A barrier to vehicular passage is described. The barrier is cast from dense, heavy material and has a frusto-pyramidal shape of six surfaces. The barrier forms (A) a top and a bottom surface, which are opposing and substantially parallel to each other and wherein the area of the bottom surface is greater than the area of the top surface, and (B) four non-vertical side surfaces wherein the angle of inclination from vertical of at least one side surface is greater than the angle of inclination from vertical of the opposing side surface. Methods of use of the barrier or a plurality of barriers are also described.
FIG. 6
MULTI-PURPOSE PRECAST BARRIER

REFERENCE TO RELATED APPLICATION

This application claims the benefit of U.S. Provisional Patent Application No. 60/338,021, filed Nov. 7, 2001, the disclosure of which is incorporated herein by reference.

TECHNICAL FIELD

This invention relates to precast barriers for use as barricades.

SUMMARY OF THE INVENTION

A need exists for an aesthetically pleasing, movable heavy duty barrier for securing an area or structure from unauthorized vehicular access. A need also exists for a barricade system which provides protection to designated areas while at the same time enabling authorized traffic access and using a reduced amount of concrete or like fabrication materials. A need also exists for a barrier which may be put to use in a variety of other uses or applications when not required as part of a barricade system.

The present invention is deemed to satisfy these and other needs by providing, in one embodiment, a portable barrier having a pyramidal or frusto-pyramidal shape constructed of dense, heavy material, which optionally can be adapted to incorporate discrete aesthetic features. Preferably, the portable barrier has a frusto-pyramidal shape formed by a bottom surface, a top surface, two opposing side surfaces and a front surface opposing a back surface in which the angle of inclination of the front surface from vertical is greater than the angle of inclination of the back surface from vertical. The area of the top surface typically is smaller than that of the bottom surface, and these two surfaces preferably are substantially parallel to each other and to the ground or support medium so as to provide a sturdy, truncated pyramid shape for the barrier. The geometry of the barrier’s shape and its heavy weight ensure that any vehicle which might attempt to travel over the barrier member from the direction of its front surface will be significantly hindered in its forward motion. The shape, size and weight of the barrier member make it unlikely that it can be dislodged or dragged any significant distance if hit by a vehicle from any direction.

Another embodiment of this invention is the aforementioned barrier further comprising anchoring means for anchoring the barrier at a point proximate to the imaginary axis formed along the intersection of the bottom and back surfaces, so that, upon a sufficient impact to the front surface of the barrier by a vehicle, the barrier will rotate substantially about the imaginary axis. In this way, as a striking vehicle travels up the inclined front surface, the barrier rocks backward and rotates about the imaginary axis because of the anchoring means (e.g., dowel pin). The bottom surface will then swing up and back under the advancing vehicle, causing the vehicle to be further lifted and disabled to effectively stop it from entering the restricted area.

Another embodiment of this invention is a method of impairing vehicular passage into a restricted area by providing one or more barriers as configured above. Each barrier will preferably further comprise the anchoring means described above. Providing such an anchor will provide the pivot point along the intersection of the bottom surface and the back surface of the barrier which will enable the barrier to tilt up and back when struck by a vehicle along the barrier’s front surface, thus further hindering the vehicle’s forward progress by disabling it on the barrier.

Yet another embodiment of this invention is a method of limiting vehicular access to designated areas by providing a perimeter barricade formed from a plurality of barriers linked together. The barriers preferably are linked together with wire rope which passes through a cylindrical aperture or bore in each barrier. Any vehicle encountering such a barricade of linked barriers will be impeded in its motion, either by running over a barrier and becoming disabled upon it, by striking the linking cable and being stopped by the weight and tension of the barricade as a whole, or by striking a portion of the barrier and a section of cable. If the vehicle strikes a barrier but not at such an angle as to become disabled by it, the inertia of the barriers and linked cables will serve to quickly slow and stop the vehicle.

Another embodiment of this invention is a mold or form, shaped, sized and configured, to provide a barrier in accordance with this invention.

These and other embodiments, features, and advantages of this invention will become still further apparent from the ensuing description and accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view, obliquely from above, of a barrier according to a preferred embodiment of the invention.

FIG. 2 is a view of the front surface of the barrier of FIG. 1.

FIG. 3A is a cross-sectional view of the barrier of FIG. 1, taken along lines 3A-3A in FIG. 1.

FIG. 3B is the same view of FIG. 3A, modified to illustrate another preferred embodiment of this invention which includes an anchoring pin.

FIG. 4 is a side view of a lateral surface of another embodiment of this invention.

FIG. 5 is a side view of a lateral surface of yet another embodiment of this invention.

FIG. 6 is a side view of a lateral surface of yet another embodiment of this invention.

FIG. 7 is a perspective view of a barricade system according to a preferred embodiment of the invention.

FIG. 8 is a perspective view of a mold for forming one or more of the preferred barriers of this invention.

In each of the above figures, like numerals are used to refer to like or functionally like parts among the several figures.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

Preferred embodiments of this invention will now be described with reference to the accompanying figures.
One preferred embodiment is illustrated in FIGS. 1, 2 and 3A, which show a portable barrier 10 forming six surfaces so as to define a frusto-pyramidal shape. The surfaces include a front surface 12, a back surface 14, a top surface 16, a bottom surface 18, a lateral surface 20, and a lateral surface 22. There is a cylindrical bore 24 which extends through barrier 10 from lateral surface 20 to lateral surface 22. Bore 24 is substantially parallel to top surface 16. As depicted, barrier 10 is part of a barrier system in which a steel cable 26 is threaded through bore 24 so that barrier 10 serves as part of a larger barricade system in which several portable, spaced-apart barriers of like configuration are linked by steel cable to provide a perimeter barricade. A loop ferrule insert 28, constructed of metal and imbedded in concrete, is depicted in FIG. 1 as having an open threaded end. Such inserts can provide attachment points for sign posts, bolts, poles, etc. Though only one insert 28 is shown, a plurality of these can be provided on any surface of barrier 10. Eyebolt 30 is shown screwed into a coil loop insert 31 (shown on FIGS. 3A and 3B). A hook 34 of a cable 36 which can be part of a crane, hoist, winch or other lifting means (not shown), is depicted hooked into the eye of eyebolt 30. A decorative element 32 is attached to front surface 12. Such decorative elements, herein depicted as a metal cast fleur-de-lis element, can take many forms and shapes such as letters, symbols, signs, logos, etc. Two open, elongate slots 38, 38 defined by bottom surface 18 of barrier 10 readily accommodate forks of a conventional forklift (not shown) to enable lifting, moving and positioning of barrier 10.

FIG. 2 illustrates in a front plan view the two elongate slots 38,38. The perimeter of each open end of each slot 38 is chamfered to prevent unsightly damage to barrier 10 during interaction with forks of a forklift or the like. Eyebolt 30 is shown threaded into insert 31 (shown on FIGS. 3A and 3B only). In the preferred embodiment shown, the angles of inclination from vertical of lateral surface 22, depicted as z°, are the same, and z° preferably is an angle in the range of about 20° to about 50° from the respective imaginary vertical axes shown in broken line. More preferably, z° is an angle in the range of about 25° to about 35°. Back surface 14 is shown as having an angle of inclination from vertical of Y°. Y° is preferably an angle in the range of about 0° to about 30° from the respective imaginary vertical axes shown in broken line. More preferably, Y° is an angle in the range of about 5° to about 15°, and most preferably is an angle of about 11°.

Another embodiment of the invention is illustrated in FIG. 3B, which is a cross-sectional view as in FIG. 3A, with one modification. Barrier 10 is shown to have an anchoring means in the form of an opening 40 in bottom surface 18 which receives a pivot dowel pin 42 embedded in a support surface 44. Support surface 44 can be the concrete or asphalt surface of the parking lot, sidewalk, ground or other area where barrier 10 is to be utilized to impede unwanted vehicular traffic. As seen in FIG. 3B, opening 40 is positioned proximate to the intersection of surfaces 18 and 14, which intersection itself defines the imaginary axis a (as seen in FIG. 1) about which the barrier will rotate in the event of a direct strike to front surface 12.

FIG. 4 depicts another preferred embodiment of this invention. Post member 46 is attached to top surface 16 by use of hex bolt 48. Hex bolt 48 has been passed through a flange 50 of post member 46 before being threaded into an insert 28 (shown in FIG. 3A). One or a plurality of such bolts 48 may be used with a plurality of threaded inserts to accomplish attachment of post member 46. Another preferred embodiment of the invention, depicted in FIG. 5, comprises a pole member 52 having a flanged end 50 which is attached to top surface 16 by means of four hex bolts 48 (only 2 shown). Hex bolts 48 have been passed through flange 50 and screwed into corresponding inserts 28 (as may be seen in FIG. 3A).

FIG. 6 represents an embodiment of the invention which comprises barrier 10 disposed along support surface 44 of the parking lot, for example, wherein back surface 14 is adjacent to pivot pin 42 which is securely embedded in support surface 44. This pivot pin arrangement is yet another anchoring means which may be employed to encourage the barrier to flip over in the desired direction in the event of a sufficient strike to the front face of the barrier. Other anchoring means besides those already mentioned could include, e.g., one or more spikes driven through the barrier or apertures in the barrier, to anchor the barrier to the ground at the desired location previously described.

FIG. 7 illustrates a preferred embodiment of the invention which comprises a barricade system for impairs vehicular passage and more particularly vehicular and pedestrian passage into a restricted area. Barriers 10,10, as previously described, are shown linked together by cable 26. Also shown is flange 50 attached to top surface 16 and to a post member 54 of a fence 56. Fence 56 is shown as a chain link-type fence with anti-personnel wire disposed at its top region, but fence 56 can be any suitable type of fencing, such as, but not limited to, wooden, metal, metal alloy and masonry.

As may be seen with reference to FIG. 8, barriers of this invention may be formed using a mold 60 which can
be filled with concrete. The mold is sized and configured to produce barriers of this invention. In the preferred embodiment depicted, mold 60 can produce up to five barriers at a time. Opposing turning trunnions 62 (only one shown) are attached to a mold frame 64 which defines five cavities 66 in which the barriers are cast. A crane or similar lifting device may be attached to trunnions 62 for lifting the mold for rotation and removal of the formed product after curing. A rod 68 extends through each cavity 66 to form bore 24 (see, e.g., FIG. 1) in the barrier produced. Additional forms 70 are placed across each of the cavities 66 to form slots 38 (see, e.g., FIG. 1) in the cast concrete. The illustrated mold frame is made of a metal or metal alloy material for strength and durability. However, molds of this invention may be fabricated and assembled in different ways without varying from the spirit and scope of the invention taught herein. The molds of this invention may, for example, be formed using different frame designs or configurations, as long as the mold is configured to form a barrier of this invention.

[0029] The dense, heavy material employed to fabricate barriers of this invention will preferably be a concrete material, but may alternatively be a plastic, thermoplastic, polymer, resin, molten metal, molten metal alloy or the like, as long as the material is sufficiently dense and heavy to provide to the barrier adequate weight and sizing characteristics for the intended use.

[0030] It will now be appreciated that this invention provides other features and advantages. For example, an alternative configuration of the barrier can be provided wherein the bottom surface defines a footing or extension of the body of the barrier which is sized and configured to extend down into the support surface or ground to provide the anchoring means of this invention.

[0031] For barricade systems of this invention, it will be noted that the distance between the barriers and the number of barriers used will be driven by factors such as the size and shape of the area to be protected from unwanted vehicular traffic, the desired aesthetic appearance, the amount of mass desired for the barricade system, and the number of pedestrian access points desired along the length of the barricade system.

[0032] The barriers of this invention can ensure that a vehicle does not travel past a certain point while providing a stable and aesthetically pleasing base for a sign, such as a no-parking or other traffic-related signage, a lighting fixture post or the like. The possible uses for this attachment feature in the top of the barrier are myriad. These uses can include, but are not limited to, fencing, traffic direction signs, support for parking lot lights, support for flags, sports equipment anchors and bases, etc.

[0033] Barriers of this invention may also be configured to have decorative designs, emblems, letters, etc. attached to the front surface to provide artwork or indicia as desired. The barriers may also be constructed of colored or stained material, exposed aggregate, etched or textured concrete or the like. The exposed surfaces of the barrier may also be supplemented with a decorative surfacing material, e.g., granite, marble, limestone, slate or the like, to provide architecturally consistent features and to give the barriers a decorative appearance.

[0034] Although, as herein depicted and described, the barrier is of a frusto-pyramidal shape, a pyramidal shape is also within the scope of this invention. However, the different angles specified for the front surface and the back surface described above are particularly preferred, since these angles increase the likelihood that the barrier will roll as described herein, increasing the likelihood that a ramming vehicle will be effectively stopped from passing into the protected area.

[0035] Each and every patent, publication, or commonly-owned patent application referred to in any portion of this specification is incorporated in toto into this disclosure by reference, as if fully set forth herein.

[0036] This invention is susceptible to considerable variation in its practice. Therefore the foregoing description is not intended to limit, and should not be construed as limiting, the invention to the particular exemplifications presented above. Rather, what is intended to be covered is that subject matter set forth in the following claims and the equivalents thereof permitted as a matter of law.

That which is claimed is:

1. A barrier to vehicular passage cast from dense, heavy material having a frusto-pyramidal shape of six surfaces, wherein the barrier forms:

   (A) a top and a bottom surface, which top and bottom surfaces are opposing and substantially parallel to each other and wherein the area of the bottom surface is greater than the area of the top surface, and

   (B) four non-vertical side surfaces wherein the angle of inclination from vertical of at least one side surface is greater than the angle of inclination from vertical of the opposing side surface.

2. A barrier according to claim 1 wherein the side surfaces comprise opposing first and second lateral surfaces and opposing front and back surfaces and wherein (a) the front surface is inclined from vertical at an angle in the range of about 25 to about 55 degrees, (b) the back surface is inclined from vertical at an angle in the range of about 0 to about 30 degrees, and (c) the first and second lateral surfaces are each inclined from vertical at angles in the range of about 20 to about 50 degrees.

3. A barrier according to claim 2 which defines a bore extending from the first lateral surface to the second lateral surface, the bore being sized and configured to receive a linking element passing through the bore in order to link two or more other barriers to the barrier.

4. A barrier according to claim 2 which comprises anchoring means for anchoring the barrier at a point proximate to an imaginary axis formed along the intersection of the bottom and back surfaces, so that, upon sufficient impact to the front surface by a vehicle, the barrier will rotate substantially about the imaginary axis.

5. A barrier according to claim 4 which defines one or more openings in one or more of the six surfaces.

6. A barrier according to claim 5 wherein the anchoring means comprises an anchor pin attached to and extending from the support surface under the barrier.

7. A barrier according to claim 5 wherein the one or more openings are threaded.

8. A barrier according to claim 1 which forms at least one slot defined by the bottom surface, which slot extends from the central region of the bottom surface to at least one opening in one of the non-vertical side surfaces.
9. A barrier according to claim 8 which forms two slots on one non-vertical side surface, which two slots are sized and configured to accommodate forks of a forklift.

10. A barrier according to claim 7 wherein a threaded eyebolt is threaded into the threaded opening.

11. A barricade system for impairing vehicular passage into a restricted area comprising:

(A) two or more barriers cast from dense, heavy material forming a frusto-pyramidal shape of six surfaces, wherein each barrier forms (1) a top and a bottom surface, which top and bottom surfaces are opposing and substantially parallel to each other and wherein the area of the bottom surface is greater than the area of the top surface, (2) four non-vertical side surfaces wherein the angle of inclination from vertical of at least one side surface is greater than the angle of inclination from vertical of the opposing side surface, and (3) a bore extending from one side surface to the opposing side surface, and

(B) at least one linking element extending through the bores of each of the two or more barriers,

wherein each of the barriers is sized and configured such that the forward motion of a vehicle impacting the barrier will be impeded by inertia of the impacted barrier together with inertia of the linked barriers.

12. A system according to claim 11 further comprising a fence attached to one or more of the two or more barriers.

13. A method of impairing vehicular passage into a restricted area, which method comprises:

(1) positioning at a perimeter of the area at least one barrier cast from dense, heavy material forming a frusto-pyramidal shape of six surfaces, wherein the barrier forms (A) a top and a bottom surface, which top and bottom surfaces are opposing and substantially parallel to each other and wherein the area of the bottom surface is greater than the area of the top surface, (B) a first and a second lateral surface, and (C) a front and a back surface wherein the angle of inclination from vertical of the front surface is greater than the angle of inclination from vertical of the back surface, and

(2) anchoring the barrier at a point proximate to an imaginary axis formed along the intersection of the bottom surface and the back surface,

such that, upon sufficient impact to the front surface by a vehicle, the barrier member rotates substantially about the imaginary axis, the bottom surface pivots up and back under the vehicle, the vehicle is lifted upon the barrier and further forward motion of the vehicle is impaired.

14. A method of limiting vehicular access to a designated area comprising

(1) positioning at a perimeter of the area a plurality of barriers cast from dense, heavy material each forming a frusto-pyramidal shape of six surfaces wherein each barrier forms (I) a top and a bottom surface, which top and bottom surfaces are opposing and substantially parallel to each other and wherein the area of the bottom surface is greater than the area of the top surface, (2) four non-vertical side surfaces wherein the angle of inclination from vertical of at least one side surface is greater than the angle of inclination from vertical of the opposing side surface, and (3) a bore extending from one side surface to the opposing side surface, and

(2) linking the plurality of barrier members to one another by passing a linking element through each of the bores, such that the forward motion of a vehicle impacting the barrier will be impeded by inertia of the impacted barrier together with inertia of the barriers linked thereto.

15. A mold for forming at least one barrier from a dense, heavy material, wherein the barrier so formed forms a frusto-pyramidal shape of six surfaces comprising:

(A) a top and a bottom surface, which top and bottom surfaces are opposing and substantially parallel to each other and wherein the area of the bottom surface is greater than the area of the top surface, and

(B) four non-vertical side surfaces wherein the angle of inclination from vertical of at least one side surface is greater than the angle of inclination from vertical of the opposing side surface.

16. A mold according to claim 15, wherein the side surfaces comprise opposing first and second lateral surfaces and opposing front and back surfaces and wherein (a) the front surface is inclined from vertical at an angle in the range of about 25 to about 55 degrees, (b) the back surface is inclined from vertical at an angle in the range of about 0 to about 30 degrees, and (c) the first and second lateral surfaces are each inclined from vertical at angles in the range of about 20 to about 50 degrees.

17. A mold according to claim 15, wherein the barrier so formed also defines a bore extending from the first lateral surface to the second lateral surface, the bore being sized and configured to receive a linking element passing through the bore.

18. A mold according to claim 15, wherein the barrier so formed defines two slots on one non-vertical side surface, which two slots are sized and configured to accommodate forks of a forklift.