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(54) **MOVEABLE BARRIER**

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(57) **ABSTRACT**

A moveable barrier includes a frame having a plurality of spaced apart frame members and a reinforcing layer fastened to at least one of the frame members. A first concrete portion at least partially embeds at least one of the frame members, and a foot assembly is attached to the frame. The foot assembly is rotatable from a stored position generally in-plane with the frame, to a deployed position generally normal to the plane of the frame.

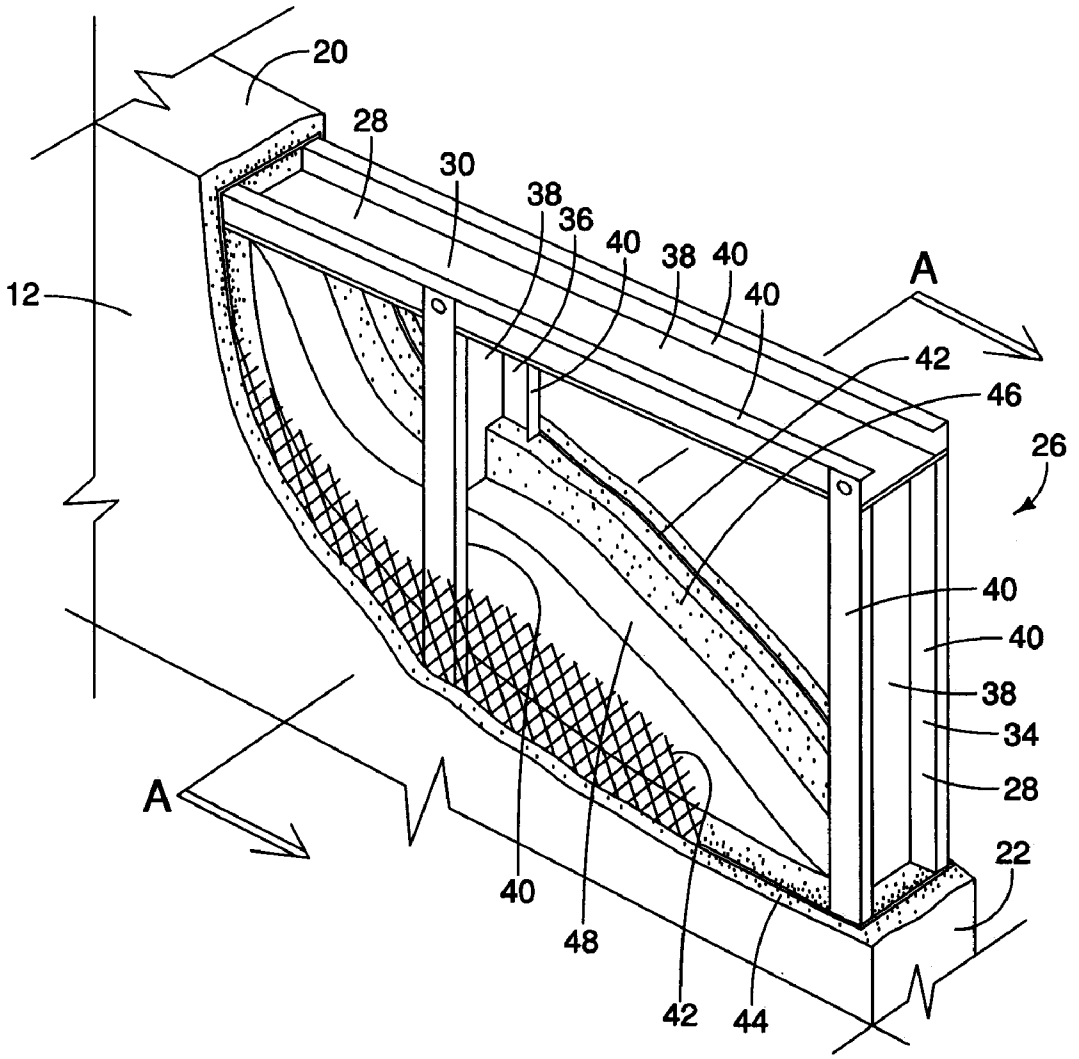
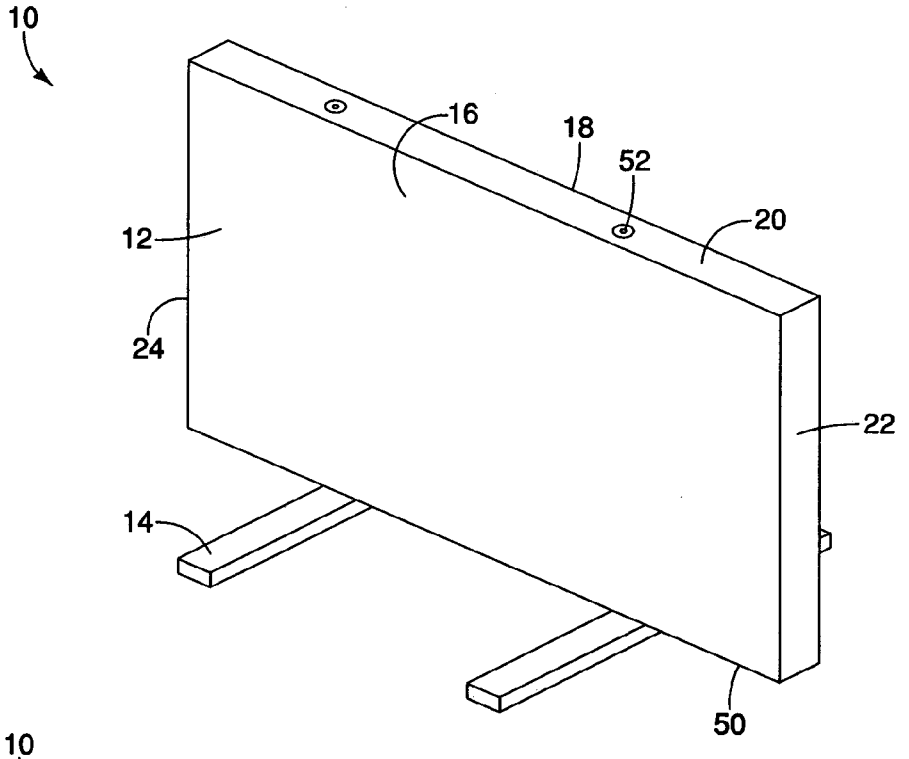


FIG. 1



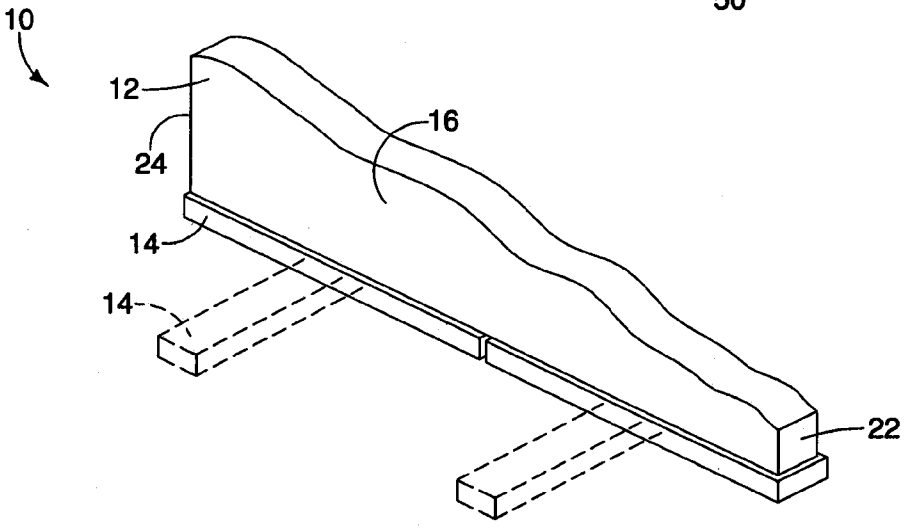


FIG. 2

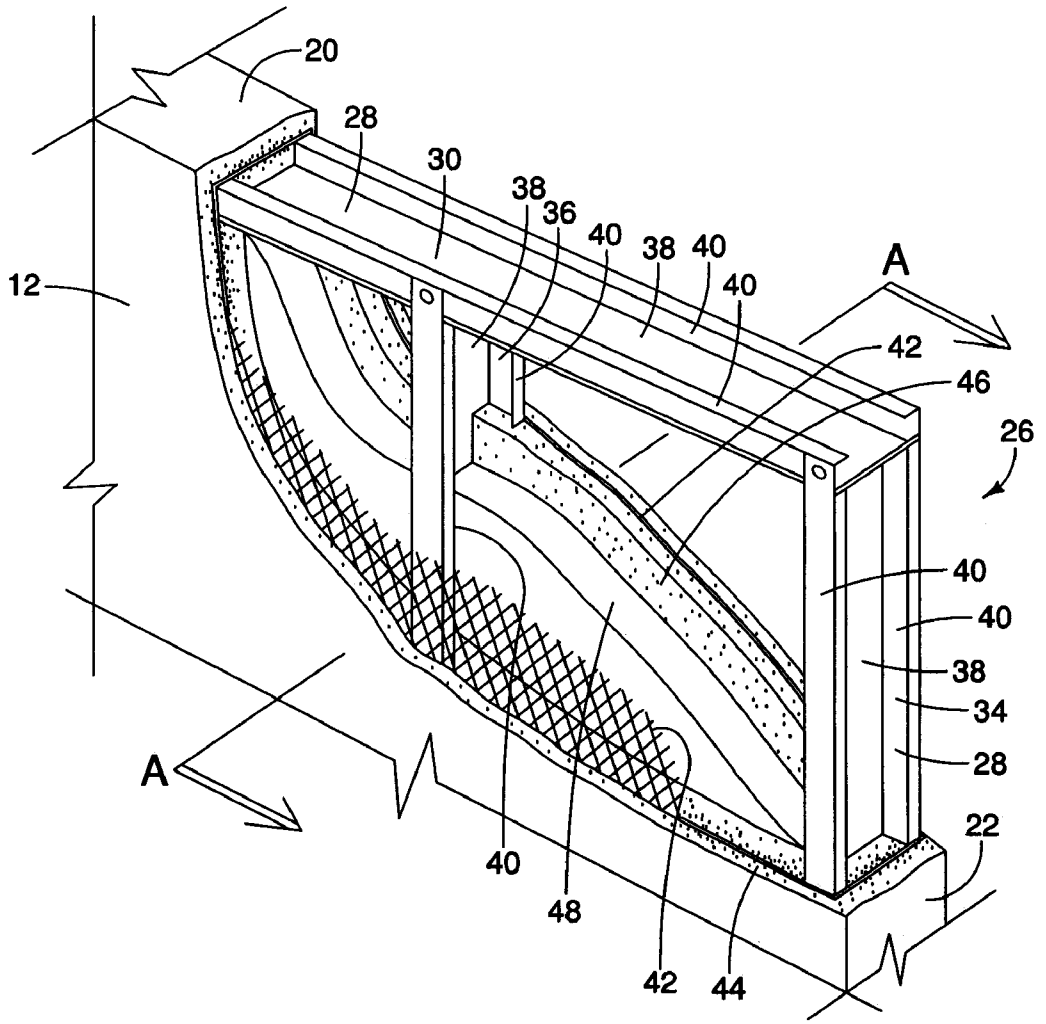


FIG. 3

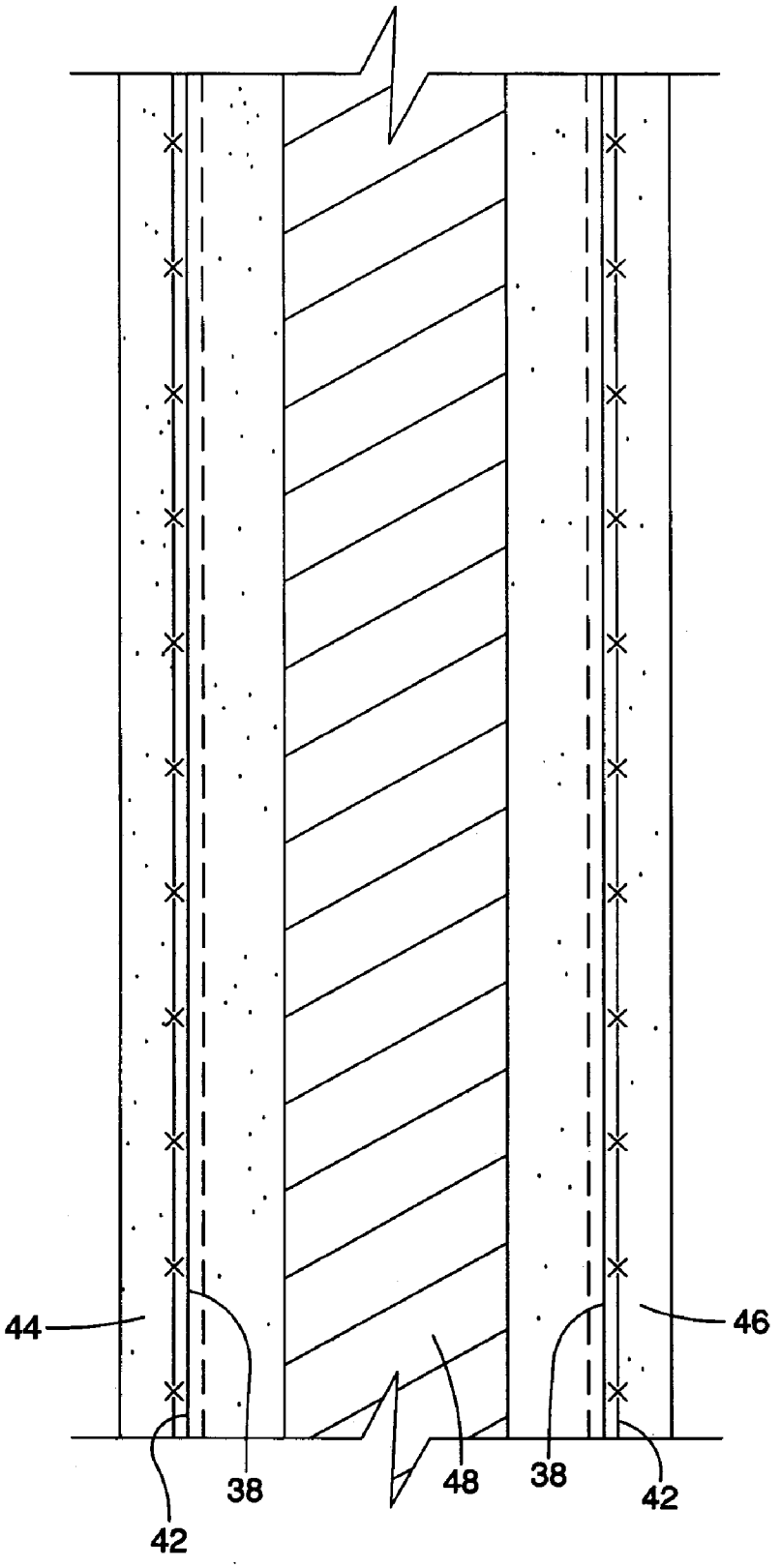
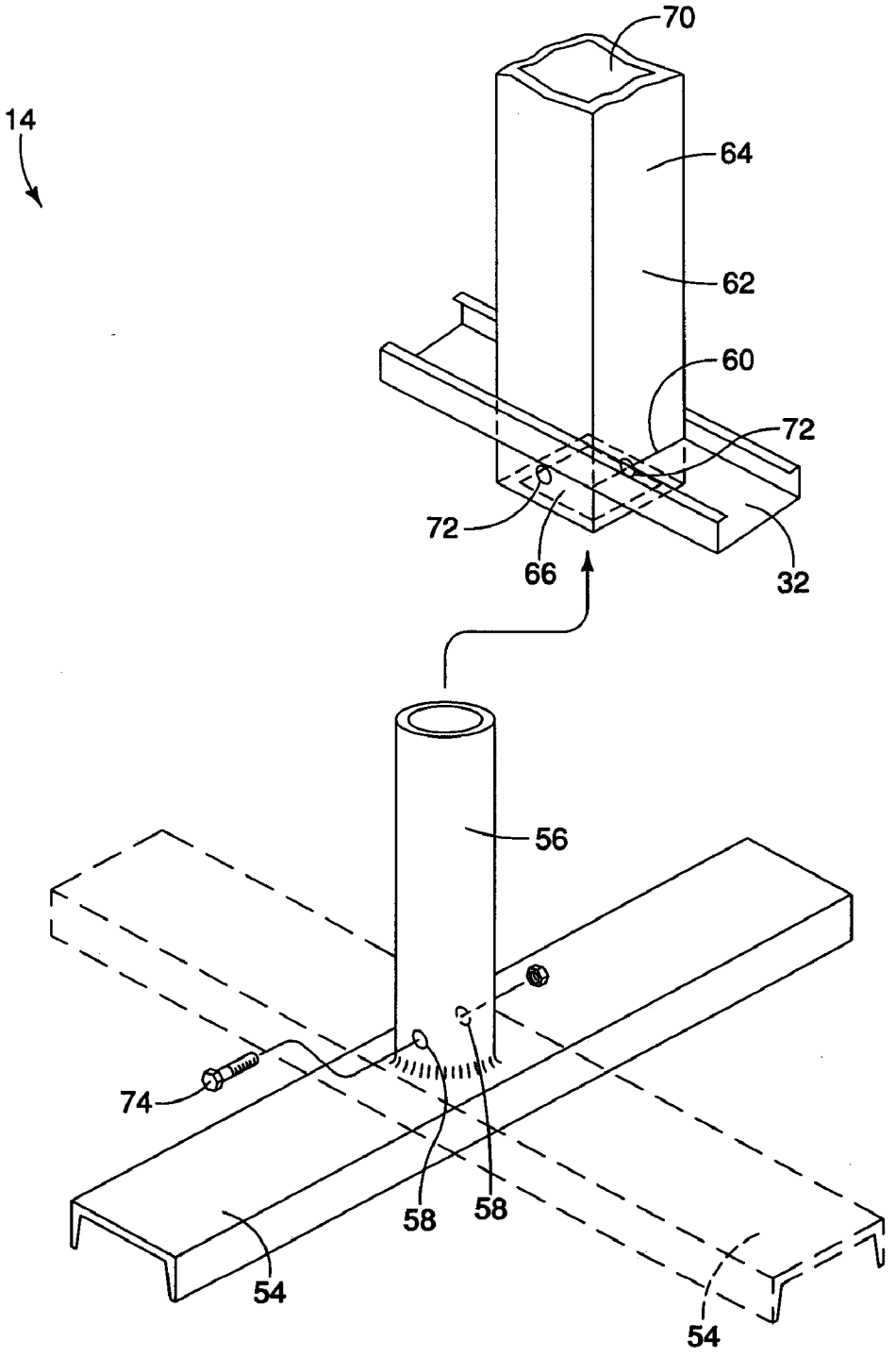


FIG. 4

FIG. 5



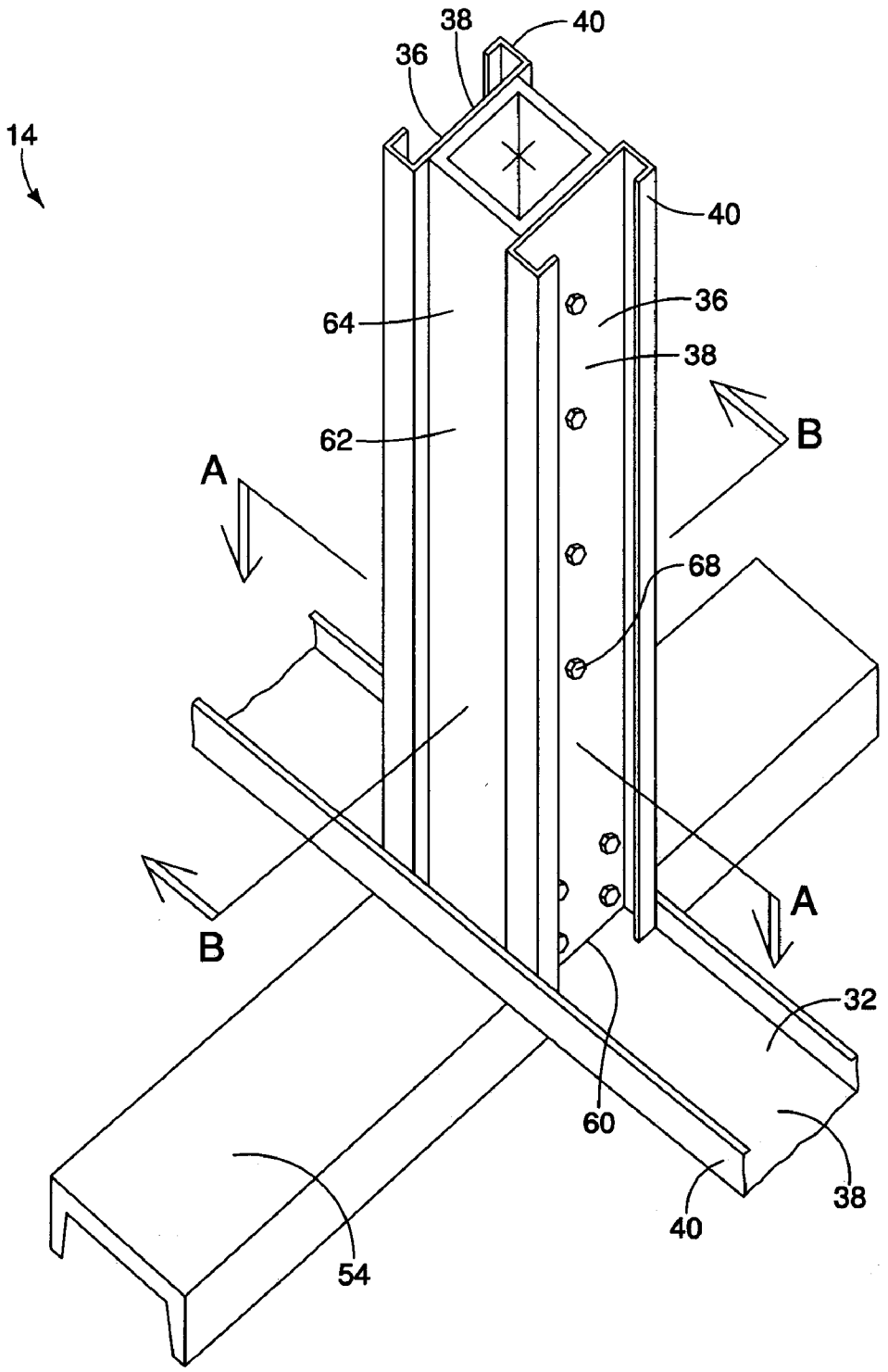
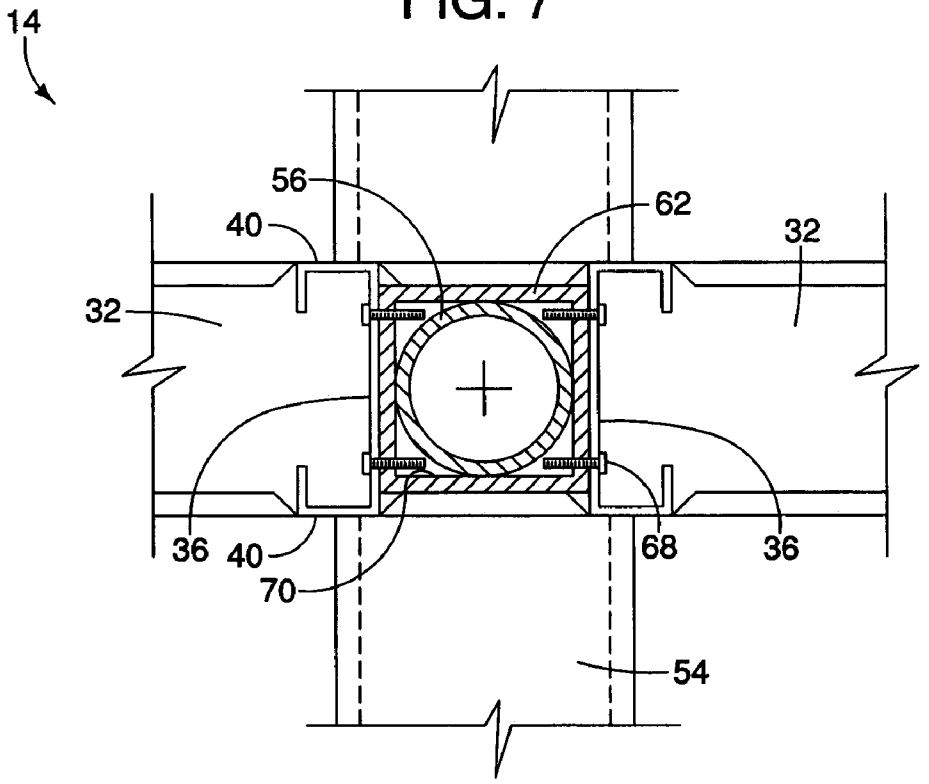


FIG. 6

FIG. 7


14
56
62
40
32
32
36
40
70
68
36
54

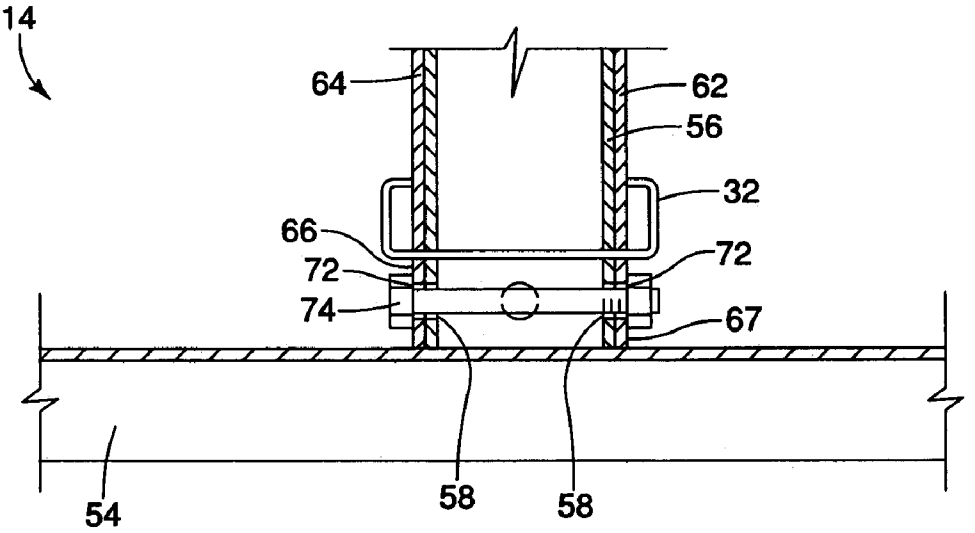

14
64
62
56
32
66
72
72
74
67
54
58
58

FIG. 8

MOVEABLE BARRIER

FIELD OF THE INVENTION

[0001] The present invention relates to moveable barriers. Another aspect of the present invention relates to a moveable barrier having a rotatable leg assembly.

BACKGROUND OF THE INVENTION

[0002] Barriers are used in a variety of situations, such as crowd control barriers to direct crowds in a desired location, as cordoning barriers to limit access to areas located behind the barrier, and as protective barriers to protect objects located behind the barrier.

[0003] Barriers typically include a metal frame having a top rail, a bottom rail, and a plurality of vertical rails positioned between the top rail and the bottom rail. This fence-type of barrier also typically has a base attached to the bottom rail for supporting the frame in a vertical position. The base is typically fixed to the frame such as with a bolted connection. A disadvantage of a bolted or welded connection is that the base is in a fixed position with respect to the frame, making storage and transportation of the barrier difficult.

[0004] Concrete barriers are also known. Solid concrete barriers are strong and prevent viewing across the barrier, however concrete is extremely heavy. As such, concrete barriers are very difficult to transport and maneuver into position. Concrete barriers typically require very massive concrete bases to maintain them in the upright position. Due to their weight and to the structures required to anchor them to the ground, concrete barriers tend to leave a footprint at the location where they are placed, even after they are removed.

SUMMARY OF THE INVENTION

[0005] A moveable barrier includes a frame having a plurality of spaced apart frame members and a reinforcing layer fastened to at least one of the frame members. A first concrete portion at least partially embeds at least one of the frame members, and a foot assembly is attached to the frame. The foot assembly is adjustable from a stored position generally in-plane with the frame to a deployed position generally normal to the plane of the frame.

[0006] Another embodiment of a moveable barrier includes a frame having a plurality of spaced apart frame members and a first concrete portion at least partially embedding a first side of at least one of the frame members. A second concrete portion at least partially embeds a second side of at least one of the frame members. The first and second concrete portions extend generally the length and the width of the frame, and a foot assembly is attached to the frame. The foot assembly is rotatable from a stored position generally in-plane with the frame to a deployed position generally normal to the plane of the frame.

[0007] In another embodiment of a moveable barrier, a frame has a plurality of spaced apart frame members. A reinforcing layer is fastened to at least one of the frame members, and a first concrete portion is attached to at least one of the frame members. A foot assembly is also attached to the frame and is rotatable from a stored position generally in-plane with the frame to a deployed position generally normal to the plane of the frame. The foot assembly includes a generally elongate leg, a generally cylindrical attachment member extending generally perpendicularly from the leg, and a receiving member disposed in the frame and configured for receiving the attachment member to couple the leg to the frame. The leg and the attachment member are fixed, and the attachment member is rotatable with respect to the receiving member.

[0008] Another embodiment of a moveable barrier includes a plurality of frame members arranged to define a frame, at least one intermediate layer attached to the frame and having a first density, and at least one concrete layer encapsulating the first layer and overlying the frame. The concrete layer has a density greater than the first density. Also included is a foot assembly attached to the frame, wherein the foot assembly is adjustable from a stored position generally in-plane with the frame, to a deployed position generally normal to the plane of the frame.

DESCRIPTION OF THE DRAWINGS

[0009] FIG. **1** is a front perspective view of a moveable barrier of the present invention having a panel and a foot assembly in a deployed position;

[0010] FIG. **2** is a front perspective view of the moveable barrier of FIG. **1** with the foot assembly in a stored position;

[0011] FIG. **3** is a partial perspective view of the panel of FIG. **1** with portions broken away to reveal the material layers thereof;

[0012] FIG. **4** is a section view of the panel taken along line A-A of FIG. **3**;

[0013] FIG. **5** is an exploded view of the foot assembly of the moveable barrier of FIG. **1**;

[0014] FIG. **6** is a front perspective view of the foot assembly of FIG. **5**;

[0015] FIG. **7** is a section view of the foot assembly taken along line A-A of FIG. **6**; and

[0016] FIG. **8** is a section view of the foot assembly taken along line B-B of FIG. **6**.

DETAILED DESCRIPTION OF THE INVENTION

[0017] Referring to FIGS. **1-2**, a moveable barrier is generally designated **10**. The moveable barrier **10** includes a panel **12** and foot assembly, generally indicated as **14**. The panel **12** has a front surface **16**, a rear surface **18**, a top surface **20**, a first side surface **22** and a second side surface **24**, each surface preferably being formed of concrete.

[0018] The foot assembly **14** is attached to the panel **12** and is rotatable from a stored position generally in-plane with the panel (shown in solid lines in FIG. **2**), to a deployed position generally normal to the plane of the panel (shown in FIG. **1** and in dashed lines in FIG. **2**). The foot assembly **14** is preferably made of metal, and more preferably is made of steel, however, it is also contemplated that the foot assembly can be made of other types of metal or rigid material such as fiber glass and carbon fiber composites.

[0019] Referring now to FIGS. **3-4**, the portions of the panel **12** are broken away to reveal a frame **26**. The frame **26** includes a plurality of frame members **28** including a top frame member **30**, a bottom frame member **32** (see FIG. **6**), side frame members **34**, and at least one intermediate frame member **36**. The frame members **30**, **32**, **34** generally define the periphery of the frame **26**.

[0020] The frame **26** is made of a plurality of C-channel frame members **28**, but can be made of other types of frame members and can include different types of frame members, such as metal studs, or any other shaped members. The frame **26** is also preferably made of steel, however, it is also con-

templated that the frame can be made of other types of metal or rigid material such as fiber glass and carbon fiber composites.

[0021] The frame members **28** include a web **38** and two opposing flanges **40** projecting normally from each end of the web, as is known in the art with respect to C-channels. Each frame member **28** is arranged and attached to at least one other frame member to form the frame **26**.

[0022] The frame **26** is fabricated by attaching the frame members **28** together with fasteners such as screws, rivets or any other method. A reinforcing layer, such as slit and expanded metal lath **42**, or wire mesh or other reinforcement known in the art, is also used to connect the frame members **28** into the frame **26**. The reinforcing layer **42** is preferably attached to the exterior front, rear, sides, and top surfaces of the frame **26** at the flanges **40**.

[0023] Located at the front surface **16** of the panel **12** is a first concrete portion **44**, and located at the rear surface **18** is a second concrete portion **46**. The first concrete portion **44** embeds the reinforcing layer **42** and the flange **40** nearest the front surface **16**, and the second concrete portion **46** embeds the reinforcing layer **42** and the flange **40** nearest the rear surface **18**. It is also contemplated that the concrete portions **44** and **46** can be fastened to the frame **26** instead of or in addition to embedding the frame.

[0024] The concrete portions **44**, **46** can be made of conventional, lightweight or aerated concrete. For purposes of this patent application, conventional concrete has a cured density of about 2400 kg/m^3 (150 pcf), while lightweight concrete has a cured density of about 1922 kg/m^3 (120 pcf) or less. Aerated concrete, or foam concrete, is a species of lightweight concrete typically having a cured density of about 160 to 2243 kg/m^3 (10 to 140 pcf). Preferably, the concrete portions **44**, **46** are lightweight concrete having a cured density of about 50 to 70 pcf, and more preferably, having a cured density of about 60 pcf.

[0025] Disposed between the first concrete portion **44** and the second concrete portion **46** is an intermediate substrate **48**, preferably a lightweight material such as polystyrene foam. It is contemplated that other layers can be incorporated on the panel **12**. With the foam and lightweight concrete construction, the panel **12** is significantly lighter than a conventional, solid concrete slab barrier, while retaining high strength characteristics due to the frame **26** structure.

[0026] To form the panel **12**, the frame members **28** are fastened in the preferred arrangement. The intermediate substrate **48** is disposed between the frame members **28**, generally spanning from web **38** to web of adjacent frame members. The intermediate substrate **48** is about 1 to 5 inches thick, and is preferably about 3½ inches thick.

[0027] The reinforcing layer **42** is laid across the first flanges **40** located near the front surface **16** of the respective frame members **28**, and is secured to the frame member with screws, ties, spot welding or any other fastening method. The reinforcing layer **42** is similarly laid across and secured to other flanges **40** located near the rear surface **18** of the frame members **28** as well as sides **22** and **24** and top **20**, and secured in place. It is contemplated that the reinforcing layer **42** can be laid across all or a portion of the frame member **28**. Alternatively, it is contemplated that no reinforcing layer **42** is used.

[0028] When the frame **26** is complete, it is preferably taken to a pouring pad and placed between forms. As is known in the art, the pouring pad is a conventional, planar, horizontal surface that is used, typically with forms, in the fabrication of precast concrete structures.

[0029] Concrete is poured onto the frame **26** such that the front surface **16**, the rear surface **18**, the top surface **20**, the first side surface **22** and the second side surface **24** of the panel **12** each have a layer of concrete. It is also contemplated that a lower surface **50** can also have a layer of concrete, however it is preferred that the bottom frame member **32** (FIG. **6**) does not have a layer of concrete at the exterior surface of its web **38**.

[0030] Referring to FIG. **4**, the first concrete portion **44** and the second concrete portion **46** each have a total thickness in the range of about 1 to 4 inches, and preferably about 2¼ inches, with about ¼ inch to 2 inches, and preferably about 1 inch of thickness located to the exterior of the frame **26**. Referring to FIG. **3**, it is also contemplated that there is about ¼ inch to 2 inches of thickness, and preferably about 1 inch of thickness of concrete at the top surface **20**, the first side surface **22** and the second side surface **24**.

[0031] It will further be appreciated by those skilled in the art that the size and configuration of the frame members **28**, in addition to the type and amount of concrete used, will vary to suit the use. For example, a barrier wall that is intended to bear a large load will require different frame and concrete characteristics than a barrier wall that is intended to bear a small load. The preferred dimensions of the panel **12** can be in the range of about 5 to 20 feet and preferably about 10-feet in length, about 4 to 10 feet and preferably about 6 feet in height, and about 4 to 12 inches and preferably about 5½ to 7½ inches in width.

[0032] Further, it is contemplated that the panel **12** can have openings where concrete is removed or not poured, and can be of any desirable shape and dimension. It is also contemplated that the panels **12** can have linking structures so that multiple barriers **10** can be linked to form a generally continuous wall. Further still, it is contemplated that the panel **12** can include a lifting formation **52** (see FIG. **1**) to facilitate the transportation of the moveable barrier **10**.

[0033] Referring now to FIGS. **5-8**, one foot assembly **14** of the moveable barrier **10** will described, although it is contemplated that one or a plurality of foot assemblies can be used with the moveable barrier **10**. The foot assembly **14** includes a generally elongate leg **54** attached to a generally cylindrical attachment member **56** that extends generally perpendicularly from the leg. The legs **54** have a length in the range of about 3 to 7 feet, and preferably about 5 feet, depending on the size of the panel **12**.

[0034] The attachment member **56** has a cylindrical shape, however other shapes are contemplated, such as square, triangle and others. The dimensions of the attachment member **56** are in the range of about 1 to 3 feet, and preferably about 1½ feet in length with an outer diameter of about 3 to 5 inches, and preferably about 4 inches.

[0035] The leg **54** and the attachment member **56** are preferably fixed together, such as with a weld or any other fastening method. At least one and preferably two pairs of aligned holes **58** are located on the attachment member **56** and spaced at about 180-degrees from each other such that each hole is about 90-degrees from the adjacent hole.

[0036] A receiving member **62** is generally hollow and is configured for receiving the attachment member **56** to couple the leg **54** to the frame **26**. The bottom frame member **32** is attached to the frame **26** and includes an opening **60** in the

web **38** of the bottom frame member (FIG. **5**). The receiving member **62** extends through the opening **60**.

[0037] As shown in FIG. **6**, an upper portion **64** of the receiving member **62** is disposed between adjacent intermediate frame members **36**, and a lower portion **66** extends outwardly from the bottom frame member **32**. The lower portion **66** engages the top surface of the leg **54** and provides a clearance **67** (FIG. **8**) between the top surface of the leg **54** and the bottom surface of the bottom frame member **32**.

[0038] The adjacent intermediate frame members **36** are C-channel members with their respective webs **38** facing towards each other and their respective flanges **40** facing away from each other, however other shaped members are contemplated. The intermediate frame members **36** are attached to the bottom frame member **32**, and it is contemplated that the intermediate frame members **36** can also be attached to other frame members **28**. As shown in FIG. **7**, the flanges **40** of the intermediate frame members **36** can be received in a slot of the flanges of the bottom frame member **32**, or attached in any other manner.

[0039] The receiving member **62** is square-tube shaped and has two opposite surfaces engaging the webs **38** of the two adjacent intermediate frame members **36**. The receiving member **62** is attached to the intermediate frame members **36** along the length of the receiving member, such as with screws or power-driven nails, **68**. A group of these fasteners **68** is installed to attach the low ends of members **36** and **62** such that the fasteners **68** extend into the annular space between **56** and **62** as shown in FIG. **7** such that they do not interfere with the adjustability of **56** within **62**. While the receiving member **62** preferably has a square-tube shape, other shapes, such as a cylinder-shape, are contemplated. The dimensions of the square-tube are in the range of about 3 to 6 inches by 3 to 6 inches by ⅛ to ¾ inches, and most preferably 4½ by 4½ by 3/16 inches. The height of the receiving member **62** can be the entire height or a portion of the height of the panel **12**, however it is preferred that the receiving member **62** have a height of at least a ⅙ of the height of the panel, and preferably have generally the same height as the panel.

[0040] Referring to FIGS. **5-8**, the attachment member **56** is received at an interior surface **70** of the receiving member **62**. The generally cylindrical attachment member **56** is adjustable within and with respect to the receiving member **62**, where "adjustable" should be understood to encompass, without limitation, rotatable, removable, insertable, displaceable, and foldable.

[0041] To rotatably fix the attachment member **56** with respect to the receiving member **62**, the receiving member also preferably has two pairs of aligned holes **72** that are spaced at about 180-degrees from each other such that each hole is about 90-degrees from the adjacent hole. In the square-shaped embodiment, there is preferably one hole **72** on each surface of the square.

[0042] When the attachment member **56** is received in the receiving member **62**, the holes **72** are alignable with the holes **58** (see FIGS. **5** and **8**). A fastener **74**, such as a bolt, is used to fix the rotational position of the attachment member **56** with respect to the receiving member **62**. The clearance **67** between the bottom frame member **32** and the leg **54** permits the user to insert and remove the fastener **74**.

[0043] When the moveable barrier **10** is in use, the legs **54** are rotated to a deployed position that is generally normal to the plane of the panel **12**, and the fastener **74** fixes that position. When the moveable barrier is to be removed or transported, the fastener **74** is removed from the holes **58**, **72** and the legs **54** are rotated to a position that is generally in-plane with the panel **12**, and the fastener **74** is re-inserted into the holes to fix that position. When the fastener **74** is removed from the holes **58**, **72**, it is contemplated that the attachment member **56** is removable from the receiving member **62**. However, it is also contemplated that the attachment member **56** can be rotatably fixed to the receiving member **62**, such as by providing an annular rim to the top surface of the attachment member, or a protrusion that travels within a slot of the receiving member.

[0044] The combination of the lightweight concrete and steel panel **12** with the rotatable foot assembly **14** makes the moveable barrier **10** strong, lightweight, and easily transportable. Further, when the moveable barrier **10** is removed, there is little to no impact, footprint or evidence on the environment where the moveable barrier was once placed.

[0045] While specific embodiments of the moveable barrier of the present invention have been shown and described, it will be appreciated by those skilled in the art that changes and modifications may be made thereto without departing from the invention in its broader aspects and as set forth in the following claims.

What is claimed is:

1. A moveable barrier comprising:

a frame including a plurality of spaced apart frame members;

a reinforcing layer fastened to at least one of said frame members;

a first concrete portion at least partially embedding at least one of said frame members; and

a foot assembly attached to said frame, wherein said foot assembly is adjustable from a stored position generally in-plane with said frame, to a deployed position generally normal to the plane of said frame.

2. The moveable barrier of claim **1** wherein the concrete portion is concrete having a density of 400 to 1760 kg/m^3 (25 to 110 pcf).

3. The moveable barrier of claim **1** wherein said first concrete portion at least partially embeds a first side of said at least one frame member, and further comprising a second concrete portion at least partially embedding a second side of said at least one frame member.

4. The moveable barrier of claim **3** further comprising a foam substrate disposed between said first concrete portion and said second concrete portion.

5. The moveable barrier of claim **1** wherein said reinforcing layer includes a slit and expanded metal lath.

6. The moveable barrier of claim **1** wherein said foot assembly comprises:

a generally elongate leg;

an attachment member extending generally perpendicularly from said leg; and

a receiving member disposed in said frame and configured for receiving the attachment member to couple said leg to said frame.

7. The moveable barrier of claim **6** wherein said leg and said attachment member are fixed, and wherein said attachment member is rotatable with respect to said receiving member.

8. The moveable barrier of claim **7** wherein said attachment member is received at an interior surface of said receiving member.

9. The moveable barrier of claim **7** wherein said attachment member and said receiving member have aligned holes at 90-degree increments to receive a fastener to fix the rotational position of said attachment member with respect to said receiving member.

10. A moveable barrier comprising:

a frame including a plurality of spaced apart frame members;

a first concrete portion at least partially embedding a first side of at least one of said frame members;

a second concrete portion at least partially embedding a second side of at least one of said frame members, wherein said first and second concrete portions extend generally the length and width of said frame; and

a foot assembly attached to said frame, wherein said foot assembly is rotatable from a stored position generally in-plane with said frame, to a deployed position generally normal to the plane of said frame.

11. The moveable barrier of claim **10** further comprising a reinforcing layer fastened to at least one of said frame members.

12. The moveable barrier of claim **10** further comprising a lifting formation on an exterior surface of the moveable barrier.

13. The moveable barrier of claim **10** wherein said foot assembly comprises:

a generally elongate leg;

a generally cylindrical attachment member extending generally perpendicularly from said leg; and

a receiving member disposed in said frame and configured for receiving the attachment member to couple said leg to said frame;

wherein said leg and said attachment member are fixed, and wherein said attachment member is rotatable with respect to said receiving member.

14. The moveable barrier of claim **13** wherein said attachment member is received at an interior surface of said receiving member.

15. A moveable barrier comprising:

a frame including a plurality of spaced apart frame members;

a reinforcing layer fastened to at least one of said frame members;

a first concrete portion attached to at least one of said frame members; and

a foot assembly attached to said frame, wherein said foot assembly is rotatable from a stored position generally in-plane with said frame, to a deployed position generally normal to the plane of said frame, said foot assembly comprising:

a generally elongate leg;

a generally cylindrical attachment member extending generally perpendicularly from said leg; and

a receiving member disposed in said frame and configured for receiving the attachment member to couple said leg to said frame;

wherein said leg and said attachment member are fixed, and wherein said attachment member is rotatable with respect to said receiving member.

16. The moveable barrier of claim **15** further comprising a front surface, a rear surface opposite said front surface, a top surface, a first side surface and a second side surface, wherein said front surface, said rear surface, said top surface, said first side surface and said second side surface are concrete.

17. The moveable barrier of claim **15** wherein said frame members comprise at least one C-channel member, and said first concrete portion at least partially embeds said C-channel member.

18. The moveable barrier of claim **15** wherein said receiving member is a square tube and said attachment member is received at an interior surface of said receiving member.

19. The moveable barrier of claim **18** wherein said receiving member is disposed between and attached to two frame members.

20. A moveable barrier comprising:

a plurality of frame members arranged to define a frame;

at least one intermediate layer attached to said frame and having a first density;

at least one concrete layer encapsulating said first layer and overlying said frame, said concrete layer having a density greater than said first density;

a foot assembly attached to said frame, wherein said foot assembly is adjustable from a stored position generally in-plane with said frame, to a deployed position generally normal to the plane of said frame.

* * * * *