

DOOR EDGE CONSTRUCTION

SPECIFICATION

CROSS-REFERENCE TO RELATED APPLICATIONS

5 This application is a continuation-in-part of U.S. Patent Application Serial No. 10/686,325, filed October 14, 2003. This application claims priority to U.S. Patent Application Serial No. 11/454,046, filed June 15, 2006, the entire contents of which are incorporated herein by reference in their entirety.

10 FIELD OF THE INVENTION

 The present invention relates generally to a door edge construction and more particularly, to a replaceable door edge arrangement.

BACKGROUND OF THE INVENTION

15 One popular form of vertically hung doors typically comprises a wooden frame defining outer dimensions of the door, panels of sheet material, such as plywood, plastic or metal covering the frame or both sides, and a core within the frame, which may be solid or hollow.

 In certain high traffic environments, for example, schools, hospitals
20 and other types of health care institutions, doors are often subjected to impacts from carts, wagons, dollies, etc. which take their toll on the doors, particularly along their free edges and the hinged edges. Nicks, gouges and cracks produced along door edges by such impacts compromise a door's ability to effect a secure closure, which is particularly important where the door serves as a fire barrier as well as a closure, and
25 mar its aesthetic appearance.

 Heretofore, when a door edge was severely damaged, it was necessary either to replace the door in its entirety or to refinish it. With the latter expedient, the door panels may also have to be replaced and, in any event, the door will have to be
 refinshed as well. The cost of maintaining the structural integrity and appearance of
30 the many doors in a hospital, for example, can become substantial.

SUMMARY OF THE INVENTION

The object of the present invention is to minimize the necessity of replacing or refinishing doors that have been severely damaged along their edges by enabling a damaged door edge to be simply and inexpensively restored.

5 The foregoing object is achieved by constructing a door with a replaceable edge strip or stile which, when damaged, can be readily removed and replaced with a new one, thereby restoring the door's integrity and appearance. In accordance with the invention, this is achieved by so constructing the door such that the replaceable edge strip or the replaceable stile can be removed and replaced
10 without affecting the door frame or door slab, thus eliminating the need for otherwise replacing or refinishing the door. The stile is so configured that it can be covered with a plastic cap that provides an extra layer of protection against damage and helps maintain a snug seal against a doorway or an opposite door.

 Another feature of the invention is the incorporation in the replaceable
15 door edge assembly of an intumescent (heat expanding) material such that in case of fire, the edge is expanded outwardly to effect a tighter seal with the surrounding doorway or opposite door. The fire safety rating of the door is thus improved.

 Still another feature of the invention is the incorporation in the door edge construction of an accent material to provide a reveal, or line of color different
20 than the door panel color, for aesthetic and/or identification purposes.

BRIEF DESCRIPTION OF THE DRAWINGS

The foregoing and other features and advantages of the invention will become apparent from the following detailed description thereof, taken in conjunction with the appended drawing, in which:

25 FIG. 1 is an oblique view partially cut away, of a door incorporating the present invention;

 FIG. 2 is a cross-section of the door of FIG. 1, taken along the line 2-2;

FIG 3 is an enlarged view of the right-hand portion of the cross-section view of FIG. 2 showing one representative embodiment of the door edge construction of the invention in greater detail;

FIGS. 4A, 4B and 4C illustrate modifications of the door edge construction of FIG. 3;

FIG. 5 is an enlarged cross-sectional view similar to FIG. 3 illustrating the incorporation of an intumescent strip in the door edge construction of the invention;

FIG. 6 illustrates a modification of the door edge construction of FIG. 5;

FIGS. 7A, 7B, 7C and 7D illustrate the replaceable door edge construction of the invention incorporating various types of accent strips or reveals;

FIGS 8A and 8B illustrate variations of the invention embodying an alternate tongue and groove arrangement for securing the replaceable stile to the door edge;

FIG. 9 illustrates a variation of the invention in which the tongue and groove members are covered with metal channels;

FIG. 10 illustrates a modification of the arrangement of FIG. 9;

FIGS. 11 and 12 illustrate variations of the arrangement of FIG. 9;

FIG. 13 illustrates a replaceable stile arrangement in accordance with the invention in which the width of the replaceable stile is adjustable;

FIG. 14 is an enlarged view of the cross-section view of a second representative embodiment of the door edge construction in accordance with the invention;

FIGS. 15A, 15B, and 15C illustrate representative steps of preparing a door and door edge construction in combination in accordance with FIG. 14;

FIG. 16 is an enlarged cross-sectional view similar to FIG. 14 illustrating the incorporation of an intumescent strip in the door edge construction of the invention; and

FIGS. 17A, 17B, and 17C illustrate representative steps in preparing a door and door edge construction in combination in accordance with FIG. 16.

DETAILED DESCRIPTION OF THE INVENTION

Turning now to the drawings, in particular FIGS. 1, 2 and 3, a door of the type commonly used in health care facilities and the like, but incorporating the present invention, is shown. Such a door 20 typically comprises vertical stiles 22 and top and bottom rails 24, surrounding a core 26. The stiles 22 and rails 24 preferably are made of hardwood and the core 26 of particle board, although other materials may be used to provide the necessary strength and rigidity.

Finish panels 28 cover the particle board core, top and bottom rails and stiles on both sides to provide strength, impact resistance and aesthetic appeal. As seen best in FIG. 3, the panels 28 may comprise a hardboard layer 28a covered by a decorative plastic cladding 28b such as of ACROVYN®, a vinyl acrylic plastic manufactured by Construction Specialties, Inc., Lebanon, NJ. The layers 26, 28a and b are laminated together to form a 5-ply construction. Doors of the type illustrated are manufactured, for example, by Jeld-Wen, Inc.

Doors 20 may be made in dimensions to fit various size doorways in which they are mounted. As will be appreciated, the door 20 may be hinged to swing around along either vertical edge to suit the application. In a typical installation often found in health care facilities, a pair of such doors are hinged at opposite edges to close a wide hallway and are swingable in both directions so that rolling beds, carts, etc may be pushed through without the need to hold the door open.

As discussed above, such doors are subjected to repeated, severe impact by beds, carts, etc., as they are pushed through the doors, often resulting in significant damage to the free vertical edges of the doors. Not only is the appearance of the door thus marred, the integrity of the closure and its fire resistance capability are degraded. Heretofore, in the case of significant edge damage, it was necessary to

completely replace a damaged door with a new one to restore the closure's appearance and integrity, at substantial cost.

In accordance with the present invention, the vertical edges of a door such as described herein are fabricated with separable edge assemblies that can be
5 readily replaced if damaged, thereby avoiding the necessity of complete door replacement and greatly reducing the cost of restoring the door's appearance and integrity.

A preferred embodiment of the removal door edge arrangement of the invention is shown in FIGS. 1, 2 and 3; most clearly in the enlarged section through a
10 door edge of FIG. 3. The vertical door stile is indicated at 22 and the replaceable edge assembly indicated at 30. The latter comprises replaceable stile 32, preferably of hardwood, extending the full length of the edge stile 22 and a plastic cover 34 secured over replaceable stile 32. Stile 22 is milled with a longitudinal tapered groove 22a and replaceable stile 32 with a longitudinally extending complementary tapered spline
15 32a, forming a snug tongue-and-groove mating of stile 22 and replaceable stile 32. A plurality, e.g., 4, of screws 36, spaced along the door edge, firmly but releasably secure replaceable stile 32 to stile 22. If desired, spots of glue may also be applied between stile 22 and replaceable stile 32 to more firmly hold them together, while still allowing replaceable stile 32 to be removed when required.

20 Cover 34 may be formed of ACROVYN® or other relatively hard but resilient material, such as aluminum or stainless steel, with inwardly directed flanges 34a along both edges. Cover 34 is formed to be of the same shape as the outer surface of replaceable stile 32, e.g., generally rectangular with rounded corners. Replaceable stile 32 is provided with rectangular indents 32b along both inner longitudinal edges,
25 such that when stile 22 and replaceable stile 32 are joined, rectangular grooves 32b are formed therebetween extending the full length of the door. These grooves snugly receive the flanges 34a of cover 34. To remove a damaged cover from a door, one of the flanges 34a is pried out of its groove and the cover bent away to release the other flange. To install a new cover, one of the flanges is inserted into its groove and the
30 cover pressed toward the outer surface of replaceable stile 32 until the other flange snaps into the other groove.

It will be understood that the curvature of the corners of the stile and cover combination discussed and illustrated may be varied to suit the particular application. For example, for paired swinging doors, such as often found across hospital passageways, the corner curvature will be of greater radius than single doors,
5 to provide the required clearance.

It will also be understood that the cover 34 need not be removable, but may be permanently secured to its replaceable stile 32, such as by a suitable adhesive. In such an arrangement, flanges 34a and indents 32b may be unnecessary.

FIGS. 4A, 4B and 4C illustrate alternative forms of the tongue-and-groove coupling of FIG. 3, with the screws omitted for the sake of clarity. In FIG. 4A, a dovetail spline 42 mates with a corresponding groove 44; in FIG 4B, the spline 46 has a partially circular cross-section to mate with a partially circular groove 4B; and in FIG. 4C, the spline 50 and groove 52 are rectangular in cross-section. It will be understood that other variations of the tongue-and-groove cross-sections may be
15 used as desired.

FIG. 5 illustrates another embodiment which further enhances the fire resistance advantages of doors of the invention. A heat-expansion or intumescent strip 52 extends the full length of the door edge and is adhered in a groove 54 milled along the outer edge of replaceable stile 32. Cover 34 may have a complementary
20 groove along its inner surface to accommodate the strip as well. The strip 52 is covered by outer cover 34 when the latter is snapped in place. At normal room temperatures, strip 52 maintains its normal thickness. In case of fire or extreme heat adjacent the door, strip 52 expands, pushing cover 34 outwardly to tighten the seal between the edge of the door and an adjacent door or doorframe, thus increasing the
25 fire resistance rating of the door.

A variation of the arrangement of FIG. 5 is illustrated in FIG. 6 wherein the intumescent strip 52 is adhered in a groove 34a formed in the outer edge of cover 34, the inward extension of the cover 34 fitting in a groove milled along the outer edge of replaceable stile 32.

It will be understood that in the embodiments of FIGS. 5 and 6, any of the tongue-and-groove couplings described above may be used in place of the configurations illustrated.

To improve the appearance of the door, an accent strip or reveal, of a contrasting or complementary color to the remainder of the door surface, may be incorporated in the door edge arrangements of FIGS. 3 to 6. In the embodiment of FIG. 7A, longitudinal grooves 60 are milled along opposite sides of replaceable stile 32, inwardly of its interior face, for receiving the flanges 34a of cover 34, leaving exposed narrow longitudinal surfaces 62 on opposite sides of the stile, between cover 34 and the panels 28. These exposed surfaces 62 may be painted in any aesthetically pleasing color.

The reveal or accent strip may also be provided by insertion of a suitably colored strip of accent material in a slot provided between the stile 22 and replaceable stile 32, as shown in FIG. 7B. As seen, stepped indents 64 are provided along each inner corner of replaceable stile 32 to receive the flanges of cover 34 and accent strips 66. The strips 66 may be of PVC plastic, aluminum, stainless steel or other material having their outer surfaces ridged and slightly thicker than the grooves created upon joinder of replaceable stile 32 to stile 22. The strips 66 are pressed into the grooves after cover 34 is inserted and the ridged surfaces resist any tendency of the strips to move out of the grooves.

A variation of the accent strip of FIG. 7B is illustrated in FIG. 7C. In this modification, the inside longitudinal edges of replaceable stile 32 are milled to provide both stepped indents and longitudinal grooves for receiving L-shaped accent strips 68. One leg of each accent strip extends outwardly to just below the respective outer surface of the door with its edge exposed when replaceable stile 32 is joined to stile 22 with the accent strip in place.

In the embodiment of FIG. 7D, the accent strips comprise opposite exposed edges 70 of a strip 72 sandwiched between stile 22 and replaceable stile 32.

The accent strips of FIGS. 7B-D may be made of any suitable material, including PVC plastic, aluminum and stainless steel.

FIGS. 8A and 8B illustrate variations of the tongue and groove arrangements of the invention shown in the previous embodiments. In both variations, the groove in the stile 22 is rectangular (as in FIG. 4C) and lined with a U-shaped channel 80 having longitudinal ridges 82 formed along both interior sides of the channel. Channel 80 is secured in the rectangular groove milled in stile 22 by screw 84.

Adhered along the inner surface of replaceable stile 32 is a tongue plate 86 having integral longitudinal extending flanges 88 with longitudinally extending ridges 90 formed along their outer surfaces. The pair of flanges 88 and channel 80 are dimensioned such that the flanges are snugly received within the channel and the respective ridges 82, 90 engaged to secure replaceable stile 32 to stile 22. Tongue plate 86 may extend the full width of stile 32, with rounded edges extending slightly beyond the door panel as in FIG. 8A, or be narrower than the width of the stile and received in a depression milled in the inner surface of replaceable stile 32, as in FIG. 8B. In the embodiment of FIG. 8A, the rounded extensions of the tongue plate 86 may serve as accent strips. In FIG. 8B, accent strips are provided by inserts 92 between the edges of cover 34 and stile 22. In both embodiments, intumescent strips 52 may be provided.

Channel 80 and tongue plate 86 may be made of aluminum or other metal or plastic, as desired.

In the embodiment of FIG. 9, a dovetail tongue and groove coupling between stile 22 and replaceable stile 32 with screw 36, such as shown in FIG. 4A, has both tongue 94 and groove 96 covered with channels of thin aluminum, steel, or other material providing low friction slideable surfaces, 98a and 98b, respectively, which extend to the outer surfaces of the door. The covered channels facilitate the insertion and removal of replaceable stile 32 on stile 22.

A variation of the embodiment of FIG. 9 is shown in FIG. 10, in which the extents of the metal channels 100a and 100b are limited to the extents of the groove and tongue, respectively. This variation of the embodiment includes cover 34 and may include intumescent strip 52. The space left between stile 22 and replaceable

stile 32 is filled with tapered inserts 102, which serve to wedge the members 22, 32 apart and also to provide accent strips.

In FIG. 11, a single metal channel 110 is applied to the dovetail tongue element only and in FIG. 12, the single metal channel 112 is extended outwardly
5 between stile 22 and replaceable stile 32 to the door faces with rounded outer edges 114 which provide accent strips.

To accommodate different door thicknesses, the adjustable width replaceable stile of FIG. 13 is advantageous. In this embodiment, the replaceable stile is made up of two separate longitudinal elements 132a and 132b, each having a
10 generally L-shaped cross-section overlying and nesting with each other to be slideable away from each other between a minimum width arrangement wherein the respective longitudinal edges of elements 132a and 132b are in contact with each other and a maximum width configuration wherein the respective longitudinal edges are separated. Opening 134 is of greater diameter than screw 36 to allow for varying
15 amounts of separation.

In one embodiment, as shown in FIG. 14, a replaceable door edge construction is shown. The door edge construction is indicated at 30' and comprises main body 36' having first and second sidewall portions 36a' extending distally therefrom. The sidewall portions are integrally connected to the main body by curved
20 portions 36b'. Alternatively, however, the sidewall portions 36a' can be integrally connected to the main body 36' by planar portions or L-shaped portions (not shown). The door edge construction further includes first and second leg portions 38' integrally connected to first and second sidewall portions 36a', respectively.

The main body 36' of the door edge construction is preferably formed
25 from a resilient material and is configured to contour the vertical edge of a door. For example and not limitation, the door edge construction can be formed from a malleable metal such as aluminum or stainless steel, or alternatively from a hard yet flexible polymeric material. The main body 36' has a generally bowed or curved configuration. Alternatively, however, the main body 36' may have a generally
30 planar configuration. Additionally, the first and second sidewall portions 36a' may have a planar, curved or bowed shape configuration. In one embodiment, as shown in

FIG. 14, the edge construction includes planar first and second sidewall portions integrally connected by curved portions to planar main body. In this manner, the main body 36' and the first and second sidewall portions 36a' generally form an C-shaped member configured to contour an edge of a door.

5 The first and second leg portions 38' are configured to engage a surface of a door. The first and second leg portions are further disengageable with the door surface. Accordingly, a readily removable and replaceable edge construction is provided. In this aspect of the invention, the edge construction can be removed from the door and replaced by a second edge construction member having a similar
10 construction. Advantageously, a replaceable stile member is not required to provide the replaceable edge construction. Rather, the replaceable edge construction is directly engageable and disengageable with a door edge.

 As shown in FIG. 14, the first and second leg portions 38' are preferably configured to form a mating relationship with groove 22a' formed in door
15 10. In this manner, the replaceable door edge construction 30' is coupled to the edge of door. Preferably, groove 22a' is a longitudinal groove milled or otherwise disposed along the full length of the front and back surfaces of the door 10, preferably to a depth sufficient so that the groove extends through 28b', 28a' and 22'. Leg
20 portions have a longitudinal length suitable for full engagement with the longitudinal grooves disposed in surfaces 28a', 28b' and vertical stile 22'.

 In one embodiment, the first and second leg portions 38' form a sliding engagement with longitudinal grooves 22a' defined in and extending in the front and back surfaces 28b' 28a' and vertical stile 22' of the door 10. In this manner, the replaceable door edge construction 30' can be slid or snap-fit into the edge of the door
25 10 such that the first and second leg portions 38' are received in the longitudinal grooves 22a' of the door. As shown in FIG. 15B, the longitudinal grooves 22a' have a depth sufficient to receive the first and second leg portions 38'. Further, the door edge construction 30' is disengageable from the door edge by sliding the replaceable edge construction upwardly to disengage the sliding engagement of the leg portions
30 and the longitudinal grooves 22a'.

Alternatively, however, the first and second leg portions can form a tongue and groove connection with the longitudinal grooves 22a'. In this regard, the longitudinal grooves 22a' snugly receive the first and second leg portions when the leg portions, which are snap-fit into the longitudinal grooves. The door edge construction 30' is disengaged from the door edge by prying one of the leg portions out of the groove and bending the edge construction to release the other leg portion. It should be appreciated in the art that alternative mating relationships can be formed between the edge construction and the door, if desired.

In yet another aspect of the invention, a door 10 and replaceable door edge construction 30' in combination is indicated in FIG. 15C. As shown in FIG. 15A, door 10 generally comprises core 26', vertical stile 22' and opposing front and back surfaces 28b'. Vertical stile 22' is disposed adjacent to core 26' such that vertical stile 22' and core 26' are longitudinally aligned. Preferably, vertical stile 22' has substantially the same length as core 26'. As will be recognized in the art, however, the length of the vertical stile 22' can differ from core 26', if desired. The front and back surfaces of door 10 is disposed proximate to sidewalls of core 26' and vertical stile 22'.

As shown in FIG. 15B, the front and back surfaces 28b' 28a' and vertical stile 22' of door 10 is milled to define longitudinal grooves 22a' extending longitudinally along the front and back surfaces of door 10. Additionally, the door surfaces can be further milled to define a door 10 having a first portion 10a' having a first width W_1 and a second portion 10b' having a second width W_2 . As illustrated in FIG. 15B, in a preferred embodiment, the first width is greater than the second width. In this manner, the door and edge in combination have a constant width, as shown in FIG. 15C.

In another embodiment, as shown in FIGS. 16 and 17A-17C, door 10 and/or edge construction 30' further includes a heat-expansion or an intumescent strip 52'. The heat expansion or intumescent strip preferably extends the full length of the door edge. As depicted in FIG. 17B, the edge of vertical stile 22' is configured to include an indent 22b' defined along a surface thereof. The strip of intumescent material 52' is disposed in the indented surface 22b', as depicted in FIG. 17C. The replaceable edge construction 30', as shown in FIG. 16, covers intumescent strip 52'

when engaged to the edge of door 10. Alternatively, however, in yet another embodiment, the strip of intumescent material 52' is secured to a surface of the replaceable edge construction, preferably, the main body. The intumescent material can be disposed in a indent formed in a surface of the edge construction 30' such as in the outer surface of the main body. Alternatively, however, the strip of intumescent material can be secured to a planar surface of the edge construction such as the inner or outer surface of main body 36' (not shown).

To improve the appearance of the door and edge construction in combination, the door may include a contrasting or complementary color relative to the color of the edge construction. In this manner, the edge construction may incorporate an aesthetically pleasing color on the main body or sidewall portions, if desired.

It will be seen from the foregoing that the present invention provides a simple, inexpensive way of repairing damaged doors by allowing replacement only of a removable door edge assembly, thereby saving the considerable expense of replacing an entire door. Although a number of specific embodiments of the invention above have been illustrated, various modifications thereof will be apparent to those skilled in the art within the spirit of the invention. For example, replaceable stile 32 and cover 34 may be made as a single integral member and joined to stile 22 as shown. Also, the tongue-and-groove coupling between replaceable stile 32 and stile 22 may be eliminated, if desired and any of these variations may be provided with or without intumescent strips. Accordingly, it will be evident that the scope of the invention is to be limited only as set forth in the appended claims.

WE CLAIM:

1. A replaceable door edge construction comprising:
a main body having a first sidewall portion and a second sidewall
5 portion, each of the first sidewall portion and the second sidewall
portion integrally connected to the main body; and
a first leg portion and a second leg portion integrally connected to the
first sidewall portion and the second sidewall portion, respectively.
2. The replaceable door edge construction of claim 1, wherein the first and
10 second sidewall portions are integrally connected to the main body by curved
portions.
3. The replaceable door edge construction of claim 1, wherein the main body is
planar.
4. The replaceable door edge construction of claim 1, wherein the main body is
15 generally bowed.
5. The replaceable door edge construction of claim 4 wherein the main body has
a generally C-shape.
6. The replaceable door edge construction of claim 1, wherein the first and
second leg portions are configured to engage a door to define a readily
20 removable edge construction.
7. The replaceable door edge construction of claim 6, wherein the first and
second leg portions form a mating relationship with first and second grooves
formed in a front surface and a back surface of a door, respectively.
8. The replaceable door edge construction of claim 7, wherein the first and
25 second leg portions slidably engage the first and second grooves.

9. The replaceable door edge construction of claim 7, wherein the first and second leg portions form a tongue and groove connection with the first and second grooves.
10. The replaceable door edge construction of claim 6, wherein the door edge construction is configured to readily disengage the door to define a replaceable door edge construction.
11. The replaceable door edge construction of claim 1, further comprising a strip of intumescent material secured to a surface of the main body.
12. The replaceable door edge construction of claim 11, wherein the surface of the main body includes an indent, and further wherein the intumescent strip is disposed in the indented surface.
13. The replaceable door edge construction of claim 11, wherein the intumescent material extends along a length of an outer surface of the main body.
14. The replaceable edge construction of claim 13, wherein the intumescent material has a length substantially equal to the length of the main body.
15. The replaceable edge construction of claim 1, wherein the edge construction is formed from a resilient material.
16. A door having first and second vertical edges, and opposing front and back surfaces in combination with a replaceable edge construction comprising:
- a first longitudinal groove formed in the front surface of the door,
- a second longitudinal groove formed in the back surface of the door,
- and
- an edge construction disposed proximate one of the vertical edges of the door, the edge construction comprising a main body including integrally connected first and second leg portions connectively engaged to the first and second longitudinal grooves, respectively, to define a door having a replaceable edge construction.

17. The door and edge construction combination of claim 16, wherein the edge construction further includes first and second sidewall portions integrally connected to the main body.
18. The door and edge construction combination of claim 16, wherein the first and second leg portions slidingly engage the first and second longitudinal grooves formed in the front and back surfaces of the door, respectively.
19. The door and edge construction combination of claim 16, wherein the first and second leg portions form a tongue and groove connection with the first and second longitudinal grooves of the door, respectively.
20. The door and edge construction combination of claim 16, wherein the edge construction extends longitudinally along a length of the vertical edge of the door.
21. The door and edge construction combination of claim 20, wherein the edge construction has a length that is substantially equal to the length of the vertical edge of the door.
22. The door and edge construction combination of claim 16, wherein the edge construction is readily removable from the door and replaceable with a second edge construction.
23. The door and edge construction combination of claim 16, further comprising a strip of intumescent material disposed proximate the vertical edge of the door.
24. The door and edge construction combination of claim 23, wherein the intumescent material is disposed between the vertical edge of the door and the edge construction.
25. The door and edge construction combination of claim 23, wherein the intumescent material is secured to the vertical edge of the door.
26. The door and edge construction combination of claim 25, wherein the vertical edge of the door includes an indentation along a longitudinal surface thereof.

and further wherein the intumescent material is disposed in the indented surface.

27. The door and edge construction combination of claim 23, wherein the intumescent material is secured to a surface of the main body of the edge construction.
28. The door and edge construction combination of claim 16, wherein the edge construction is formed from a resilient material shaped to conform to an outer contour of the vertical edge of the door.
29. The door and edge construction combination of claim 16, wherein the edge construction is a different color than the color of the door.