A telescoping slide rail assembly includes a stationary slide rail including a wall having an outer surface, the stationary slide rail adapted for engaging a pair of uprights in a rack at opposing ends of the stationary slide rail wall. The telescoping slide rail assembly further includes a mounting slide rail operatively coupled to the stationary slide rail so that the mounting slide rail is movable relative to the stationary slide rail between a fully extended position and a fully retracted position. A reinforcing element is connected to the outer surface of the wall, and a mounting element adapted for operative coupling with one of the uprights of the rack that is operatively coupled to the reinforcing element for movement between a first operative position and a second operative position.
ADJUSTABLE REINFORCING BRACKET FOR TELESCOPING SLIDE RAIL ASSEMBLY

BACKGROUND

[0001] This disclosure pertains to a telescoping slide rail assembly adapted for use in a telecommunications rack, and more particularly, to a bracket which reinforces the telescoping slide rail assembly and provides for adjustable connection with different telecommunications racks.

[0002] Telecommunications or computing devices can be mounted in a telecommunications rack in a vertical stack configuration. Such racks typically include at least four uprights that form a rectangular frame for the rack. To mount a telecommunications or computing device in the rack, a pair of telescoping slide assemblies can be mounted in the rack at the same height. Each telecommunications or computing device is then mounted to the telescoping slide assemblies. The telescoping slide assemblies allow a user to pull the telecommunications or computing device out of the rack and push the telecommunications or computing device back in the rack when desired.

[0003] To provide full extraction of the telecommunications or computing device out of the rack while still being mounted on the telescoping slide assemblies, typical telescoping slide assemblies include more than two nested telescoping components. Such telescoping slide assemblies can include an outer rail that connects to the uprights, an intermediate rail, and an inner rail that supports the telecommunications or computing device. The noted rails typically have C-shaped cross sections and are slidable attached to each other by being nested. Typically, the intermediate rail is nested inside and supported by the outer rail, and the inner rail is nested inside and supported by the intermediate rail. Accordingly, the outer rail must support both the intermediate rail and the inner rail when connected to the uprights. Additionally, the outer rail is typically sized to connect with a corresponding rack. Accordingly, the outer rail may be only connectable to a rack that has a depth corresponding to the length of the outer rail.

[0004] With the above-described nesting, the intermediate rail must be large and structurally adequate to not only structurally support the inner rail but to provide a sliding track for the inner rail. Similarly, the outer rail must be large and structurally adequate to structurally support both the inner rail and the intermediate rail and to provide a sliding track for the intermediate rail. Therefore, the outer rail of a typical telescoping slide rail can be quite large and heavy. Additionally, different racks having different depths may require correspondingly sized outer rails to be connected thereto. Therefore, for each size rack, a particular telescoping slide rail must be manufactured.

[0005] Furthermore, because the telescopic slide assembly supports the weight of a communication or computing device, the weight of the telecommunication or computing device directly affects the size of the telescopic slide assembly. Telescopic slide assemblies are categorized by widely accepted size standards that are set by the Electronic Industries Association. Accordingly, the weight of a telecommunication or computing device may dictate a minimum standard size of a telescopic slide assembly that can be used to support the telecommunication or computing device in the rack. Although telescopic slide assemblies that are larger than the minimum standard size can be used, such use may not be cost effective or convenient. However, telescopic slide assemblies that are smaller than the minimum standard may not be used because they may not be able to provide adequate support for a telecommunication and computing device.

[0006] Therefore, there exists a need for a telescoping slide rail that is smaller and lighter than existing telescoping slide rails, can support a higher load than similarly sized standard telescopic slide assembly, and can be adjusted for mounting to different size racks.

SUMMARY

[0007] In accordance with one principle aspect to the present disclosure, a telescoping slide rail assembly includes a stationary slide rail including a wall having an outer surface, the stationary slide rail adapted for engaging a pair of uprights in a rack at opposing ends of the stationary slide rail wall. The telescoping slide rail assembly further includes a mounting slide rail operatively coupled to the stationary slide rail so that the mounting slide rail is movable relative to the stationary slide rail between a fully extended position and a fully retracted position. A reinforcing element is connected to the outer surface of the wall, and a mounting element adapted for operative coupling with one of the uprights of the rack that is operatively coupled to the reinforcing element for movement between a first operative position and a second operative position.

[0008] In accordance with another principle aspect to the present disclosure, a telescoping slide rail assembly configurable for connection to a pair of uprights in one of a first rack and a second rack includes a stationary slide rail including a wall and opposing first and second ends, a mounting slide rail operatively coupled to the stationary slide rail so that the mounting slide rail is movable relative to the stationary slide rail between a fully extended position and a fully retracted position, and a reinforcing element connected to the wall along an outer surface of the wall. The telescopic slide rail assembly further includes a first mounting element operatively coupled to the reinforcing element for movement between a first operative position and a second operative position including a first flange to facilitate connection with one of the pair of uprights of one of the first and second racks, and a second mounting element connected to the second end of the stationary slide rail including a second flange to facilitate connection with one of the pair of uprights of one of the first and second racks, whereby when the first mounting element is oriented in the first operative position the first and second flanges are configured for connection to the pair of uprights of the first rack and when the first mounting element is oriented in the second operative position the first and second flanges are configured for connection to the pair of uprights of the second rack.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] Certain embodiments are shown in the drawings. However, it is understood that the present disclosure is not limited to the arrangements and instrumentation shown in the attached drawings, wherein:

[0010] FIG. 1 is a perspective view of a slide rail assembly constructed in accordance with the teachings of the present disclosure shown in a first operative position.
FIG. 2 is a perspective view of a slide rail assembly constructed in accordance with the teachings of the present disclosure shown in a second operative position.

FIG. 3 is a top view of a rack supporting telecommunications or computing device with a slide rail assembly constructed in accordance with the teachings of the present disclosure.

FIG. 4 is a side elevational view of a slide rail assembly constructed in accordance with the teachings of the present disclosure shown in a fully retracted position.

FIG. 5 is a side elevational view of a slide rail assembly constructed in accordance with the teachings of the present disclosure shown in a fully extended position.

FIG. 6 is an enlarged fragmentary opposing view of region 6 of FIG. 1.

FIG. 7 is an enlarged fragmentary view of region 7 of FIG. 2.

FIG. 8 is a partial cross-sectional view of a slide rail assembly constructed in accordance with the teachings of the present disclosure.

DETAILED DESCRIPTION

For the purposes of promoting and understanding the principles disclosed herein, reference will now be made to the preferred embodiments illustrated in the drawings and specific language will be used to describe the same. It will nevertheless be understood that no limitation of the scope is thereby intended. Such alterations and further modifications in the illustrated device and such further applications are the principles disclosed as illustrated therein as being contemplated as would normally occur to one skilled in the art to which this disclosure relates.

Referring to FIGS. 1 and 2, a telescoping slide rail assembly 20 constructed in accordance with the teachings of the present disclosure is shown. The telescoping slide rail assembly 20 includes a stationary slide rail 22 having an outer surface 24. A first mounting element 26 is provided at a first end 27 of the stationary slide rail 22 to provide attachment of the stationary slide rail 22 to a first upright 28 of a rack 30 (shown in FIG. 3). A reinforcing element 32 is attached to the outer surface 24 of the stationary slide rail 22. The reinforcing element 32 slideably supports a mounting slide rail 34, which slides over the reinforcing element 32 along the length of the stationary slide rail 22. The mounting slide rail 34 includes a first end 36 and a second end 38. Attached to the second end 38 is a second mounting element 40 that provides connection of the mounting slide rail 34 to a second upright 28 of the rack 30. Accordingly, the telescoping slide rail assembly 20 can be mounted to the first and second uprights 28 with the first mounting element 26 and the second mounting element 40, respectively. As will be described in detail in the following, the slideable engagement of the mounting slide rail 34 with the reinforcing element 32 provides connection of the stationary slide rail 22 to a pair of uprights 28 that may be apart by a distance within a range of possible distances.

Referring to FIG. 3, a typical rack 30 that is designed to hold one or more telecommunications or computing devices 42 is shown. The rack 30 typically includes four uprights 28 that are arranged to form a vertically rectangular frame. Each upright 28 includes a plurality of apertures 44 (shown in FIGS. 1 and 2) that are arranged to receive any one of the mounting elements 26, 40. When a pair of telescoping slide rail assemblies 20 are connected to the uprights 28 of the rack 30 at the same height, the pair of telescoping slide rail assemblies 20 can support the telecommunications or computing device 42, which is mounted to the pair of telescoping slide rail assemblies 20. As shown in FIG. 3, the telecommunications or computing device 42 can be pulled out of the rack 30 while still mounted and supported on the pair of telescoping slide rail assemblies 20. The telecommunications or computing device 42 may be any electronic device, that includes a rectangular enclosure for being mounted to the telescoping slide rail assemblies 20. Such telecommunications or computing devices 42 may include servers, arrays of storage devices, routers, switches, or an array of telephone modems.

Referring to FIGS. 4 and 5, the telescoping slide rail assembly 20 is shown in the fully retracted position and the fully extended position, respectively. Each telescoping slide rail assembly 20 includes the stationary slide rail 22, an intermediate slide rail 50, and an inner slide rail 52. The intermediate slide rail 50 is slideably mounted to an interior surface 54 of the stationary slide rail 22. Accordingly, the intermediate slide rail 50 slides relative to the stationary slide rail 22. The inner slide rail 52 is slideably mounted to an inner surface 56 of the intermediate slide rail 50. Accordingly, the inner slide rail 52 slides relative to the intermediate slide rail 50. Therefore, the combination of the stationary slide rail 22, the intermediate slide rail 50, and the inner slide rail 52 provide the telescoping slide rail assembly 20, which can be placed in the retracted position, as shown in FIG. 4, or the fully extended position, as shown in FIG. 5.

Each inner slide rail 52 includes a plurality of mounting slots 60 that can receive a corresponding plurality of pins (not shown) that may be attached to the sides of the telecommunications or computing device 42. Accordingly, the telecommunications or computing device 42 can be supported in the rack 30 by the inner slide rails 52 of a pair of telescoping slide rail assemblies 20. Each inner slide rail 52 includes a first release tab 62 that engages an outer end 63 of the intermediate slide rail 50 when the inner slide rail 52 is in the fully extended position. Accordingly, when the inner slide rail 52 is in the fully extended position, the first release tab 62 does not allow the inner slide rail 52 to be retracted in the intermediate slide rail 50. The first release tab 62 is spring loaded such that a user can press the first release tab 62 downward to disengage the first release tab 62 from the outer end 63 of the intermediate slide rail 50.

The intermediate slide rail 50 includes a locking tab 64 that engages an aperture (not shown) in the stationary slide rail 22 to lock the intermediate slide rail 50 to the stationary slide rail 22 when the intermediate slide rail 50 is in the fully extended position. The inner slide rail 52 includes a second release tab 66 that engages the locking tab 64 when the inner slide rail 52 is moved toward the fully retracted position. Engagement of the second release tab 66 with the locking tab 64 releases the locking tab 64 to provide sliding of the intermediate slide rail 50 relative to the stationary slide rail 22. Therefore, when the telescoping slide rail assembly 20 is fully extended, the inner slide rail 52 cannot be retracted in the intermediate slide rail 50, and
the intermediate slide rail 50 cannot be retracted into the stationary slide rail 22. Once the first release tab 62 is disengaged from the outer end 63 of the intermediate slide rail 50, and the inner slide rail 52 is retracted into the intermediate slide rail 50, the second release tab 66 releases the locking tab 64, so that the inner slide rail 52, the intermediate slide rail 50 and can both be fully retracted into the stationary slide rail 22 to place the telecommunication or computing device 42 fully back in the rack 30.

[0024] Referring to FIGS. 1 and 6, the telescoping slide rail assembly 20 is shown in a first operative position, where the mounting slide rail 34 is in a fully extended position over the reinforcing element 32 and relative to the stationary slide rail 22. As shown in FIG. 6 in more detail, when the mounting slide rail 34 is in the first operative position, a tab 70 disposed at the first end 36 of the mounting slide rail 34 engages a tab 72 disposed at a first end 74 of the reinforcing element 32. Accordingly, the tab 72 stops the movement of the mounting slide rail 34 by engaging the tab 70. Thus in the first operative position as shown in FIGS. 1 and 6, the mounting slide rail 34 cannot be extended further outward relative to the stationary slide rail 22.

[0025] Referring to FIGS. 2 and 7, the telescoping slide rail assembly 20 is shown in a second operative position, where the mounting slide rail 34 is fully retracted over the reinforcing element 32 and relative to the stationary slide rail 22. As shown in FIGS. 7 in more detail, when the mounting slide rail 34 is in the fully retracted position relative to the reinforcing element 32, a shoulder 80 at the second end 38 of the mounting slide rail 34 engages a second end 82 of the reinforcing element 32. Accordingly, the second end 82 of the reinforcing element 32 stops further retraction of the mounting slide rail 34 over the reinforcing element 32 and relative to the stationary slide rail 22. Therefore, as shown by FIGS. 1 and 2, the range of slidable movement of the mounting slide rail 34 on the stationary slide rail 22 can be defined by the length of the reinforcing element 32.

[0026] Referring to FIG. 2, when the mounting slide rail 34 is in the second operative position or the fully retracted position, the second mounting element 40 is nearest to the first mounting element 26. Because the second mounting element 40 and the first mounting element 26 are used to connect the telescoping slide rail assembly 20 to a pair of uprights 28, the distance between the second mounting element 40 and the first mounting element 26 defines the distance between the uprights 28. Additionally, because the distance between the uprights 28 defines the depth of the rack 30, the fully retracted position of the slide rail assembly 20 represents the shallowest rack 30 in which the slide rail assembly 20 can be mounted. Therefore, based on the foregoing, the telescoping slide rail assembly 20 can be placed anywhere between the first operative position and the second operative position so as to be mounted in any rack 30 having a depth within the range of the fully retracted position to the fully extended position.

[0028] FIGS. 1 and 2 illustrate how the telescoping slide rail assembly 20 can be installed on a pair of uprights 28. Referring first to FIG. 2, the first mounting element 26 can be connected to the first upright 28 of a rack 30. The first mounting element 26 includes a pair of locking tabs 90 that can be inserted in a pair of the corresponding apertures 44 on the first upright 28. The locking tabs 90 are spring loaded and shaped so that insertion of each locking tab 90 into a corresponding aperture 44 prevents the locking tab 90 from being pulled out from the corresponding aperture 44. To remove the first mounting element 26 from the pair of corresponding apertures 44, the pair of locking tabs 90 of the first mounting element 26 can be moved toward each other against the force of the spring (not shown) so that the locking tabs 90 disengage from the apertures 44.

[0029] After mounting the first mounting element 26 to the first upright 28, the position of the mounting slide rail 34 can be adjusted relative to the stationary slide rail 22 so that the second mounting element 40 can be connected to the second upright 28. The noted adjusting of the mounting slide rail 34 involves sliding the mounting slide rail 34 over the reinforcing element 32 until the second mounting element 40 reaches the second upright 28. Referring to FIG. 1, which shows the first operative position, the mounting slide rail 34 is fully extended over the reinforcing element 32 such that the second mounting element 40 has engaged the upright 28 and has been connected to the upright 28. The components of the second mounting element 40 may be identical to the components of the first mounting element 26. Accordingly, the above described connection of the first mounting element 26 to the first upright 28 is fully applicable to the connection of the second mounting element 40 to the second upright 28 and is not repeated herein for brevity.

[0030] Although the mounting slide rail 34 is shown in the fully extended position in FIG. 1, the second upright 28 may be closer to the rear upright 28 than shown in FIG. 1, such that the mounting slide rail 34 does not have to be fully extended over the reinforcing element 32 to have the second mounting element 40 engage the second upright 28. Therefore, by initially connecting the first mounting element 26 to the first upright 28, the position of the second mounting element 40 can be adjusted relative to the second upright 28 so as to connect to the second upright 28. As described in the foregoing, the distance between the second mounting element 40 and the first mounting element 26 may be dictated by the length of the reinforcing element 32, which in turn provides the slidable range of distance by which the mounting slide rail 34 can be positioned relative to the stationary slide rail 22. Although in the above description the first mounting element 26 is connected to first upright 28 first and the second mounting element 40 is connected to the second upright 28 second, the mounting elements 26 and 40 can also be mounted to their corresponding uprights 28 in a reversible order than that described above.

[0031] Referring to FIG. 8, a cross-section of the stationary slide rail 22, the reinforcing element 32, and the mount-
ing slide rail 34 is shown. The reinforcing element 32 includes a base 100 and a pair of oppositely extending arms 102. The base 100 is attached to the outer surface 24 of the stationary slide rail 22 with fasteners 104. The fasteners 104 are shown as rivets in FIG. 8, although any type of fastener that is known may be used. The oppositely extending arms 102 are offset from the base 100 so as to define two gaps 106 between each oppositely extending arm 102 and the outer surface 24 of the stationary slide rail 22. As shown in FIG. 8, the mounting slide rail 34 has a C-shaped cross-section. Accordingly, the inwardly extending ends 108 of the mounting slide rail 34 are slideably supported in the gaps 106 so as to provide sliding of the mounting slide rail 34 over the reinforcing element 32.

[0032] As described above, the reinforcing element 32 provides the structural support necessary for the slidably connection between the mounting slide rail 34 and the stationary slide rail 22. Additionally, because the base 100 of the reinforcing element 32 is attached to the stationary slide rail 22 with fasteners 104, the reinforcing element 32 provides additional structural stiffness for the stationary slide rail 22. Therefore, the reinforcing element 32 provides sliding engagement of the mounting slide rail 34 with the stationary slide rail 22, structurally supports the mounting slide rail 34, and provides additional stiffness for the stationary slide rail 22.

[0033] As described in the foregoing, the reinforcing element 32 provides additional structural stiffness and support for the stationary slide rail 22. Accordingly, the disclosed telescopic slide rail assembly 20 can support a heavier telecommunication or computing device 42 than a typical slide rail assembly that is categorized by size under the same standard as the disclosed telescopic slide rail assembly 20. Therefore, the disclosed telescopic slide assembly 20 can also provide cost savings and convenience when used to support a telecommunication or computing device 42 instead of a typical telescopic slide assembly that may have to be larger and heavier (i.e., is in a higher standardized size category) to support the same telecommunication or computing device 42.

[0034] The stationary slide rail 22, the mounting slide rail 34, the reinforcing element 32, and the remaining above-described components of the telescoping slide rail assembly 20 can be constructed from metals, rigid plastics, composite materials, or combinations thereof. The disclosed stationary slide rail 22, the mounting slide rail 34, and the reinforcing element 32 may be constructed from aluminum to provide structural support, rigidity, and light weight for the telescoping slide rail assembly 20.

[0035] Furthermore, while the particular preferred embodiments have been shown and described, it will be obvious to those skilled in the art that changes and modifications may be made without departing from the teaching of the disclosure. The matter set forth in the foregoing description and accompanying drawings is offered by way of illustration only and not as limitation. The actual scope of the disclosure is intended to be defined in the following claims when viewed in their proper perspective based on the related art.

What is claimed is:

1. A telescoping slide rail assembly comprising:
   a stationary slide rail including a wall having an outer surface, the stationary slide rail adapted for engaging a pair of uprights in a rack at opposing ends of the stationary slide rail wall;
   a mounting slide rail operatively coupled to the stationary slide rail so that the mounting slide rail is movable relative to the stationary slide rail between a fully extended position and a fully retracted position;
   a reinforcing element connected to the outer surface of the wall; and
   a mounting element adapted for operative coupling with one of the uprights of the rack that is operatively coupled to the reinforcing element for movement between a first operative position and a second operative position.

2. The telescoping slide assembly as recited in claim 1, wherein the reinforcing element includes a base and a pair of oppositely extending arms.

3. The telescoping slide assembly as recited in claim 2, wherein the pair of oppositely extending arms are disposed coplanar and offset from the base and the wall.

4. The telescoping slide assembly as recited in claim 1, wherein the reinforcing element includes a first end, an opposing second end and a stop disposed at the first end.

5. The telescoping slide assembly as recited in claim 4, wherein the mounting element includes a tab disposed at a first end and a shoulder disposed at a second end.

6. The telescoping slide assembly as recited in claim 1, wherein the first operative position is defined when a tab disposed on a first end of the mounting element is contiguous with a stop disposed at a first end of the reinforcing element.

7. The telescoping slide assembly as recited in claim 1, wherein the second operative position is defined when a shoulder disposed at a second end of the mounting element is contiguous with a second end of the reinforcing element.

8. The telescoping slide assembly as recited in claim 1, wherein the mounting element includes a pair of opposing channels that engage a pair of opposing arms of the reinforcing element.

9. The telescoping slide assembly as recited in claim 1, wherein the reinforcing element is disposed generally intermediate between the opposing ends of the stationary slide rail.

10. A telescoping slide rail assembly configurable for connection to a pair of uprights in one of a first rack and a second rack, the telescoping slide rail assembly comprising:
    a stationary slide rail including a wall and opposing first and second ends;
    a mounting slide rail operatively coupled to the stationary slide rail so that the mounting slide rail is movable relative to the stationary slide rail between a fully extended position and a fully retracted position;
    a reinforcing element connected to the wall along an outer surface of the wall;
    a first mounting element operatively coupled to the reinforcing element for movement between a first operative position and a second operative position including a first flange to facilitate connection with one of the pair of uprights of one of the first and second racks; and
a second mounting element connected to the second end of the stationary slide rail including a second flange to facilitate connection with one of the pair of uprights of one of the first and second racks, whereby when the first mounting element is oriented in the first operative position the first and second flanges are configured for connection to the pair of uprights of the first rack and when the first mounting element is oriented in the second operative position the first and second flanges are configured for connection to the pair of uprights of the second rack.

11. The telescoping slide assembly as recited in claim 10, wherein the reinforcing element includes a base and a pair of oppositely extending arms.

12. The telescoping slide assembly as recited in claim 11, wherein the pair of oppositely extending arms are disposed coplanar and offset from the base and the wall.

13. The telescoping slide assembly as recited in claim 10, wherein the reinforcing element includes a first end and a stop disposed at an opposing second end.

14. The telescoping slide assembly as recited in claim 13, wherein the mounting element includes a shoulder disposed at a first end and a tab disposed at a second end.

15. The telescoping slide assembly as recited in claim 10, wherein the first operative position is defined when a tab disposed on a second end of the first mounting element is contiguous with a stop disposed at a second end of the reinforcing element.

16. The telescoping slide assembly as recited in claim 10, wherein the second operative position is defined when a shoulder disposed at a first end of the mounting element is contiguous with a first end of the reinforcing element.

17. The telescoping slide assembly as recited in claim 10, wherein the first mounting element includes a pair of opposing channels that engage a pair of opposing arms of the reinforcing element offset from the base and the wall.

18. The telescoping slide assembly as recited in claim 10, wherein the reinforcing element is disposed generally intermediate between the opposing first and second ends of the stationary slide rail.

19. The telescoping slide assembly as recited in claim 10, wherein the flange is disposed more adjacent the first end of the stationary slide rail when the first mounting element is oriented in the first operative position than when the first mounting element is oriented in the second operative position.

20. The telescoping slide assembly as recited in claim 10, wherein the uprights of the first rack are spaced apart more than the uprights of the second rack.