Title of the Invention: Video display panel pop-out mounting and video wall
Abstract Title: Video display comprising manual releasing actuator

A video wall assembly comprises an array of juxtaposed video display panels having their respective display screens aligned on a common plane or other surface (fig. 1), wherein at least one said display panel is supported on an ejector carriage 30 that is manually releasable by means of an actuator 90 extending downwardly behind the panels and accessible from below the array. The actuator may be a flexible cord and the carriage may comprise a biasing means urging the carriage into the extended position. The carriage may further include a latching means 60, 70 to resist the biasing means and hold the display in the retracted position.
VIDEO DISPLAY PANEL POP-OUT MOUNTING AND VIDEO WALL

FIELD OF THE INVENTION

This invention relates to aspects of a mounting system for a display screen, and in particular to aspects of a mounting system for a plurality of adjacent video display panels making up a video wall.

BACKGROUND OF THE INVENTION

The term 'video wall' is used to describe an array of video panel screens or other display devices set up in side-by-side relationship so as to form a composite display in which the individual display devices are mounted so that they can be used as individual tile elements. These elements can then be individually provided with different input signals contributing, usually, to one much larger, coherent display, made up from different images appearing on the adjacent tiles. The composite display may be entirely flat (planar), but the development of curved display screens points to the wider future adoption of curved video walls. In either case, the several display surfaces making up the video wall should be aligned with one another so that they all lie on one smooth flat or curved surface.

The individual panels of the adjacent display devices in the wall need to be as close together as possible in order to minimise the area of the dead space between the individual display areas that is formed by the adjacent rims or bezels of the panels. The individual screens also need to be as nearly aligned as can be achieved, so that the composite image displayed on the whole video wall is not distorted when seen from an oblique viewing angle.

In addition to the above considerations, access to the rear of the panels in the video wall is required for assembly, screen replacement, and maintenance purposes. A preferred solution to
this need for access is to mount individual panels so that they can be pulled forward, out of the plane of the video wall. This eliminates, or at least reduces, the need to construct the wall with space at the rear for easy access by a technician.

This invention is concerned with mounting systems for the tiled individual display elements of a composite video wall display that will facilitate a technician to conveniently, and practically, maintain the individual display elements in the array by means of pop-out panel supports.

**SUMMARY OF THE INVENTION**

It is an object of the invention to address the continued demand for a mounting system for the video display panels of a tiled video wall display which enables selected panels to be ejected from the wall, serviced or replaced, and returned into the wall, reliably and simply.

In a broad aspect of the present invention, there is provided a video wall assembly comprising a framework supporting a plurality of juxtaposed video panels carried on one or more ejector carriages; wherein each said ejector carriage is moveable between a retracted position in the wall, and an extended position out of the wall, into which it is urged by biasing means; wherein each carriage is associated with latch means adapted to retain the carriage in its retracted position; wherein the latch means is releasable manually from an access position below the array, to allow the carriage to eject the associated panel from the wall to the extended position; and wherein the latch is adapted to automatically re-engage on manually returning the carriage into the wall against the biasing means.

Thus the invention offers a solution to the problem of releasing a panel from a video wall when there is little free surface over the wall that is not occupied by display surfaces, and in the
interests of minimising interruptions to the total tiled display screen borders are desired to be minimised in width, thus effectively ruling out front controls. Approaches to this problem that require a cyclical latch mechanism responsive to successive repeated pushes on the panel are very difficult to engineer reliably, and while one central latch controlling the panel may have a relatively simple on-off cycle, there is some risk of the panel screen not settling to an entirely flush position in the tiled display; but if separate latches are used at opposite sides of the panel, to improve display screen alignment, there are risks of one latch disengaging while the other remains engaged, further attempts reversing the two latches and not improving the situation, and so on.

More specifically, in a preferred aspect, there is provided a video wall assembly comprising a framework supporting a plurality of juxtaposed video panels in a tiled array, and one or more ejector carriages each carrying one of said plurality of panels. The number of ejector carriages may be equal to the number of panels. In cases where the edge panels of the wall are relatively easily accessible, the edge panels may not need to be provided with ejector carriages. However, each panel that is surrounded by other panels will advantageously be carried on an ejector carriage. Each panel in the top row of a tiled array may advantageously be carried on an ejector carriage, especially panels that are not at the ends of the top row.

Suitably, each ejector carriage is moveable between a retracted position in which the screen of the video panel carried on the carriage is flush with adjacent screens in the wall, and an extended position in which the video panel carried thereon stands out of the wall, clear of said adjacent panels. The framework of the video wall assembly is the composite structure that carries all the panels and supports their weight; the ejector carriages move in relation to this framework.
Accordingly, each ejector carriage is subject to biasing means acting between the carriage and the framework to urge it from its retracted position to its extended position. The carriage may be built and fitted in the framework in a wide variety of ways.

Mechanical engineers are familiar with a wide variety of linkages that may be used for this purpose. Generally, the ejector carriage will be required to follow a straight-line motion out of the wall, at least in its initial movement, to avoid interference from the adjacent panels. Guides may be built into the framework to assist this, and to help carry the load of the heavy panel. A preferred linkage resembles an elementary lazy-tongs with a scissor action, in which the carriage is connected to the framework by two parallel pairs of links (one pair located on each side of the carriage), each pair being pivoted together at their midpoints, one end of one link being pivoted on the framework, one end of the other link being pivoted on the carriage, and the other ends of the two links being constrained to run in parallel guides on the framework and carriage respectively.

The biasing means may take many forms, according to all manner of considerations applying to any given installation. Generally, manufacturing considerations point to simple mechanical springs, such as coil springs. Gas springs may in some cases be an acceptable alternative, or even a system of weights and pulleys.

Each carriage may be associated with latch means operative between the carriage and the framework, adapted to retain the carriage in its retracted position against the biasing means. The latch means is suitably releasable manually by means of an actuator extending downwardly from the latch means behind the tiled array of video panels to an access position below the array. The actuator may take a variety of forms; it may be rigid or somewhat flexible, as in a rod, or a composite of part rigid and part flexible, but it is particularly preferred that the actuator be both flexible and simple, and for this reason a cord or the like is favoured. A flexible cord has a particular advantage when the carriage is
provided with latch means comprising two paired latches, one acting on each side of the carriage, as may be desired for improved location of the screen flush with the adjacent screens in the wall. Such a cord may be connected at one end with one of the latch means, and at the other end with the other latch means, so a downward manual pull by an operator on the approximate centre of the cord, which will be at or near its lowest part, can release both latches in one actuating movement.

On release of the latch means, the carriage is free to respond to the biasing means and eject its associated panel out of the wall to the extended position; and the latch is suitably adapted to automatically re-engage on manually returning the panel on its carriage into the wall against the biasing means, whereby once more to retain the carriage in its retracted position. Latch designs that automatically engage on closure are of course extremely well known as such. Preferred latches are discussed in relation to the specific example shown and illustrated in the accompanying drawings.

In a further aspect, the invention provides a video wall incorporating one or more of the elements of the invention discussed above. Thus, the invention includes a video wall assembly comprising an array of juxtaposed video display panels having their respective display screens aligned on a common plane or other surface, wherein at least one said display panels is supported on an ejector carriage that is manually releasable by means of an actuator extending downwardly behind the panels and accessible from below the array.

In an array including one panel above another, the respective actuators are desirably of different lengths, corresponding to the different elevations of the panels. In this way both or all may be operable from one access point below the screen array in the wall. The actuators may be distinguished from one another by position, shape, colour, or any other convenient means, so that an operator
can readily identify which actuator controls which panel. Alternatively, the panels can be ejected in sequence from the bottom up, ejection of each lower panel exposing the actuator of the panel above.

5 BRIEF DESCRIPTION OF THE DRAWINGS

An embodiment of the invention is illustrated by way of example in the accompanying drawings, in which:-

Figure 1 is a front perspective view of a video wall assembly consisting of a 4 x 4 array of sixteen rectangular video display panels on a supporting structure;

Figure 2 is a similar view to Figure 1 with the video display panels removed, to show the underlying panel support structure, including an array of sixteen identical panel mounting units clamped to a columnar framework;

Figure 3 is a front perspective view of an individual display panel mount suitable for use in a video wall of the kind shown in Figures 1 and 2 in accordance with the principles of this invention, with an ejector carriage shown in its extended position;

Figure 4 is a side elevation of the mount as viewed from the left in Figure 3; and

Figure 5 is an enlarged perspective view of a latch block utilised in the mount.

DETAILED DESCRIPTION OF THE INVENTION

25 In Figure 1 of the drawings, a video wall assembly 10 is illustrated, comprising a set of sixteen rectangular flat video display panels 12, arranged as a grid of four abutting horizontal
rows and vertical columns. Each panel has a casing 14 with a forward-facing rectangular screen 16 surrounded by a bezel 18. In use, the screens form sixteen adjacent tiles constituting a larger composite display covering the front of the wall, interrupted by narrow mullions where adjacent bezels meet. The display screens of the several panels themselves may be any of the various kinds used for video walls, such as, but not limited to, LCD (liquid crystal display) screens and LED (light emitting diode) screens.

The panels 12 are supported on a rigid framework 20, shown in Figure 2, of vertical columns 22 and horizontal braces 24, connected by clamps 26. In Figure 2, there are sixteen individual panel mounts 28 supported by framework 20 in positions corresponding to the sixteen panels 12, and a further sixteen back-to-back with the first sixteen on the far side of the framework, so that the video wall may be two-sided. Such a wall is one in which there is insufficient space behind the panels to permit access for a technician, so the pop-out solution is adopted for service access to the rear of the panels.

The individual panel mounts 28 are supported by fittings clamped into desired positions on columns 22. Each mount includes a pair of laterally spaced apart substantially vertically disposed elongate hangers 29a, which will be attached to the VESA mounting points on the backs of the video panels 12. The hangers are carried on a substantially horizontal video panel support rail 29b. Mounts 28 are replaced, in accordance with the invention, by modified mounts 30 incorporating the ejector carriage illustrated and described in relation to Figures 3 to 5.

As shown in Figures 3 and 4, the modified mount 30 includes a rearward portion 32 which, by means of an articulated linkage 34, is connected to and supports a forward portion 36 including a substantially horizontal video panel support rail 38. The rearward portion is bolted, clamped, or otherwise firmly fastened to, the
framework 20. The forward portion and its associated linkage
together constitute the ejector carriage.

A laterally spaced pair of composite elongate hangers 40
constitute separable elements of mount 30. These hangers are, in
use, screwed to the VESA pattern of screw holes which, in
practice, all flat video display panels 12 provide on the rear of
their casings 14. Hangers 40 enable the panel to be first hung,
then clamped, on to rail 38, and the position of the panel's
display screen 16 finely adjusted. In the course of the assembly
and servicing of the individual panels in the video wall assembly,
it is convenient, as noted, for the technician to work with the
panel projected forward, out of the wall, before causing the panel
to retract into the wall and assume its operating position. The
most convenient way to retract the panel into the wall is simply
to push it in, and rely on a latch mechanism in the mount to
retain it there.

Before dealing with the latch mechanism, it is convenient to
describe the articulated linkage 34. This is formed in two parts,
located towards the left and the right sides of the mount
respectively, which are mirror images of one another. Each part
comprises two stiff links 42, 44, of substantially equal length,
which cross and are pivotally connected at their centre points 46.
An upper end of link 42 is pivotally connected to a fixed upper
point 48 on the rearward portion of the mount 30. An upper end of
link 44 is pivotally connected to a fixed upper point 50 on the
forward portion of the mount 30, at the same height as point 48.
The opposite lower end of link 42 is retained in a vertical guide
slot or channel on the forward portion of the mount, below point
50. In the right hand linkage, as seen from the front of the wall,
the opposite lower end of link 44 is fast with the right hand end
of a horizontal connecting bar 52, while in the left hand linkage,
the corresponding end of link 44 is fast with the left hand end of
the connecting bar. Each end of the connecting bar is retained in
a parallel vertical guide slot or channel 54 on the rearward portion of the mount, below the right and left points 48.

The result of these connections is that the articulated linkage 34 allows the forward portion 36 of the mount to move horizontally towards and away from the rearward portion 32, between the extended position shown in Figures 3 and 4 and a closed position in which the two portions abut one another and the linkage is closed, the lower ends of links 42 and 44 having travelled to the bottoms of their respective guides. Since the lower ends of links 44 are connected by rigid bar 52, the motions of the two linkages are co-ordinated at all times.

Biasing means in the form of a coil spring or springs (not visible in the drawings) urge the connecting bar upwards at all times. The preferred springs are two in number, both tension springs, one contained in each upright 56 of the rearward portion of the mount, or one or a spaced apart pair of compression springs acting between the connecting bar and the lower horizontal rail 58 of the rearward portion. Other alternatives may also be employed.

Latch means illustrated in Figure 3 to 5 are, like the linkages 34, duplicated in left and right mirror-image form adjacent the two linkages. Each latch comprises a simple rearwardly-directed catch 60 pivotally mounted about a horizontal axis on the forward portion of the mount, and a releasable engagement mechanism 70 on the rearward portion facing the catch and adapted to receive it when the mount is closed.

The catch 60 (Fig. 4) comprises a small plate mounted on a pivot pin 68 so as to extend generally horizontally towards the engagement mechanism 70, and has a nose portion 62 aligned with the engagement mechanism, the nose portion including an inclined ramp 64 in front of a detent 66.
Engagement mechanism 70 (Fig. 5) comprises a mounting plate 72 with screw holes 74 for affixing it to upright 56. The plate includes a catch-receiving slot 76 for receiving the nose of catch 60, and a lateral guide slot 78 for receiving and guiding a projecting tongue 82 of a vertically movable keeper plate 80 that is retained between the plate 72 and the upright 56. Keeper plate 80 is provided with its own slot for receiving the nose of catch 60 behind mounting plate 72; this slot has a lower lip 84 that is exposed in the lower part of catch receiving slot 76. The keeper plate is provided with a through hole 88 towards its lower end, for the attachment of one end of an actuating cord 90 (Figs. 3 and 4) which connects the keeper plates of the two opposite latches, running through guide apertures in the bottoms of the respective uprights 56. A tension spring 94 in the engagement mechanism 70 pulls upwardly on the keeper plate at all times.

When the ejector carriage is pushed closed against the rearward portion of the mount, against the force of the biasing means, nose 62 of catch 60 enters slot 76; the ramp 64 of the catch runs over lip 84 of the keeper plate, lifting the nose of the catch as it enters, until the detent 66 drops over the lip and retains the latch means closed. Upon an operator pulling down on cord 90, the two keeper plates at the two ends of the cord are pulled down against return springs 94, so that the lips 84 withdraw from the detents 66, and the carriage can be ejected from the wall by the biasing means. Catch 60 is supported so that nose 62 cannot fall after the descending keeper plate lip 84, but remains in the horizontal orientation illustrated in Figure 4.

Variations on this exemplary latch means may be employed. Functional parts may be replaced by equivalents, or reoriented, or both, and in some cases it may in some designs be appropriate to pass the cord around a pulley wheel to change the direction in which it acts. It is possible for all four corners of a rectangular video panel to be latched without loss of one-handed ejection, by duplicating the latch top and bottom on each side of
the mount, and connecting the keeper plate of the lower latch to the keeper plate of the upper latch above it, so that both move in unison when the lower keeper plate is pulled down.

Cord 90 may be made of any suitable material, such as woven plastics fibre, whether polyamide (nylon), polyester, or other material. A pull cord should be acceptably inelastic, to be effective. Other elongate flexible members with similar functional characteristics, such as flexible straps, may be employed. Rods may be substituted for the cord 90, or other actuating means may be devised. It is however very desirable that the means chosen should be readily accessible by hand of an operator below the bottom row of video panels in a video wall assembly of the kind shown in Figure 1.

It will be appreciated that by means of the present invention, the operation of ejecting a video panel from a video wall can be made simple, reliable, and economical, in which an operator can one-handedly eject even a panel that has a plurality of latches. Importantly, ejection is accomplished without the need for manual pressure on the screen with its consequential risk of handprints, smears and other marking of the screen surface.

Other changes and modifications within the scope of the invention will be apparent to those skilled in the art.
CLAIMS

1 A video wall assembly comprising an array of juxtaposed video display panels having their respective display screens aligned on a common plane or other surface, wherein at least one of said display panels is supported on an ejector carriage that is manually releasable by means of an actuator extending downwardly behind the panels and accessible from below the array.

2 A video wall assembly according to claim 1 comprising a framework supporting a plurality of juxtaposed video panels carried on one or more ejector carriages; wherein each said ejector carriage is moveable between a retracted position in the wall, and an extended position out of the wall, into which it is urged by biasing means; wherein each carriage is associated with latch means adapted to retain the carriage in its retracted position; wherein the latch means is releasable manually from an access position below the array, to allow the carriage to eject the associated panel from the wall to the extended position; and wherein the latch is adapted to automatically re-engage on manually returning the carriage into the wall against the biasing means.

3 A video wall assembly according to claim 1 or 2 wherein each panel that is surrounded by other panels is carried on an ejector carriage.

4 A video wall assembly according to claim 1 or 2 wherein each panel in the top row of a tiled array not at the ends of the top row is carried on an ejector carriage.

5 A video wall assembly according to any one of the preceding claims wherein each ejector carriage is moveable between a retracted position in which the screen of the video panel carried
on the carriage is flush with adjacent screens in the wall, and an extended position in which the video panel carried thereon stands out of the wall, clear of said adjacent panels.

6 A video wall assembly according to any one of the preceding claims wherein the ejector carriages are connected to a framework for the video wall by two parallel pairs of links, one pair located towards each side of the carriage, each pair being pivoted together at their midpoints, one end of one link being pivoted on the framework, one end of the other link being pivoted on the carriage, and the other ends of the two links being constrained to run in parallel guides on the framework and carriage respectively.

7 A video wall assembly according to any one of the preceding claims wherein biasing means for the ejector carriages are selected from mechanical springs, gas springs, and systems of weights and pulleys.

8 A video wall assembly according to any one of the preceding claims wherein each carriage is associated with latch means operative between the carriage and the framework, adapted to retain the carriage in its retracted position against the biasing means, and releasable manually by means of an actuator extending downwardly from the latch means behind the array of video panels to an access position below the array.

9 A video wall assembly according to claim 8 wherein the actuator comprises a flexible cord.

10 A video wall assembly according to claim 8 wherein an ejector carriage has two said latch means, and the downwardly extending actuator comprises a flexible cord having opposite ends connected to the two latch means respectively, hanging downwardly between them.
11 A video wall assembly according to any one of claims 8 to 10, wherein the wall includes one panel above another, and the respective actuators are of different lengths, corresponding to the different elevations of the panels.

12 A video wall assembly according to any one of claims 8 to 11 in which the actuators are distinguishable from one another by position, shape, or colour.

13 A video wall assembly according to any one of claims 8 to 10 arranged so that ejection of a lower panel exposes the actuator of a panel above.

14 A video wall assembly according to any one of the preceding claims wherein the ejector carriages are connected to a framework for the video wall by two parallel linkages, one located towards each side of the carriage, and arranged so that a carriage is moveable horizontally towards and away from the framework, between an extended position out of the wall and a retracted position against the framework, biasing means urge the carriage into the extended position, and releasable and re-engageable latch means retain the carriage in the retracted position.

15 A video wall assembly according to claim 14 wherein the latch means are duplicated in left and right mirror-image form adjacent the two linkages.

16 A video wall assembly according to claim 14 or 15 wherein each latch means comprises a pivotally mounted catch and a releasable engagement mechanism facing the catch and adapted to receive it when the carriage is retracted.

17 A video wall assembly according to claim 16 wherein the catch is pivotally mounted about a horizontal axis and comprises a member mounted on a pivot pin so as to extend generally horizontally towards an engagement mechanism, and has a nose
portion aligned with the engagement mechanism, the nose portion including an inclined ramp in front of a downwardly facing detent; the engagement mechanism comprises a mounting plate including a catch-receiving slot for receiving the nose of the catch, and a keeper provided with a slot for receiving the nose of the catch behind the mounting plate, said slot having a lower lip exposed in the lower part of catch receiving slot whereby it can engage the detent of the pivoted catch; spring means pull upwardly on the keeper; and a downwardly extending actuator is connected to the keeper, whereby it may be lowered against the spring means to release the detent.

18. A video wall assembly according to claim 17 wherein the actuator comprises a flexible cord.
Application No: GB1408576.5
Claims searched: 1-18

Examiner: Mr Michael Bate
Date of search: 28 October 2015

Patents Act 1977: Search Report under Section 17

Documents considered to be relevant:

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<td>US2013/0075551 A1 (STIFAL) Whole document relevant, see particularly figures 1-5, 11 and 12 showing a mounting carriage for mounting a display in a video wall, wherein the carriage comprises a releasing lever 114 extending downwardly behind the display.</td>
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Field of Search:

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC:

Worldwide search of patent documents classified in the following areas of the IPC

F16M; H04N; H05K

The following online and other databases have been used in the preparation of this search report

EPODOC, WPI

International Classification:

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