivers comprises a gamma correction module for applying a contrast adjustment to at least one pixel in the portion of the digital pixel stream before forwarding it.

25. A system according to claim 13, wherein the usage indicator is a bit in the image datum.

26. A system according to claim 25, wherein the unused status is a "1" and the used status is a "0".

27. A pixel driver for a video display for displaying at least one video image portion provided thereto,

the display comprising a plurality of strings, each comprising a plurality of pixel elements, each pixel element containing at least one light element, each of the pixel elements being electrically connected to a previous pixel element in the string and/or a subsequent pixel element in the string, each of the plurality of strings being interconnected with another of the plurality of strings by at least one transverse structural connector to form a lightweight flexible mesh adapted to be secured to a structure in each of a plurality of pixel elements; and

a plurality of string drivers, each of the string drivers being electrically connected to a previous string driver and/or a subsequent string driver, each of the strings of pixel elements being electrically connected to one of the plurality of string drivers, the at least one video image portion being provided to a first of the plurality of string drivers;

wherein each of the plurality of string drivers is adapted to receive the at least one video image portion, extract at least one video image sub-portion corresponding to each of those strings of pixel elements electrically connected thereto, transmit the at least one video image sub-portion to the pixel driver of a first of the plurality of pixel elements in the corresponding string of pixel elements, and forward the entire at least one video image portion to its subsequent string driver, if any;

the pixel driver corresponding to one of the at least one pixel elements and housed therein and being adapted to receive the at least one video image sub-portion, scan a usage indicator corresponding to each of a

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sequential series of image data contained therein until a first image datum having an unused status is identified, drive the at least one light element in accordance with the information contained in the first image datum having an unused status, modify the usage indicator of the first image datum having an unused status to reflect a used status and forward the entire video image sub-portion, so modified, to its subsequent pixel element, if any;

whereby the at least one light element in each of the plurality of pixel elements may be driven in accordance with the image data contained in the at least one video image portion, without having any knowledge as to its location in the plurality of strings.

28. A string driver for a video display for displaying at least one video image portion provided thereto,

the display comprising a plurality of strings, each comprising a plurality of pixel elements, each pixel element containing a corresponding pixel driver and at least one light element, each of the pixel elements being electrically connected to a previous pixel element in the string and/or a subsequent pixel element in the string, each of the plurality of strings being interconnected with another of the plurality of strings by at least one transverse structural connector to form a lightweight flexible mesh adapted to be secured to a structure in each of a plurality of pixel elements;

wherein the pixel driver of each of the plurality of pixel elements in a string thereof is adapted to receive at least one video image sub-portion of the at least one video image portion corresponding thereto, scan a usage indicator corresponding to each of a sequential series of image data contained therein until a first image datum having an unused status is identified, drive the at least one light element in accordance with the information contained in the first image datum having an unused status, modify the usage indicator of the first image datum having an unused status to reflect a used status and forward the entire video image sub-portion, so modified, to its subsequent pixel element, if any;

the string driver being electrically connected to a previous one and/or a subsequent one of a plurality of string drivers, each of the strings of pixel

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elements being electrically connected to one of the plurality of string drivers, the at least one video image portion being provided to a first of the plurality of string drivers, the string driver being adapted to receive the at least one video image portion, extract at least one video image sub-portion corresponding to each of those strings of pixel elements electrically connected thereto, transmit the at least one video image sub-portion to the pixel driver of a first of the plurality of pixel elements in the corresponding string of pixel elements, and forward the entire at least one video image portion to its subsequent string driver, if any;

whereby the at least one light element in each of the plurality of pixel elements may be driven in accordance with the image data contained in the at least one video image portion, without having any knowledge as to its location in the plurality of strings.

29. A method of controlling a video display comprising a plurality of strings, each comprising a plurality of pixel elements, each pixel element containing at least one light element, each of the pixel elements being electrically connected to a previous pixel element in the string and/or a subsequent pixel element in the string, each of the plurality of strings being interconnected with another of the plurality of strings by at least one transverse structural connector to form a lightweight flexible mesh adapted to be secured to a structure; and

a plurality of string drivers, each of the string drivers being electrically connected to a previous string driver and/or a subsequent string driver, each of the strings of pixel elements being electrically connected to one of the plurality of string drivers;

the method comprising the steps of:

- (a) providing at least one video image portion to a first of the plurality of string drivers;
- (b) each of the plurality of string drivers:
 - (i) receiving the at least one video image portion;
 - (ii) extracting at least one video image sub-portion corresponding to each of those strings of pixel elements electrically connected thereto;

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(iii) transmitting the at least one video image sub-portion to the pixel driver of a first of the plurality of pixel elements in the corresponding string of pixel elements; and

(iv) forwarding the entire at least one video image portion to its subsequent string driver, if any; and

(c) the pixel driver of each of the plurality of pixel elements in a string thereof:

(i) receiving the at least one video image sub-portion;

(ii) scanning a usage indicator corresponding to each of a sequential series of image data contained therein until a first image datum having an unused status is identified

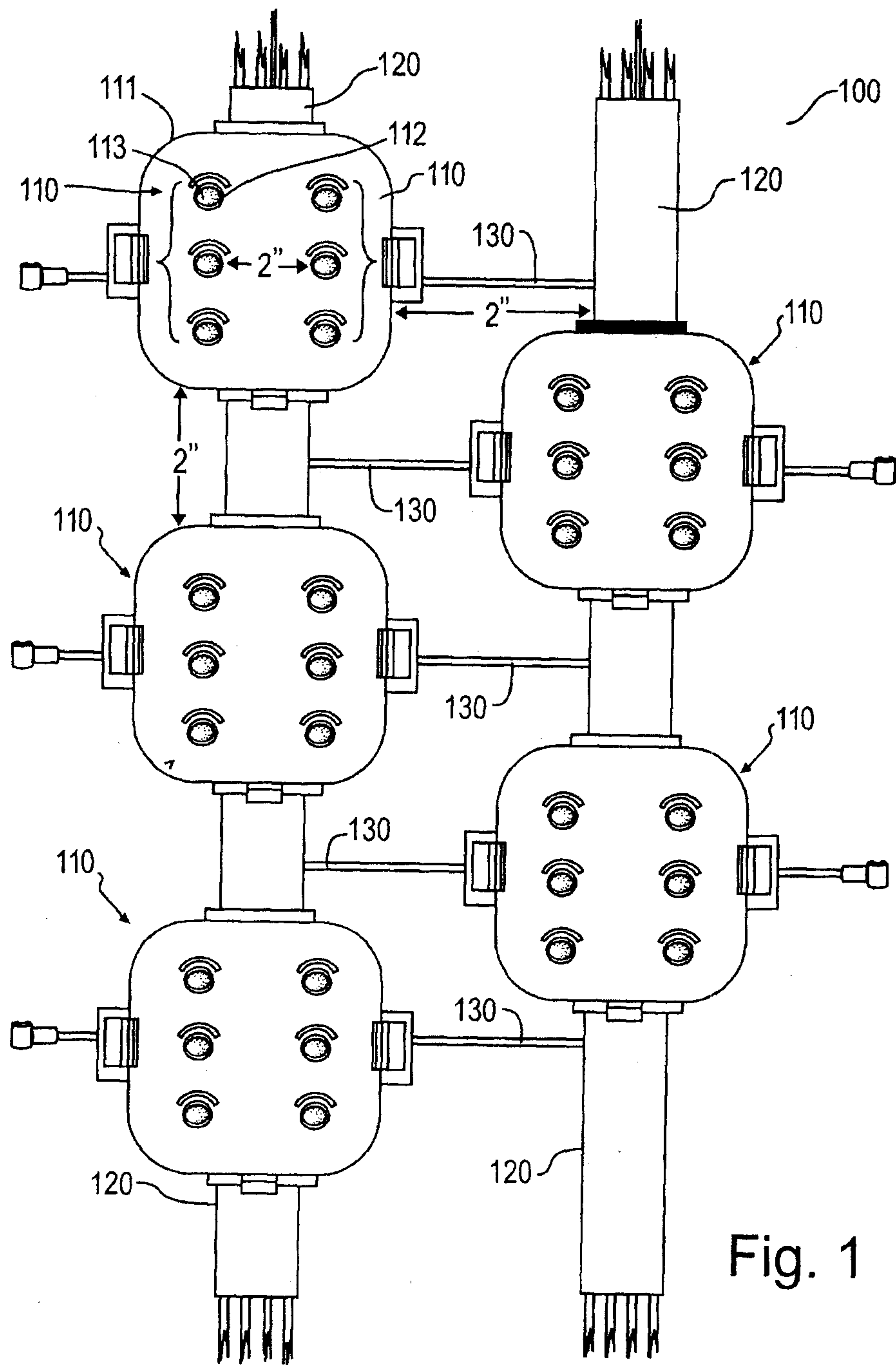
(iii) driving the at least one light element in accordance with the information contained in the first image datum having an unused status;

(iv) modifying the usage indicator of the first image datum having an unused status to reflect a used status; and

(v) forwarding the entire video image sub-portion, so modified, to its subsequent pixel element, if any;

whereby the at least one light element in each of the plurality of pixel elements may be driven in accordance with the image data contained in the at least one video image portion, without having any knowledge as to its location in the plurality of strings.

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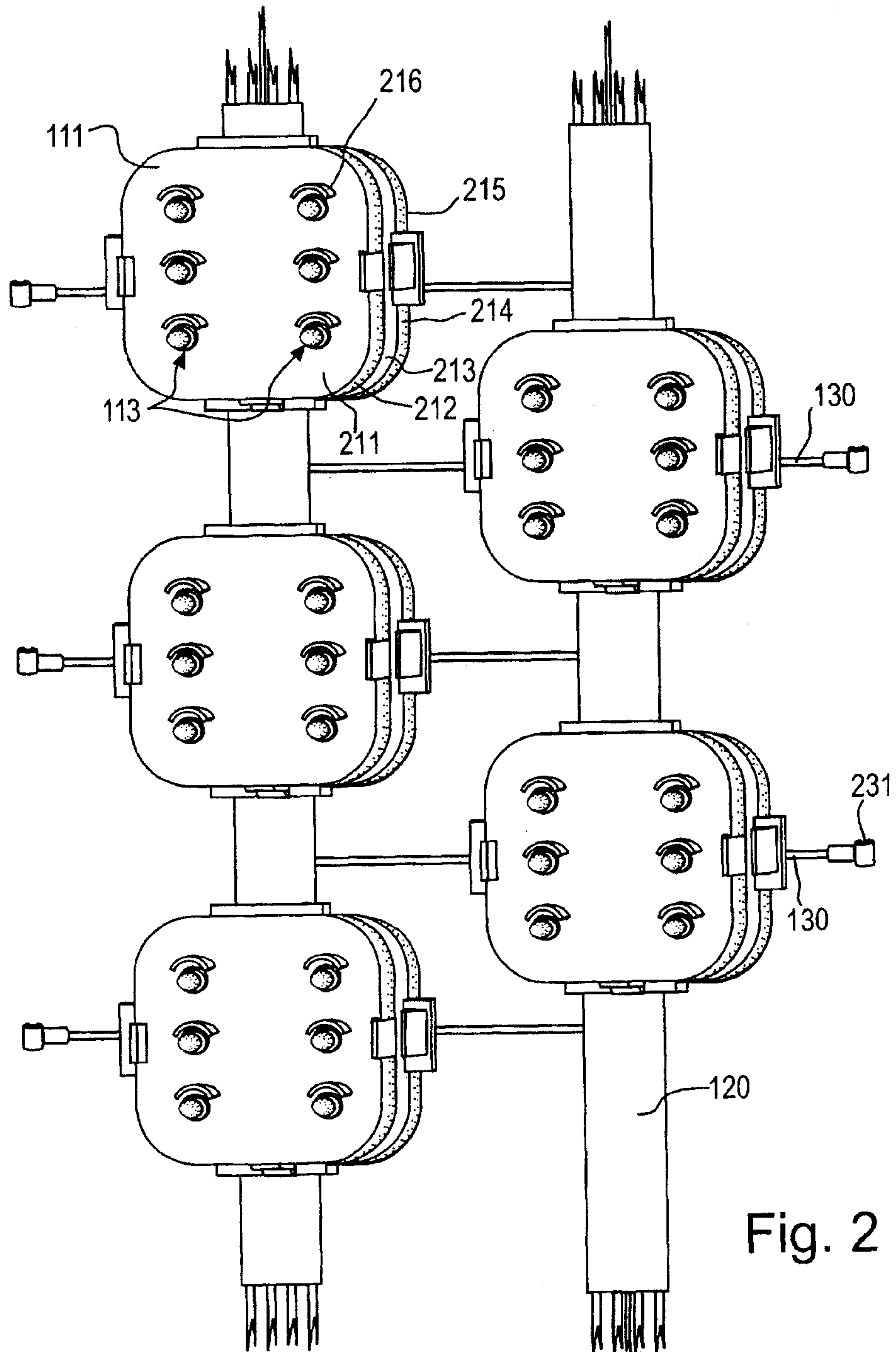


Fig. 2

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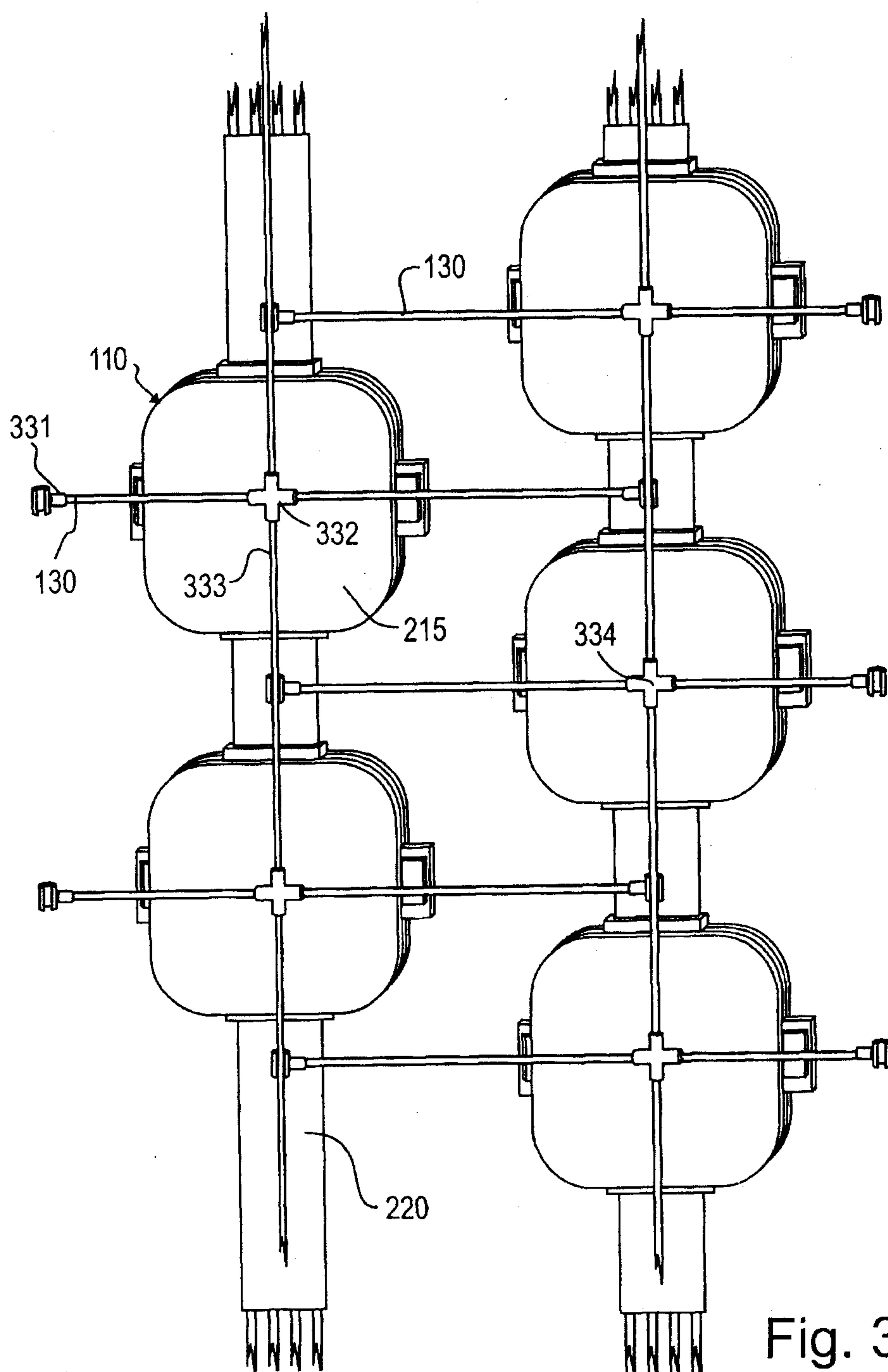


Fig. 3

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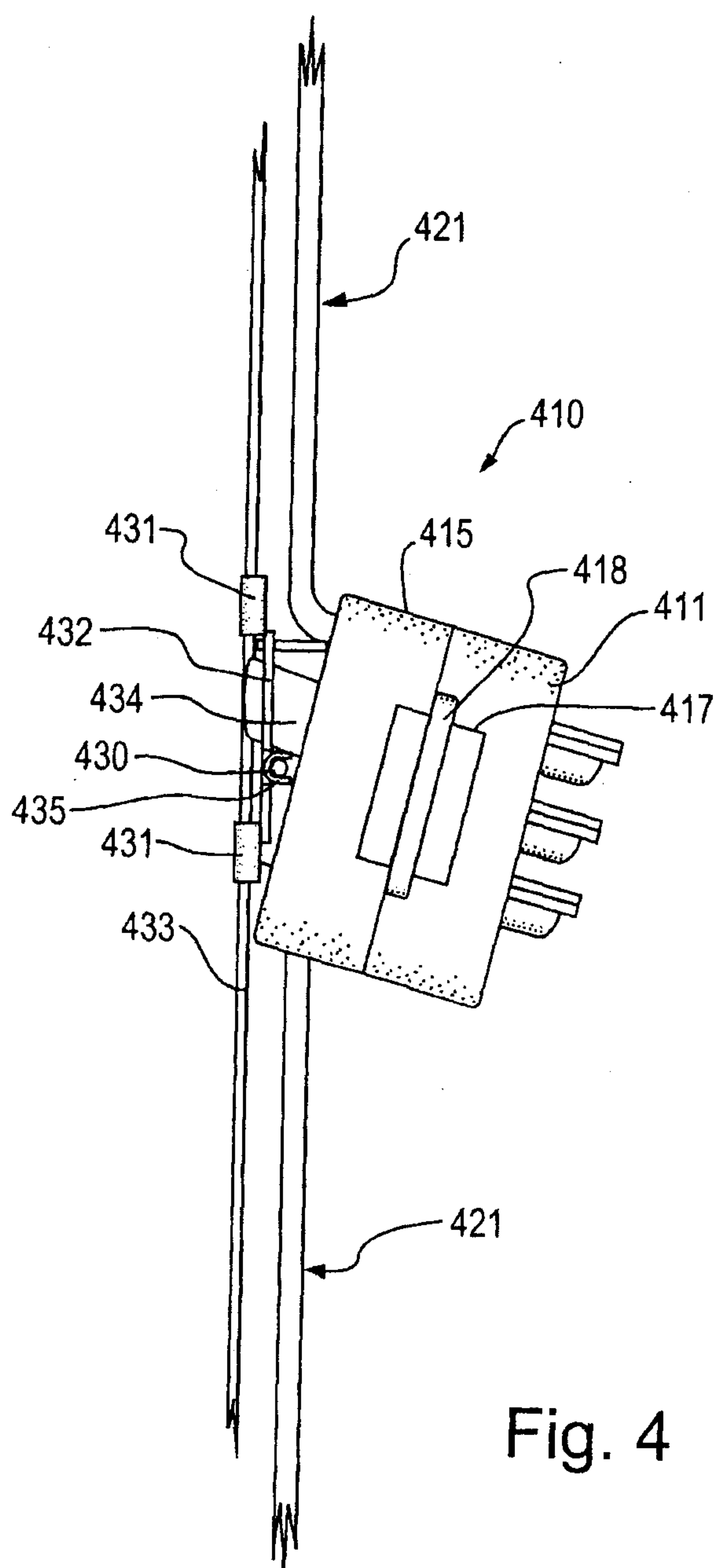


Fig. 4

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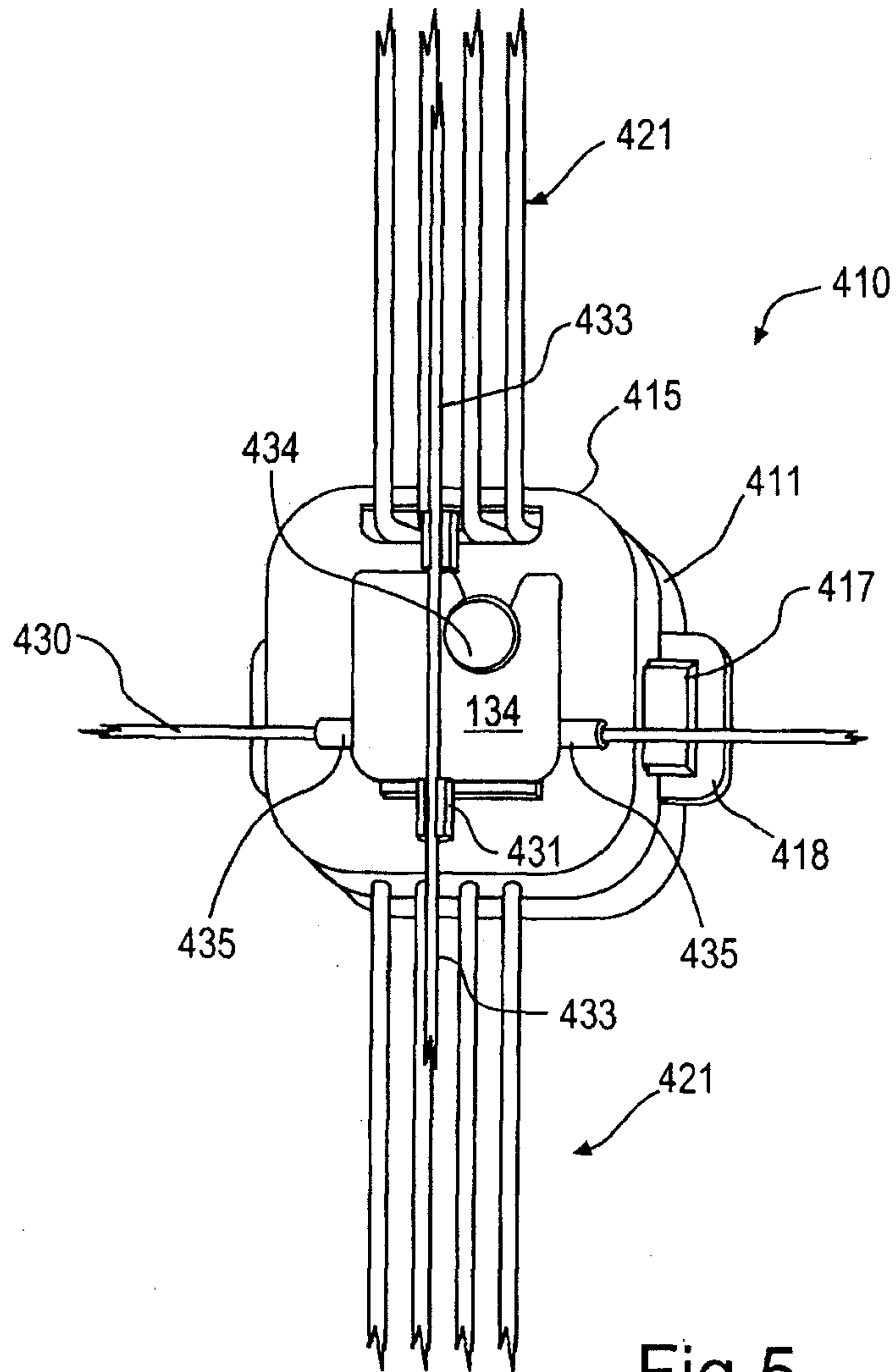


Fig 5

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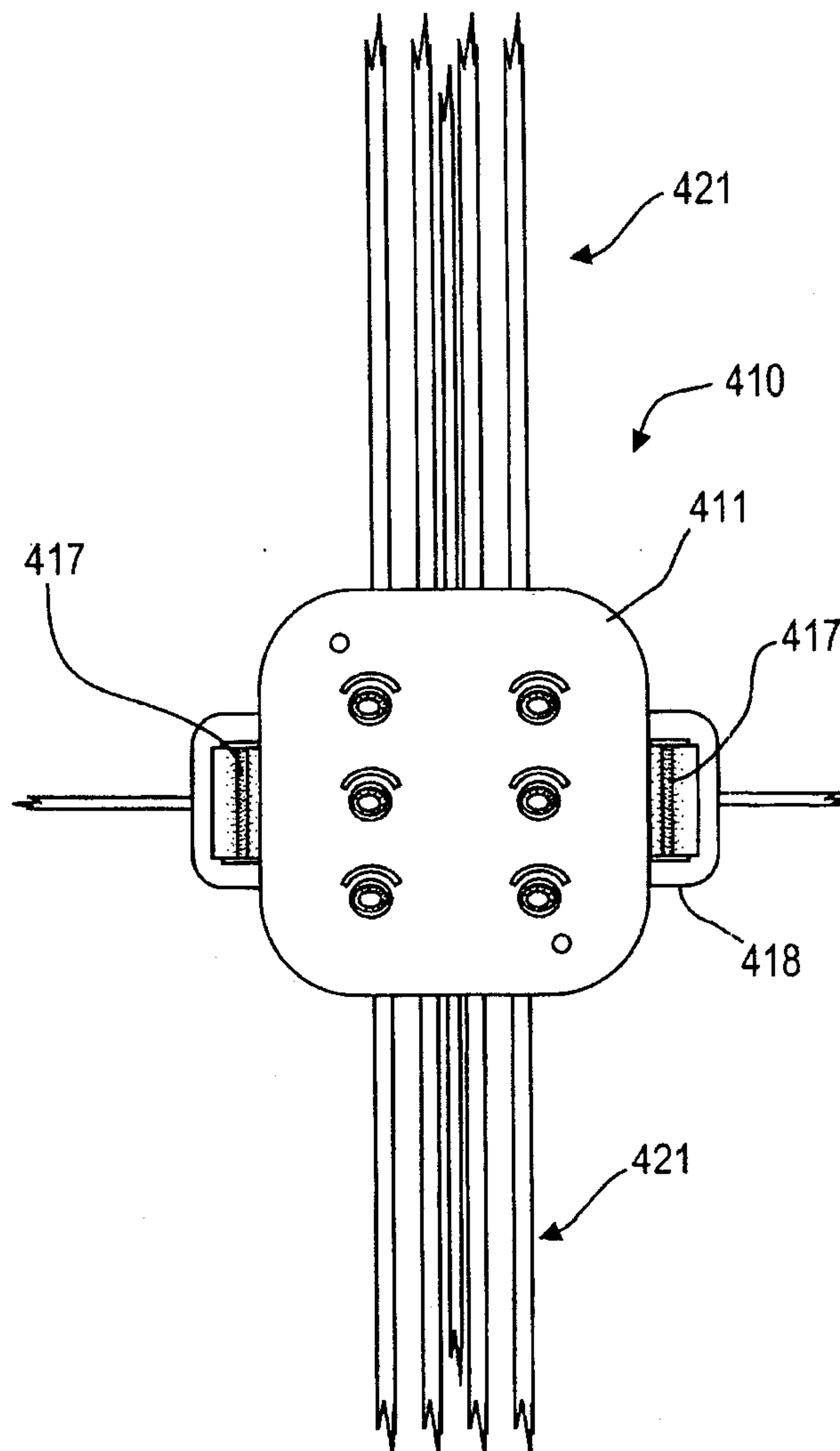
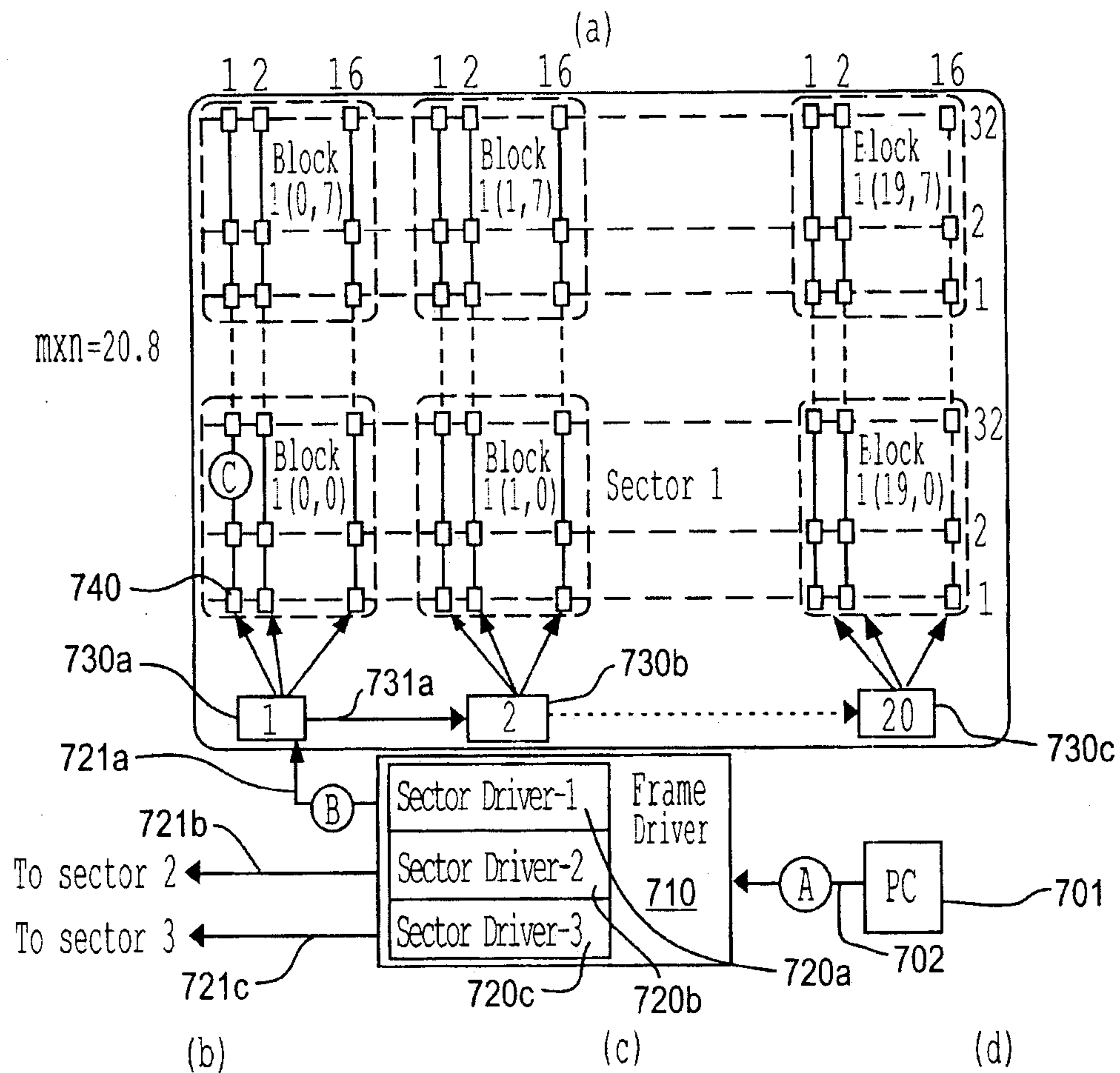


Fig 6

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Data in Channel "A"			Data in Channel "B"	Data in Channel "C"
Sector 3 (8X8 blocks)	Sector 2 (20X8 blocks)	Sector 1 (20X8 blocks)		(1, 8) (1, 2) (1, 1)
FRAME				

Fig. 7

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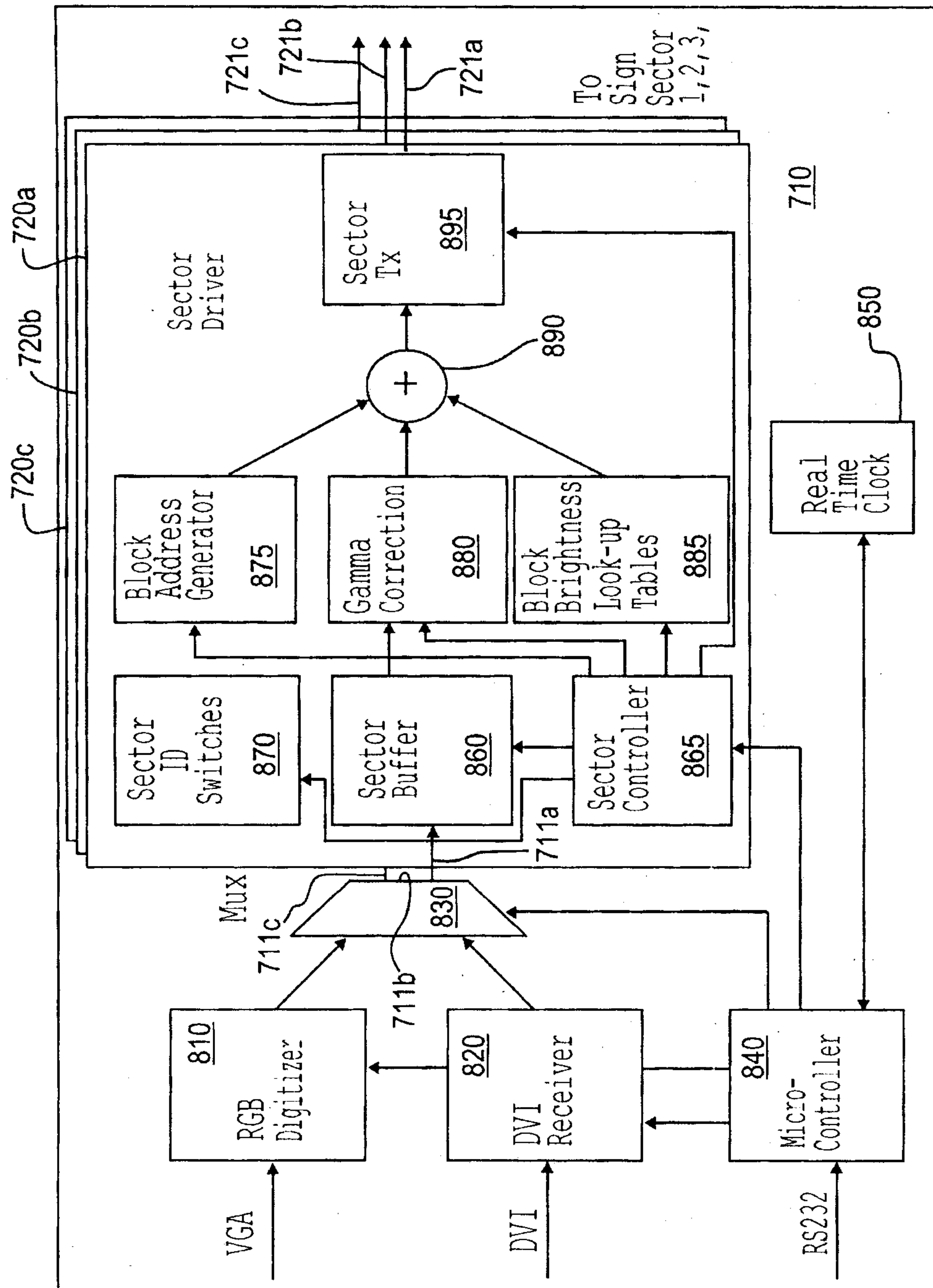


Fig. 8

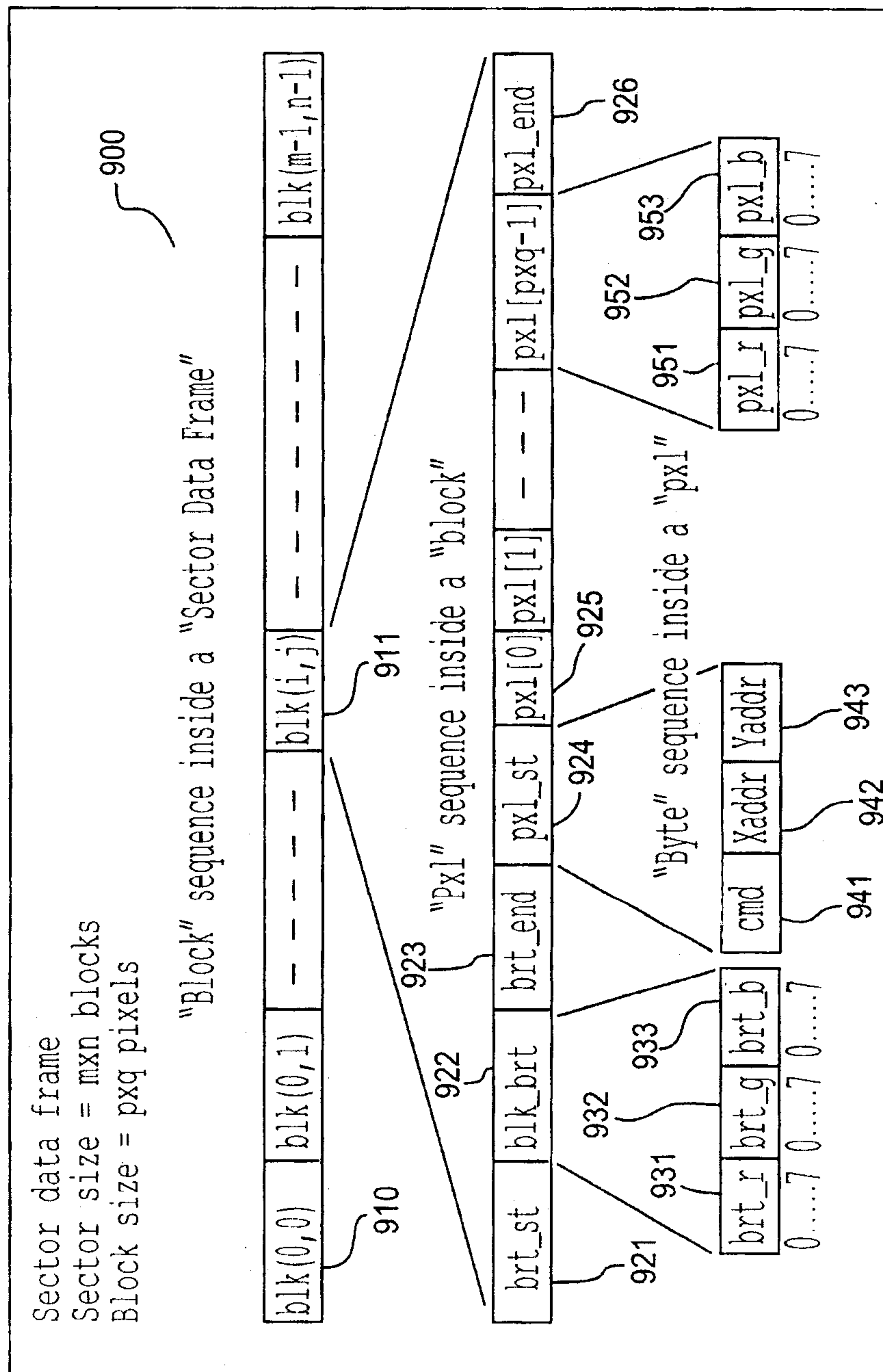


Fig. 9

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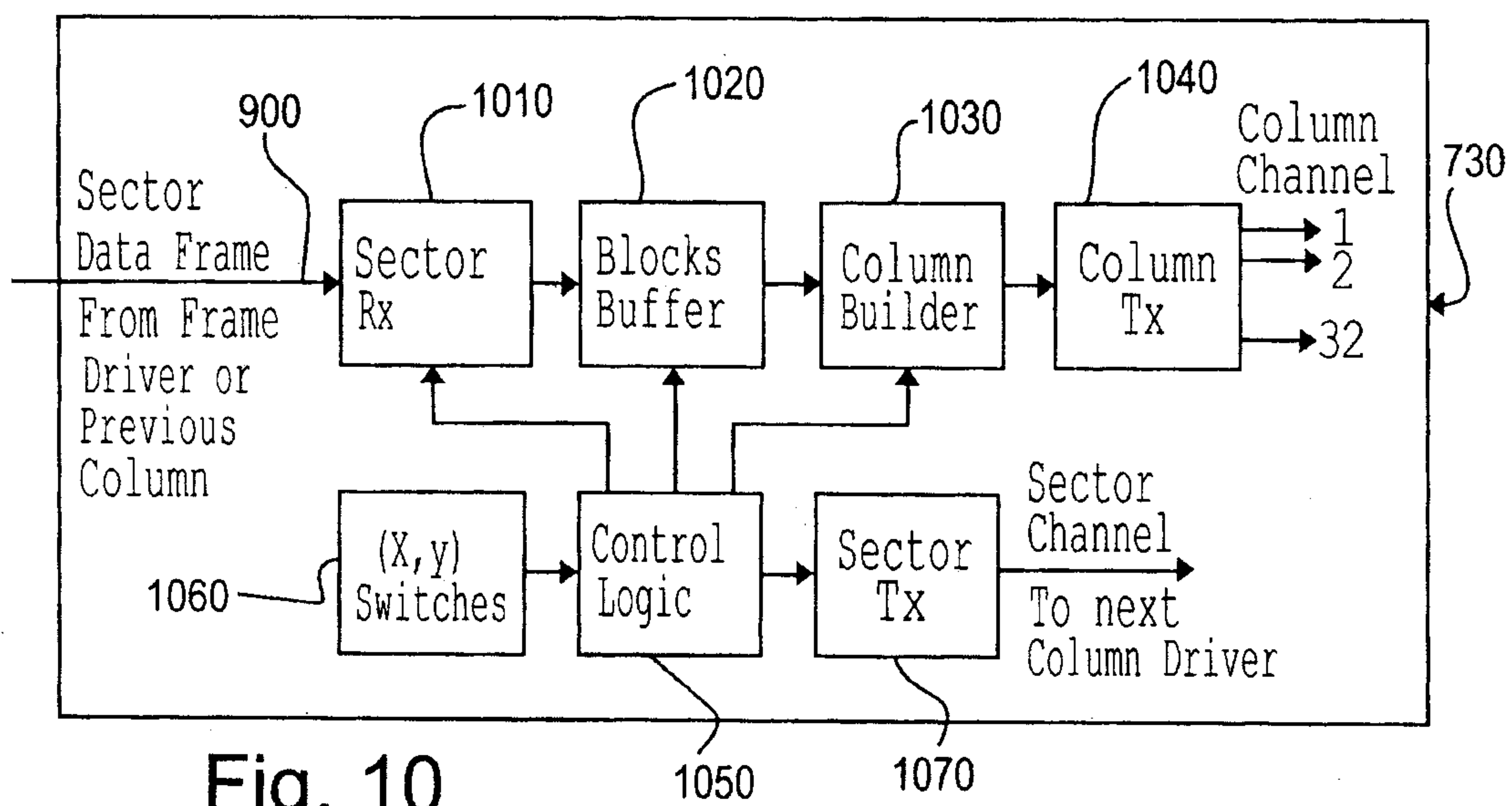


Fig. 10

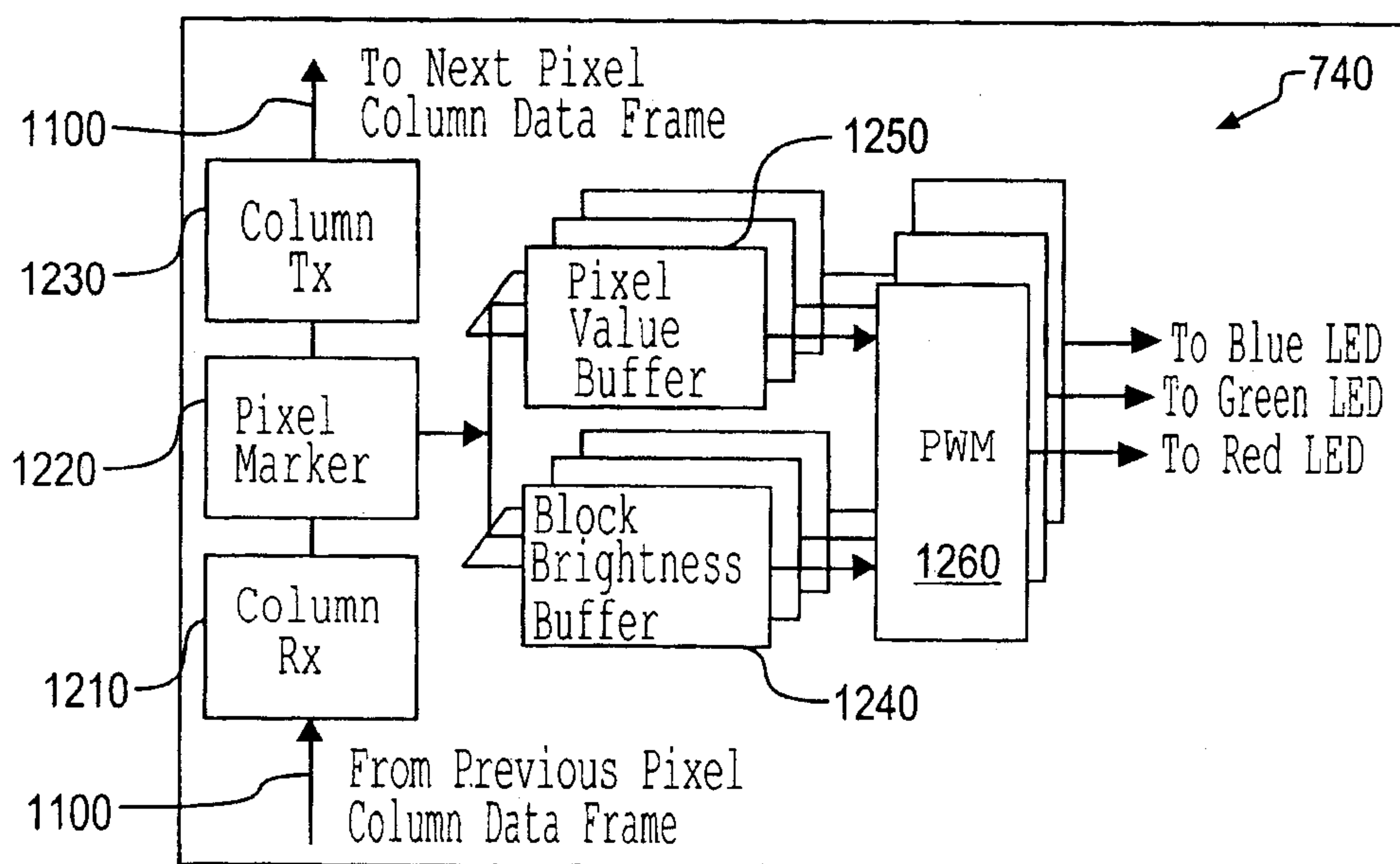
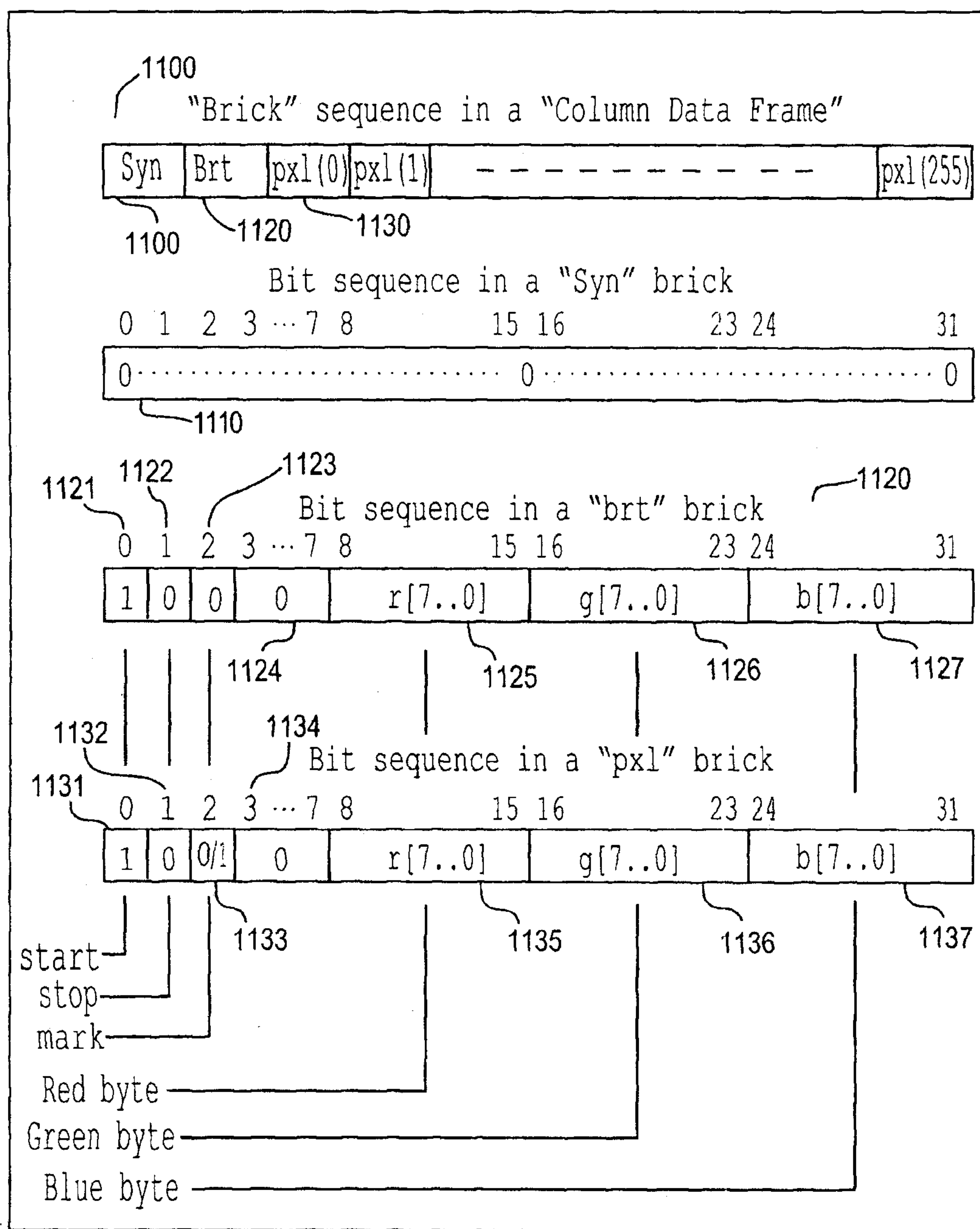


Fig. 12

11/11**Fig. 11**

