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Work Station Aperture Frame with Joining Appendages

Field of the Invention

This invention relates to component support apparatus for association with working platform apertures and, more particularly, component support apparatus having an aperture frame with joining appendages whereby various components can be connected with such appendages and supported thereby.

Background of the Invention

Below a working platform, as in a work station, it is frequently necessary to connect or attach components to work station interior surfaces, that is, surfaces that are under or beneath the work station working platform. The components can vary widely and have many different shapes, sizes, weights and functions, as is well known. For example, when a work station is provided with an aperture in the working platform, and a flat monitor is positioned in the work station interior for work station user viewability through the aperture, it is necessary to provide an appropriate support for the monitor. For another example, a keyboard support tray may be desired that slides reversably under and out from the working platform. Both the monitor support and the slide mechanism for the keyboard tray must be mounted to work station interior surfaces.

As is well known, the attachment of various components to work station interior surfaces, especially knee-hole surfaces, is typically regarded as a time-consuming, labor-intensive undertaking that requires the installing person to assume awkward, uncomfortable positions. Moreover, the attachment of components can involve various mounting, safety and other problems as when a work station incorporates into its structure materials requiring specialized fasteners or fastening techniques.

Certain components that need to be located beneath and/or in the immediate vicinity of a viewing aperture in a working

platform present additional special problems. For example, flat monitors that are to be located immediately below a windowed aperture need unobtrusive supports that do not encumber knee hole surfaces or interior space that is needed for the knees of a user.

There is a need in the art for improved apparatus and techniques for attaching components to work station interior surfaces, particularly for purposes of locating components at or near the vicinity of a viewing aperture in a work station working platform.

Summary of the Invention

This invention is directed to component support apparatus for association with a working platform that has an aperture defined therein. The apparatus incorporates an aperture frame, at least one joining appendage which outwardly extends from an adjacent edge portion of the aperture frame, and connecting elements for interconnecting each joining appendage with the aperture frame.

An aperture frame associates with perimeter portions of an aperture defined in a working platform. Usually, the working platform is associated with a work station. An aperture frame can have a unitary structure or can be comprised of a plurality of frame components. Preferably, an aperture frame extends continuously about the aperture, but an aperture frame may extend or associate only with a portion of an aperture perimeter.

Joining appendages extend outwardly from edge portions of an aperture frame. Such edge portions are generally located on or along the lower or interior side portions of an aperture frame that has been associated with an aperture. Thus, the joining appendages extend away from working platform bottom surface portions and into, typically, interior regions of an associated work station located beneath the working platform and below the aperture.

Connection means or elements interconnect joining appendages with the aperture frame. The connection means can unitarily connect joining appendages with the aperture frame. Alternatively, the joining appendages can be separate and connected to the aperture by a fastening means which is preferably releasable or adjustable. Various connection means or elements can be employed, and various connection locations in an joining appendage and in an aperture frame can be utilized for individual joining appendages that are positioned along or adjacent to an aperture frame lower side edge portions.

The joining extensions or appendages are connectable to components and enable the components to be supported or suspended from a working platform in the vicinity of the aperture in, for example, a work station interior.

Owing to the versatility of contemporary construction techniques, an aperture frame and the so connected and cooperating joining appendages can be variously constructed. In one form, for example, the aperture frame and the joining appendages can be unitarily formed as a single, one-piece structure comprised of molded plastic or the like. In another form, for example, the aperture frame, the joining extensions, and the connecting elements can be separately formed, and, in fact, each can be comprised of a plurality of cooperating sub-components or elements. In still another form, for example, the aperture frame, the joining components, and the connecting elements can be in part unitarily formed and in part comprised of a multiplicity of cooperating elements. The choice of structure for a given embodiment of the inventive component support apparatus depends upon many variables including the contemplated use environment and the desires of the fabricator and/or the user.

The inventive combination is easy and economical to fabricate, durable, reliable, easy to install, easy to utilize, safe, and versatile.

The inventive support apparatus circumvents and avoids problems otherwise associated with the positioning and mounting of components below a working platform or in a work station interior.

The inventive cooperative combination of aperture frame and joining extension, or appendage, means greatly facilitates the problem of attaching a component or components to work station interior surfaces, especially surfaces beneath the working platform and adjacent to a viewing aperture in the working platform. Various components that are to be supported and positioned beneath a working platform may be easily and simply associated with and positioned by the joining appendages. If desired, an arrangement can be such that components can be readily and simply dissociated from the joining appendages, or the joining appendages can be provided so as to be movable or relocatable relative to an aperture frame. The aperture frame is adapted to support in a safe and reliable manner components associated with the joining extensions or appendages.

The joining appendages not only can function as joining posts, but also can function as spacing and positioning arms, for purposes of connecting a component to interior regions of a work station or to the vicinity of an aperture in a working platform.

A very wide variety of components can be associated with the interior of a work station in a simple, easy, and effective manner.

Various other features, aspects, embodiments, objects, aims, purposes, applications, and the like for the present invention will be apparent to those skilled in the art from the present description taken with the accompanying drawings.

Brief Description of the Drawings

In the drawings:

Fig. 1 is a perspective, environmental view illustrating a work station equipped with an embodiment of the inventive support apparatus;

Fig. 2 is a perspective view of the support apparatus of Fig. 1 shown apart from the work station and with the associated aperture window shown fragmentarily, the support apparatus being unitarily formed, and the support apparatus being illustratively adjustably attached to a flat monitor support platform;

Fig. 3 is a transverse sectional view taken medially through the support apparatus of Fig. 2 with the illustrative flat monitor support platform supporting a flat monitor (the flat monitor being shown in phantom);

Fig. 4 is a perspective view of the flat monitor position adjustment cross-bar employed in the flat monitor support platform illustrated in Figs 3 and 4 for flat monitor position and elevation adjustment; .

Fig. 5 is a perspective view of one of the four substantially identical aperture frame corner components employed in the aperture frame of the combination assembly of Figs. 1,2, and 3;

Fig. 6 is an exploded perspective view of the support apparatus of Figs. 1 - 3 with the apparatus being illustratively in combination with the flat monitor support platform;

Fig. 7 is an exploded perspective view of another embodiment of the inventive support apparatus, the support apparatus being illustratively shown in combination with a flat monitor support platform;

Fig. 8 is a fragmentary assembled view of the support apparatus of Fig. 7 in the illustrative combination with the flat monitor support platform, some parts being broken away, and a flat monitor being shown in phantom, this view illustrating the manner in which the components of the support apparatus cooperate to provide a means for supporting the flat monitor support platform;

Fig. 9 is an exploded perspective view of another embodiment of the inventive support apparatus, this embodiment being similar to that shown in Figs. 7 and 8, but wherein here alternative aperture frame corner components are provided;

Fig. 10 is a perspective view of another embodiment of the inventive support apparatus, this embodiment being shown in illustrative cooperative combination with components of a flat monitor support platform;

Fig. 11 is a perspective view of another embodiment of the inventive support apparatus, this embodiment being shown in illustrative assembly with a detachable cooperating flat monitor support platform;

Fig. 12 is a fragmentary, enlarged, exploded perspective view of the assembly of Fig. 11 showing details of the assembly and of the flat monitor support platform;

Fig. 13 is a fragmentary perspective view of another embodiment of the inventive support apparatus, the combination being shown with the aperture frame in functional association with an aperture in a working platform, some parts being broken away and some parts being shown in section, the support apparatus being shown in illustrative combination with a support rack for a monitor support;

Fig. 14 is a vertical sectional view taken along the line XIV-XIV of Fig. 13 through a portion of the combination assembly of Fig. 13 illustrating the structure of the joining extension;

Fig. 15 is a view similar to Fig. 14 but taken along the line XV-XV of Fig. 13 and illustrating the structure of another portion of the joining extension;

Fig. 16 is a fragmentary perspective view of joining extension of the Fig. 13 embodiment apart from the aperture frame but in combination with the rail of a keyboard support tray;

Fig. 17 is a fragmentary perspective view of another embodiment of the inventive support apparatus, this combination assembly being shown in illustrative combination with an adjustable flat monitor support platform;

Fig. 18 is a side elevational, enlarged view of the left-hand joining extension provided in the assembly of Fig. 17;

Fig. 19 is a side elevational, enlarged view of the right-hand joining extension provided in the assembly of Fig. 17;

Fig. 20 is a vertical sectional view taken along the line XX-XX of Fig. 19; and

Figs. 21-35 show alternative structures of joining components.

Detailed Description

Referring to Figs. 1 through 6, there is seen an embodiment 30 of a component support apparatus of the present invention. The apparatus 30 is illustratively and functionally associated with an illustrative work station 31 that has a thickened working platform 32. The platform 32 is supported in a generally horizontal orientation by panels 34, 35 and 36, or otherwise as may be desired. Between panels 34 and 35, a kneehole 37 is provided, and between panels 35 and 36 a shelf 33 is provided which may be used for holding a computer or computer components, if desired. The platform 32 is provided with a viewing aperture 38 that is located over the kneehole 37. Various work station structures can be used, as will be readily apparent to those skilled in the art. An illustrative flat monitor 39 is supported in the aperture 38 by the apparatus 30.

The apparatus 30 incorporates an aperture frame 42 and joining appendages 43, 44, 45 and 46. The components of the support apparatus 30 are conveniently comprised of molded plastic. However, metal or other construction materials may be employed, if desired.

Separately formed back piece 41A and separately formed front piece 41B, which likewise are conveniently comprised of plastic (preferred), metal, or the like, taken together comprise a flat monitor support platform 41. Pieces 41A and 41B illustrate components that are connected to and supported by the joining appendages 43 - 46, as further explained below.

The aperture frame 42 is comprised of multiple components. Thus, in the aperture frame 42, the opposite end components 82 and 83, respectively, comprise one type of component used in aperture frame 42, and each of the four corner components 84, 85,

86 and 87, respectively, comprise another type of component used in aperture frame 42. The members of each of these component types is preferably identically configured, thereby permitting these two respective component types to be formed using the same or identical molds, as those skilled in the art will readily appreciate.

The opposite side components 88 and 89, respectively, complete the structure of the aperture frame 42. The side components 88 and 89 are regardable as being mirror images of each other, and these components 88 and 89 are each separately formed using similar but separate molds, as those skilled in the art will readily appreciate. Lower edge portions of the side component 88 incorporate unitarily the proximal end portion of each of the joining appendages 43 and 44, while the lower edge portions of the opposite side component 89 incorporate unitarily the proximal end portion of each of the joining appendages 45 and 46. The joining appendages 43 - 46 are flattened. The components 88 and 89 are preferably symmetrically formed so that, in the assembled aperture frame 42, the joining appendages 43 and 45 are aligned opposite one another while the joining appendages 44 and 46 are aligned opposite one another, and hence these respective appendage pairs are in spaced, parallel relationship relative to each other.

Preferably, the respective opposite end portions of each of the end components 82 and 83, the side components 89 and 88, and the corner components 84, 85, 86, and 87, of the aperture frame 42 are provided with a tongue and groove type of configuration that permits adjacent, abutting end portions of end-adjacent components engage and lock together preferably in a snap-fit relationship around the perimeter of an aperture 38.

Preferably, when assembled and installed in an aperture, the completed aperture frame 42 includes a continuously extending out-turned shoulder 51, a continuously extending upper inside surface portions 52 for association with an (optional but preferred) window 53 that covers the aperture 38, and a

continuously extending in-turned ledge 54 for enhancing support of window 53 as received within portions 52 and as supported by the aperture frame 42.

The joining appendages 44 and 46 are in embodiment 30 longer in length than the joining appendages 43 and 45. The arrangement of the joining appendages or components 43, 44, 45 and 46 relative to the assembled aperture frame 42 is such that, when the respective distal end portions of the are connected as below described to respective adjacent portions 41A and 41B that comprise the flat monitor support platform 41, the platform 41 is inclined relative to the aperture frame 42 at a fixed but preselected angle preferably chosen for flat monitor screen viewability. The lengths of joining appendages can be varied, as those skilled in the art will appreciate.

Particularly as the flat monitor support platform 41 is connected to the appendages 43 - 46, the platform 41 can be regarded as having a flat bottom area 91. The back piece 41A defines a flat back collar 92 that has unitarily interconnected opposed short collar side extensions 93 and 94. The front piece 41B defines a flat front collar 95 that has unitarily interconnected opposed collar side extensions 96 and 97. The upper surfaces of the collars 91, 92, 93, 94, 95 and 97 are coplanar relative to one another. The central region between the back collar 92 and the front collar 95 is open which can be considered to enhance the connectability with wires (not shown), and the heat dissipation of, a flat monitor (not shown) that rests upon and over the bottom area 91.

About outer edge portions of the collars 95, 96 and 97, an upstanding flat monitor retaining flange 100 is unitarily provided and continuously extends.

Through a distal portion of each of the joining appendages 43 - 46 an aperture 47 is defined. On each of the opposite sides of the back piece 41A and also of the front piece 41B is provided a unitarily joined upstanding tab 98. Each of the tabs 98 has an aperture 99 defined therethrough. The tabs 98 and their

respective apertures 99 are located so as to be positioned in a desired adjacent, aligned relationship with the preferably similarly sized aperture 47 in each joining appendage 43 - 46. A plurality of apertures 47 can be provided for adjustability purposes. An interconnecting bolt 48 is extended through each of the respective aligned aperture pairs 99 and 47 and each bolt 48 is threadably associated with a nut 49 thereby completing connection therebetween. Preferably, the bolts 48 and the nuts 49 are comprised of plastic. To provide convenient manual planar alignment of the surfaces of collars 92, 93 and 94 with the surfaces of the collars 95, 96 and 97 at the time when the nuts 49 are tightened, the distal lower end of each of the joining appendages 43 - 46 extends diagonally to the same extent so that collar portions adjacent to these distal lower ends can be manually or visually aligned. To reduce a tendency for the lower piece 41B to pivot about its associated bolts 48 in response to a torque force effectively applied, for example, against collar 95, the terminus at each opposite end of the retaining flange 100 is located so as to abut against the distal end edge portion of each of the joining appendages 44 and 46.

When installing a combination support assembly 30 in the preformed aperture 38 of a working platform 32, various procedures can be utilized. For example, the inter-connected structure comprising the aperture frame 42, the joining appendages 43 - 46, and the flat monitor support platform 41 may be positioned at the aperture 38 and the aperture frame 42 may be associated with the perimeter of the aperture 38. In another procedure, the aperture frame 46 with its interconnected joining appendages 43 - 46 downwardly projecting therefrom may first be associated with the aperture 38 and then the platform 41 appendages connected thereto by operating through the aperture 38.

To permit regulation of both the position and the inclination of a flat monitor 39 (shown in phantom in Fig. 6) on platform 41 relative to an overlying window 53, when the monitor

39 is supported by the platform 41, an adjustable cross bar 57 or the like is provided for the platform 41.

The cross bar 57 is adapted to extend almost across the width of the platform 41. On the cross bar 57 bottom surface, adjacent each of its opposite ends, a downwardly projecting peg leg 58 is provided. In the collars 96 and 97, adjacent each of their respective lateral sides, a series of holes 59 is provided. The holes 59 are in spaced, parallel relationship to each other and to each such adjacent lateral side, and the spacing between the holes 59 laterally taken across the platform 41 corresponds to the spacing between the peg legs 58 with the holes 59 taken in pairs being matching and aligned. Thus, the cross bar 57 is adjustably positionable across the platform 41 relative to a selected top to bottom location (on platform 41) by inserting the peg legs 58 into selected hole 59 pairs.

A feature of the cross bar 57 is that it has reversible opposite side faces 61 and 62 that can be exchanged with one another. Thus, face 61 extends generally continuously and perpendicularly relative to the bottom face of cross bar 57. The opposed face 62 extends generally diagonally relative to the bottom face of cross bar 57 so that the height of this face 62 increases with increasing transverse distance from its start at the bottom face and proceeding towards the face 61. This diagonally extending face has a series of flat surfaced steps or clefts 63 defined therein. The respective flat clefts 63 permit a back edge region of a flat monitor 39 to rest thereon and be supported thereby. Thus, once a cross bar 57 position on platform 41 is selected, if the diagonal, stair-stepped clefts 63 on face 62 face generally towards the flat monitor 39 on platform 41, then the tilt angle of the flat monitor 39 relative to apparatus 30 and window 53 can be adjusted by selecting a particular step 63 upon which to rest the flat monitor 39 frontal back edge region. If, alternatively, the flat face 61 faces towards the flat monitor 39 on platform 41, then only the

position of the flat monitor 39 on platform 41 is adjustable by the cross bar 57.

Referring to Figs. 7 and 8, there is seen an embodiment 70 of a component support apparatus of the present invention. The apparatus 70 is functionally associatable with the aperture 38 of the working platform 32 of the work station 31 or otherwise.

The apparatus 70 incorporates an aperture frame 72 and joining appendages 73, 74, 75 and 76. The components of the apparatus 70 are conveniently comprised of molded plastic. However, metal or other construction materials may be employed, if desired.

A separately and unitarily formed flat monitor support platform 77 illustrate a component that is connected to and supported by the joining appendages 73 - 76, as further explained below. Platform 77 may be comprised of molded plastic or metal or otherwise if desired.

The aperture frame 72 is comprised of multiple components. Thus, in the aperture frame 72, the opposite end components 102 and 103, respectively, as well as the opposite side components 104 and 105 comprise one type of component used in aperture frame 72. Except for differences in the length of component pairs 102 and 103 compared to component pairs 104 and 105, these components are preferably identically configured, thereby permitting these respective components to be fabricated using similar molds, as those skilled in the art will readily appreciate.

Here, the distal portion of each of the joining appendages 73 - 76 outwardly extends from an edge portion of a different one of each of the corner components 106, 107, 108 and 109, respectively, used in the aperture frame 72. The proximal portion of each joining appendage 73 - 76 is unitarily connected to its associated corner component 106 - 109, respectively. Each joining appendage 73 - 76 is configured to follow a portion of the curvature of the associated corner component 106 - 109 so that each joining appendage has the capacity to be used for component connecting in either a cross-wise or a transverse

direction relative to an assembled aperture frame. Two corner components (one pair) 106 and 107 are unitarily formed with similar joining appendages 73 and 74, and the other two (another pair) corner components 108 and 109 of the required four corner components are unitarily formed with similar joining appendages 75 and 76. The joining appendages 75 and 76 are substantially longer in projection length than the length of the joining appendages 73 and 74. These respective pairs of corner components can be fabricated using separate molds.

In the interest of minimizing fabrication costs, all corner components of the aperture frame 72 can be identically comprised with each corner component having a joining appendage of similar projecting length and mounting characteristics. Optionally, the joining appendages could be provided with scores or grooves that would enable one to break away a terminal length of a joining appendage where the initial joining appendage length is excessive for the use intended.

Preferably, the respective opposite end portions of each of the end components 102, 103, the side components 104, 105, and the corner components 106, 107, 108 and 109 of the aperture frame 72 are provided with a tongue and groove type of configuration that permits adjacent, abutting end portions of end-adjacent components engage and lock together preferably in a snap-fit relationship around the perimeter of an aperture.

Preferably, when assembled and installed in an aperture, the completed aperture frame 72 includes a continuously extending out-turned shoulder 78, a continuously extending upper inside surface portions 79 for association with an (optional but preferred) window 53 that covers the associated aperture, and a continuously extending in-turned ledge 80 for enhancing support of a window as received within portions 79 and as supported by the aperture frame 72.

The arrangement of the joining appendages or components 73 - 76 relative to the assembled aperture frame 72 is such that, when the respective distal end portions of the joining components 73 -

76 are connected as below described to respective adjacent portions of the illustrative flat monitor support platform 77, the platform 77 is inclined relative to the aperture frame 72 at a fixed but preselected angle preferably chosen for flat monitor screen viewability. The lengths of joining appendages can be varied, as those skilled in the art will appreciate. An inclination angle of about 30 degrees to about 40 degrees, more preferably about 35 degrees, of the support platform 77 relative to horizontal (the aperture frame 72) is presently preferred in the various embodiments of this invention.

The flat monitor support platform 77 has a flat bottom area 111 that is open in its mid regions, a continuously extending in-turned collar 112 unitarily formed about its perimeter, and an up-turned flat monitor retaining flange 113 unitarily formed about its perimeter.

Through a distal portion of each of the joining appendages 73 - 76, apertures 117 are defined with the elongated joining appendages 75 and 76 each containing a corresponding plurality of apertures 117 arranged along the length thereof. Through the flange 113 at each corner region of the platform 77 an aperture 118 is provided which is so located so as to be positioned in a desired adjacent, aligned relationship with the preferably similarly sized aperture 117 in each joining appendage 73 - 76. An interconnecting rod 114 is extended through the aligned apertures 117 and 118 at the rearward end of the platform 77 and a bolt 115 is threadably associated with each opposite end of the rod 114, thereby making the platform 77 pivotable relative to the aperture frame 72. At the frontal end region of the platform 77, an interconnecting bolt 119 is extended through each one of the apertures 118 and a selected aligned one of the apertures 117 with the platform 77 at a desired inclination angle relative to the aperture frame 72, and each bolt 119 is threadably associated with a nut (not shown), thereby completing connection therebetween. The inclination angle of the platform 77 relative to frame 72 is thus adjustable being dependent upon the aperture

pair 118/117 selected. Conveniently, the bolts 119 and the nuts are comprised of plastic.

When installing a combination support assembly 70 in the preformed aperture (not shown) of a working platform (not shown), various procedures can be utilized. For example, the aperture frame 72 with its interconnected joining appendages 73 - 76 downwardly projecting therefrom may first be associated with an aperture and then the platform 77 may be connected thereto by operating through the aperture.

To permit regulation of both the position and the inclination of a flat monitor 79 that rests upon platform 77, the above described adjustable cross bar 57 or the like may be employed.

Referring to Fig. 9, another embodiment 125 of the inventive apparatus is provided. The apparatus 125 is similar to apparatus 70. Similar elements are similarly numbered, but with the addition of prime marks for identification purposes.

In apparatus 125, the distal end of each of the joining appendages 73', 74', 75' and 76' is provided with an integrally formed inwardly extending leg 126 - 129 each of which is somewhat flexible laterally at the location of jointure with the appendage distal end. Each leg 126 - 129 is flattened and has an elongated slot 131 defined therein adjacent its outer end. In a central region between the appendages, the legs 126- 129 reach a configuration of terminal overlap. When a bolt 132 is extended through the aligned slots 131 of each leg, and the bolt is threadably associated with a wing nut 133, the legs 126-129 cooperate to define a platform that may be used for flat monitor support of a component support apparatus of the present invention. The apparatus 70 is functionally associatable with the aperture 38 of the working platform 32 of the work station 31 or otherwise.

Referring to Fig. 10, another embodiment 130 of the inventive apparatus is provided. In apparatus 130, an aperture frame 140 is utilized that is comprised of multiple components as

in aperture frame 42 of apparatus 30. From a mid region of each one of the frame 140 opposite sides 131 and 133, and also from a mid-region of the frame 130 back side 132, a unitarily formed and outwardly extending joining appendage 134, 136, and 135 extends downwardly. A cross plate 137 extends between the appendages 134 and 136 and is provided with upturned terminal flanges at each opposite end thereof. Each flange of plate 137 is connected by nut and bolt assemblies 139 to the adjacent respective one of the appendages 134 and 136. An elongated transverse plate 138 extends forwardly from the back appendage 135 and is provided with an up-turned flange at each opposite end thereof. The back flange of plate 138 is connected by nut and bolt assemblies 139 to the back appendage 135. The front flange is free and available as a flat monitor retainer. In the region of overlayment between the plates 138 and 137 a retaining nut and bolt 140 are employed. A flat monitor (not shown) can be placed upon the platform thus defined by the plates 138 and 137 in or under the region defined by the aperture enclosed by the aperture frame 140.

Referring to Figs. 11 and 12, another embodiment 143 of the inventive apparatus is seen. The apparatus 143 incorporates an aperture frame 144 that is comprised of multiple components as in aperture frame 42 of apparatus 30. In frame 144, the four corner components are each identically structured, and each of the side and end components is similarly structured, the latter components differing from one another in length as when the frame 42 does not have a square configuration. The frame 144 is thus relatively economical to fabricate. Optionally but preferably the frame 144 has features such as provided in the frame 42.

Each of the side and end components, which are individually identified for convenience as 145, 146 and 147 and 148 in Fig. 11, but end component 147 is representative and used for present descriptive purposes. Component 147 has a pair of laterally spaced hinge leaves 149 and 150 unitarily formed therewith and located in the lower side edge region thereof. These hinge

leaves 149 and 150 are adapted to associate and engage with three laterally spaced matingly associatable hinge leaves, such as hinge leaves 151, 152, and 153 as shown in Fig. 12, so that two of the latter leaves are positioned in aligned relationship with each one of the pair of hinge leaves 149 and 150. Thus, a hinge leaf 151 and 152 is positioned one at each end of leaf 149, and a hinge leaf 152 and 153 is positioned one at each end of leaf 150.

When hinge leaf pair 149 and 150 is thus associated with such a set of three hinge leaves like 151, 152 and 153, a pintle shaft 154, such as shown in Fig. 12, is extended, beginning at end leaf 151 or 153, through the five aligned and interdigitated hinge leaves 151, 149, 152, 150 and 153. Thereby, both sets of hinge leaves are connected together along with the respective two objects joined to such leaves. Such an interconnection also achieves a pivotable (or flexible) interconnection therebetween the connected objects. This arrangement permits one to attach to any component 145 - 148 in the frame 144 a wide variety of individual components so long as such component is itself provided with, and connected (preferably unitarily) to, a set of the three laterally spaced hinge leaves, such as 151, 152, and 153, which set is matingly engagable with such a pair of hinge leaves 149 and 150. The pair of hinge leaves 149 and 150 of component 145 are thus joining components or appendages of the inventive apparatus 143.

Illustratively, in the apparatus 143, the component 145 is employed only as a component of the aperture frame 144 and is not connected by its pair of hinge leaves 149 and 150 to any component. The component 147 of frame 144 is pivotably connected with an adjustable flat monitor support platform 155, the platform 155 thus being pivotable relative to the frame 144.

The platform 155 includes a back platform 156 and a forward platform 157. The back edge portion of the back platform 156 includes the required three leaves for connection with the two leaves of the component 144, and is connected thereto by the pintle shaft 154. Adjacent to its back edge portion, the back

platform 156 is provided with two columnarly arranged and vertically extending rows of aligned slot pluralities, each slot in the left row as shown in Figs. 11 and 12 being identified as 158, and each slot in the right row as shown in such Figs. being identified as 159. Laterally adjacent respective slots 158 and 159 are in spaced but longitudinal alignment with each other.

The back end portion of the front or forward platform 157 is provided with a pair of back extending hook legs 160 and 161 each of which terminates in a flat (that is, latterly broadened) hook member 162 and 163. Each hook member 162 and 163 is adapted to engage a slot in one slot row. The particular slot pair 158/159 engaged by hook members 162/163 determines the forward position of the forward platform 157 relative to the back platform 156. Since the forward platform 157 extends diagonally downwards over the back platform 156, gravity helps keep the hook members 162/163 engaged with a selected slot pair 158/159.

Each of the components 146 and 148 of the frame 144 is connected with a position regulating longitudinally slotted elongated arm 156, the arm 156 being reversible and thus usable on either side of the frame 144. The arm 156 on each such opposite side is transversely aligned with the other as needed for the present platform 155 position regulating purposes. A lateral forward side edge region on each side of the forward platform 157 is provided with an outwardly extending bolt 163 that is aligned with the slot in each arm 156 and a wing nut 164 is loosely engaged with each such bolt 163. To retain the platform 155 in a desired fixed position, the wing nut 164 is tightened.

Referring to Figs. 13 through 16, another embodiment 165 of the inventive apparatus is seen. The apparatus 165 incorporates an aperture frame 166 that is comprised of multiple components as in aperture frame 42 of apparatus 30. In frame 166, the four corner components are each identically structured, and each of the opposite side components is provided with unitarily formed joining appendages. Each side component includes two different

joining appendages in a combined form. One joining appendage comprises a rack support 167 for the conventional side support rack 170 employed to hold one side of a monitor support platform (the platform being conventional and not shown). The other joining appendage comprises a rail 168 for the conventional slide 169 of a keyboard support tray (the tray being conventional and not shown). One side component 171 of the frame 166, here the left side component relative to a user, is illustrative of the other side component and so only the one side component 171 is herein shown and described.

The rack support 167, as is particularly shown in Fig. 13, is functionally or in effect an elongated flattened hook that is configured to extend lengthwise along and under the top cross member 167A of a side support ladder-type monitor support rack 170 (the rack being known to the prior art). Once the rack support 167 is functionally associated with an aperture under a working platform, the rack 170 is manually elevated and engaged with (that is, the cross member 167A is hooked over) the rack support 167 which is easily accomplished. Thereby, the rack support 167 supports the rack 170 and allows the rack 170 to hang therefrom.

The rail 168 is illustratively of the slide 169 opposite side overwrapping and supporting type. The top surface of the overwrapping rail 168 is attached to and suspended from an elongated hanger 172. A lateral side of the hanger 172 is integrally formed with a conventional type of elongated connector tongue 173. The tongue 173 is slidably engagable with a mating conventional type of elongated connector groove 174. The appearance in vertical cross-section of the assembled tongue 173 and groove 174 arrangement is illustrated in Fig. 14. Fig. 15 shows the appearance of the groove 174 with the tongue 173 removed therefrom. Fig 15 also illustrates how the groove 174 is unitarily formed and located on a side wall of the rack support 167. Fig. 16 shows the appearance of the rail 168 in operative combination with the slide 169 with the rail 168 being connected

to the elongated connector tongue 173. The connector tongue 173 extends back from the rear end of the rail 178 to permit engagement of the connector tongue 173 with the groove 174.

Referring to Figs. 17 through 20, another embodiment 180 of the inventive apparatus is seen. The apparatus 180 incorporates an aperture frame 181. The frame 181 can be comprised either of multiple components, as in aperture frame 42 of apparatus 30, or can be of unitary one-piece molded construction. The joining appendages 182 of apparatus 180 are separately formed and are configured to extend over and hang from the aperture frame 181. The location of such extension and hanging is optional but is usually dependent upon the type of, or location desired for, a component being connected using the apparatus 180.

Apparatus 180 is here illustratively used for supporting and positioning a flat monitor positioning and holding device 184 of the type employing perpendicularly associated adjustable pairs of cooperating supporting members 186 and 188. The supporting members are here each in the configuration of an angle iron. Each opposite end portion of each member of one pair of supporting members 188 is supported by a different one joining appendage. Here each joining appendage is provided with a plurality of longitudinally spaced apertures 190 located along its length. Similar apertures 192 are defined in supporting members 186. Each aperture 190 and 192 is adapted to receive therein an end adjacent portion of one support member 188. By selecting the location of the joining appendages relative to the aperture frame 181, and by selecting the apertures used for the support member end portions, a flat monitor (not shown) held by device 184 is conveniently located in a desired position in the vicinity of an aperture in a working platform.

As those skilled in the art will readily appreciate from the teachings here provided, the joining appendages can be variously configured and variously classified. For example, the joining appendages may be considered to belong to different types that vary from one another based upon the manner and means by which

the joining appendages are associatable with components to be supported and/or positioned thereby or based upon the type of interconnection employed for associating a joining appendage with an aperture frame or aperture component. If desired, an aperture frame or aperture frame component (as when an aperture frame is comprised of a plurality of components or as when an aperture frame does not extend about the entire perimeter of an aperture but only about a portion or portions thereof) can incorporate unitarily a joining appendage, can be associatable with separately formed joining appendages, or can both so incorporate or separately associate with joining appendages.

In one presently preferred type of inventive apparatus, an aperture frame or aperture frame component is adapted to be associatable (or connectable) with any one of a family of various separately joining appendages, a particular joining appendage differing from others in the family by either the manner in which it connects with the aperture frame or aperture frame component or by the manner in which it connects with component(s). Correspondingly, components can be associated with integrally formed or separately connected connector elements or means that are adapted for interconnection with joining components having distal portions provided with particular connector elements or means. Thereby a single aperture frame or aperture frame component is adapted for an optimized interconnection with any one of various components. A user of the inventive apparatus who desires to associate a particular component with a particular aperture frame can thus select from among the family of joining components associatable with that aperture frame the particular joining components considered by that user to be best suited for supporting and/or positioning that component.

For example, referring to Figs. 21 through 28, there is seen in Fig. 21 a fragment of a side or end component 200 of an aperture frame (not fully shown), the component 200 being connectable to each of the joining components of Figs. 22A through Fig. 28. As shown in Fig. 21, adjacent to and extending

longitudinally along the lower edge portion of the component 200 there is provided a plurality of slots 201 here arranged in symmetrical but lateral spaced side-by-side relationship. A family of variously configured but generally flattened joining components is provided which each have a proximal end portion 202 adapted to be joined to a slot 201 by insertion of the distal end portion through the slot 201. Thus, Figs. 22A and 22B show a joining appendage with a hooked proximal end and a plurality of longitudinally spaced distal end component connecting hooks. Fig. 23 and Fig. 24 show sky-hook type joining appendages, the distal hook of the Fig. 24 joining appendage being reversed relative to the distal hook of the Fig. 23 joining appendage. Fig. 25 illustrates a joining appendage that is longitudinally extended by hooking together two joining appendages of Fig. 24, while Fig. 26 is similar to Fig. 25 except that here an S-type joining appendage of Fig. 23 is hooked to an S-hook having an elongated shank that is provided with a cushioning bumper 203, thereby to achieve a combined structure that acts like a joining appendage of extended length. Figs. 27 and 28 illustrate extended shank S-type joining appendages similar to that shown in Fig. 6 but with the distal hook of Fig. 27 being turned 90 degrees relative to the distal hook of Fig. 28.

For another example, referring to Figs. 29 through 33, there is seen a fragment of a side or end component 210 of an aperture frame (not fully shown), the component 210 being connectable to each of the joining components of Figs. 31 through 33. As shown in Figs. 29 and 30, adjacent to and extending longitudinally along the lower edge portion of the component 210, there is provided a plurality of buttons 212, each offset from the component 210 by a stem, the buttons 212 being here arranged in symmetrical but laterally spaced side-by-side relationship. A family of variously configured but generally flattened joining components is provided which each have a proximal end portion adapted to be joined to a button 212 by insertion of a keyhole aperture 214 in the distal end portion over a button 212 so that

the distal end portion is effectively hooked and locked over the associated button 212. Fig. 33 illustrates a fragmentarily shown flat monitor support platform 215 provided with keyhole apertures adjacent each of its opposite side end regions. Each such keyhole aperture is engaged with a distal end button 212 provided on each one of two joining appendages appropriately connected to an end component 210 and spaced from one another. Thus, the platform 215 is supported beneath an aperture at an inclined angle relative to the aperture frame.

In Figs. 34 and 35 there is seen a fragment of a side or end component 220 of an aperture frame (not fully shown), that is provided with three different connector means for joining components. Connector element 221 (see Figs. 34 and 35) is a unitarily formed flattened hook. Connector element 222 is a button 212 formed on portions of a unitary formed joining appendage 223. Connector element 224 is a slot 201 formed in a unitarily formed tab appendage on the component 220.

Various other embodiments, applications, features, alternative but equivalent structures, and the like will be apparent to those skilled in the art from the present description of the invention taken with the appended claims and no undue limitations are to be drawn therefrom.

What is claimed is:

1. A component support apparatus for association with a working platform that has an aperture defined therein, said component support apparatus comprising:

- an aperture frame for extending about perimeter portions of said aperture;

- at least one joining appendage, each said joining appendage extending outwardly from a different adjacent edge portion of said aperture frame; and

- connecting means for interconnecting each said joining appendage with said aperture frame.

2. The apparatus of claim 1 wherein each said joining appendage extends outwardly from a common edge of said aperture frame.

3. The apparatus of claim 1 wherein said aperture frame continuously so extends about said aperture perimeter portions.

4. The apparatus of claim 2 wherein said aperture frame is unitarily formed.

5. The apparatus of claim 2 wherein said aperture frame is separate from each of said joining appendages.

6. The apparatus of claim 2 wherein said connecting means for each said joining appendage is integral therewith and with said adjacent edge portion so that said aperture frame and all said joining appendages are unitarily formed.

7. The apparatus of claim 1 wherein said aperture frame is comprised of a plurality of separate frame components that are each unitarily formed.

8. The apparatus of claim 7 wherein at least some of said separate frame components are each separate from each of said joining appendages.

9. The apparatus of claim 7 wherein at least two of said frame components are each unitarily interconnected by said connecting means to a respective different one of said joining appendages.

10. The apparatus of claim 1 wherein said connecting means for each of said joining components is defined by an upper end portion of each of said joining components and each said upper end portion is adapted to extend over and depend from a portion of said aperture frame.

11. The apparatus of claim 1 wherein said connecting means unitarily interconnects each of said joining components with said aperture frame.

12. A component support apparatus for association with a working platform that has an aperture defined therein, said component support apparatus comprising:

- an aperture frame for extending about perimeter portions of said aperture;

- at least one joining appendage, each said joining appendage extending outwardly from a different adjacent edge portion of said aperture frame; and

- at least one connecting element for interconnecting each said joining appendage with said aperture frame.

13. The apparatus of claim 12 wherein each said joining appendage extends outwardly from a common edge of said aperture frame.

14. The apparatus of claim 12 wherein said aperture frame continuously so extends about said aperture perimeter portions.

15. The apparatus of claim 13 wherein said aperture frame is unitarily formed.

16. The apparatus of claim 13 wherein said aperture frame is separate from each of said joining appendages.

17. The apparatus of claim 13 wherein said connecting element for each said joining appendage is integral therewith and with said adjacent edge portion so that said aperture frame and all said joining appendages are unitarily formed.

18. The apparatus of claim 12 wherein said aperture frame is comprised of a plurality of separate frame components that are each unitarily formed.

19. The apparatus of claim 18 wherein at least some of said separate frame components are each separate from each of said joining appendages.

20. The apparatus of claim 18 wherein at least two of said frame components are each unitarily interconnected by said connecting element to a respective different one of said joining appendages.

21. The apparatus of claim 12 wherein said connecting element for each of said joining components is defined by an upper end portion of each of said joining components and each said upper end portion is adapted to extend over and depend from a portion of said aperture frame.

22. The apparatus of claim 12 wherein said connecting element unitarily interconnects each of said joining components with said aperture frame.