

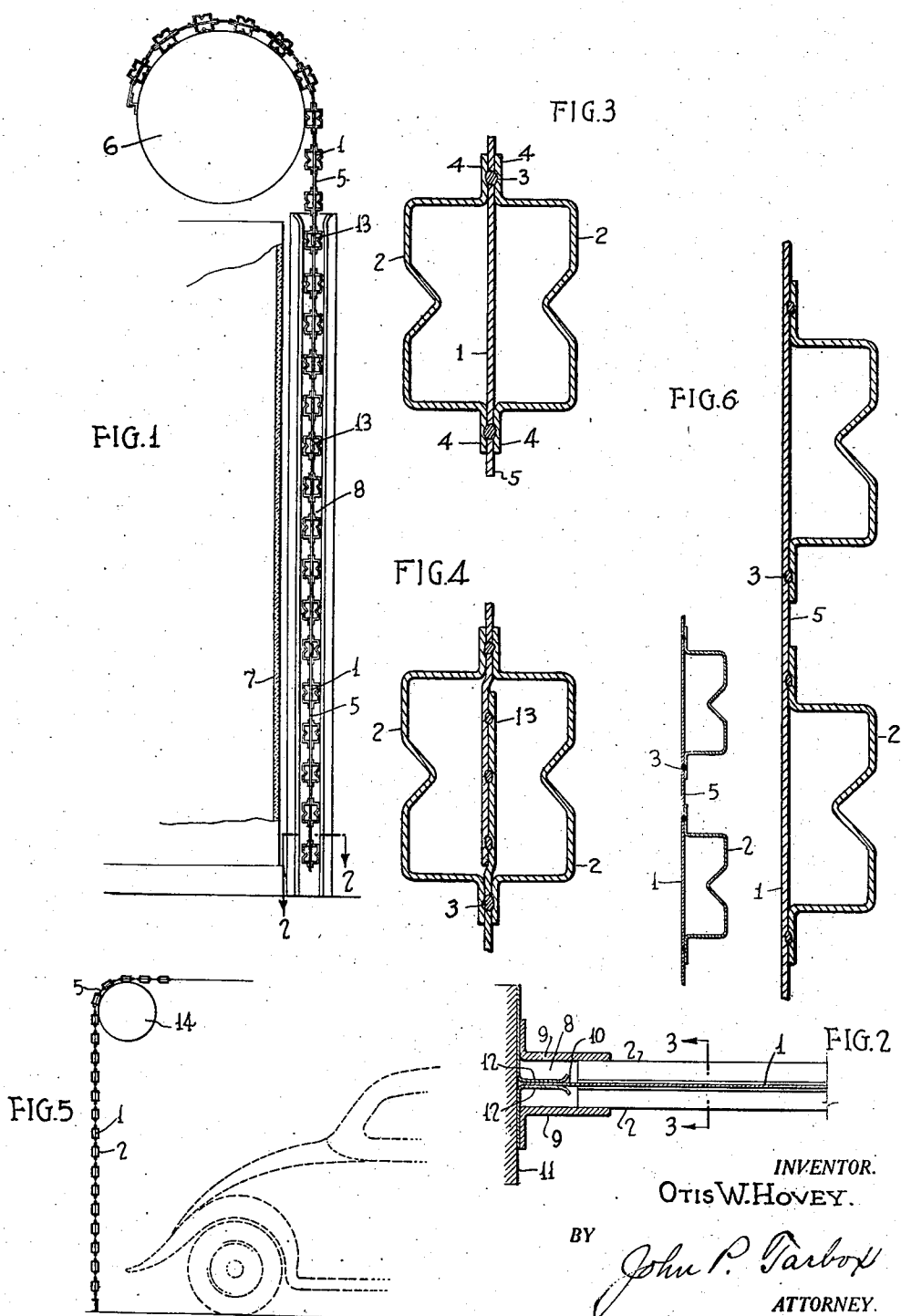
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FLEXIBLE METALLIC CLOSURE

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FLEXIBLE METALLIC CLOSURE

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The invention relates in general to door and window closures and more particularly to a flexible metal closure.

The main object of the invention is to provide a light, strong, weather proof closure of the above type particularly adapted for use in deck houses of ships to protect large windows against the action of wind and waves during heavy storms and for use as a garage or warehouse door or any place where a light, strong weather-tight closure resistant to moisture and heat, and capable of easy and quick manipulation is required.

A further object is the provision of a device of the above type adaptable to fabrication from light gauge stainless steel by spot welding, and having extreme simplicity of structure together with a high degree of strength for a given weight of material.

Briefly, these objects are accomplished by the provision of a main closure portion comprised of a thin flexible sheet or web member of high tensile stainless steel reinforced to a high degree against lateral pressure with a minimum addition of material, by channel section beams of the same material extending across the web member to within a given marginal distance of the side edges thereof and secured thereto by spot welding, the channels being closed by the web so that each channel-section beam in combination with that portion of the web which it covers, forms a box-section beam with only the added material of a channel-section beam. Flexibility is obtained without the use of jointed hinges by spacing the beams apart in parallel relation leaving a free bending strip of the thin web to form a flexible connection between the beams. Complete weather-tight closure is obtained by the provision of complementary smooth, stationary flanges arranged to overlap the free flexible side margins of the web left uncovered at the ends of the beams.

The invention will be more thoroughly understood with the aid of the following description given in connection with the accompanying drawing, the novel features being particularly set forth in the claims.

In the drawing:

Fig. 1 is a side view partly in section showing the invention applied to the protection of a glazed window opening.

Fig. 2 is an enlarged fragmentary section taken on the line 2—2 of Fig. 1.

Fig. 3 is an enlarged detail view in vertical section through one of the beams and adjacent portion of the web member, as on line 3—3 of Fig. 2.

Fig. 4 is a view similar to Fig. 3, showing the location of a seam in the web with reference to a beam.

Fig. 5 is a diagrammatic view showing the invention used as a garage door.

Fig. 6 is a view similar to Fig. 3 showing a modification.

Referring to the drawing in detail, the shutter structure comprises a web member 1 of thin flexible sheet metal preferably high tensile stainless steel, of substantially the width of the opening to be protected, reinforced at intervals by flanged channel-section beams 2 of the same material, secured to the web 1 by spot welds 3 between the flanges 4 and the web 1. Each channel-section beam 2 and that portion of the web 1 to which it is secured thus mutually reinforce each other by combining to form a closed box section beam. The beams 2 are preferably secured to the web in pairs on opposite faces of the web with the flanges in register, permitting one set of spot welds to be used for both beams. With this arrangement the pair of channel beams form with the web a double box-section beam with the web passing through the center and forming the central or intermediate wall of the double beam.

The reinforcing beams 2 extend across the web member to within a short distance of each side edge and are spaced apart in parallel relation leaving free bending strips 5 of the web between the beams, which strips act as flexible hinge connections permitting the shutter structure to be wound upon a cylindrical roller 6 mounted above the window 7. The sheet or web member 1 has such elastic properties, and is of such gauge that it can be wound around the roller 6 without exceeding the elastic limit of the material of the web so that when released it will spring back to its normal flat sheet form.

To enable the shutter to be slid up and down in front of the window opening and securely held in place against pressure from without or within, a stationary guide channel 8 formed of angle beams 9 is provided at each side of the window to receive the side edges of the shutter including the ends of the beams 2, and the free flexible side margins 10 of the web 1 left uncovered by the beams. A weather-tight connection between the side edges of the shutter and the sides 11 of the window opening is obtained through the provision of a weather tight seal formed by a pair of angle-section spring strips 12 of high tensile stainless steel or the like, mounted within each guide channel 8 and arranged to overlap and bear lightly against the side margin 10 of the web member 1. This weather seal may be given any degree of tightness by varying the set of the spring strips 12 to vary the pressure against the margin 10. This weather seal is of special importance where the device is used as a storm shutter on a ship's deck window as shown in Fig. 1.

The flexible shutter thus constructed may be readily repaired without marring its appearance

or detracting from its flexibility, by cutting out any damaged portion clear across the web and inserting a new section, joining the portions by seams 13 so placed as to be covered by a beam as shown in Figs. 1 and 4. This feature makes it possible to fabricate the web member 1 from several pieces of relatively narrow strip material instead of one or more large sheets without loss in strength or flexibility. An advantage of the latter construction is that the material can be obtained with better quality and at lower cost, in narrow strips than in wide sheets.

Instead of raising and lowering the flexible shutter by winding on and off a roller as shown in Fig. 1, it may be raised and lowered simply by drawing it over a roller 14 as indicated diagrammatically in Fig. 5 where it is shown in use as a garage door. With either use, the shutter may be counterbalanced in any known or other suitable manner. Where a simpler and lighter structure is desired, the channel beams 2 may be used singly and placed all on the same side of the web as shown in Fig. 6, without losing the advantage of the box section structure which makes for lightness with strength. It will be obvious that the beams 2 may be used singly and on both faces of the web by positioning them one above the other on alternate sides sufficiently vertically spaced to leave an intervening strip of the web member to form a flexible hinge like the strips 5 of Figs. 1 and 6.

It is to be noted that especially in the case of the double beam, that portion of the web member enclosed between the beam flanges acts to prevent the flanges spreading apart, and by thus holding the channel sections in their most advantageous position to resist bending stress, the sheet contributes to the strength of the beam, even though it is placed at the neutral axis.

While I have herein shown and described certain specific embodiments of the invention for the purpose of disclosure, it is to be understood that the invention is not limited to such embodiments but contemplates all such modifications and variants thereof as fall fairly within the scope of the appended claims.

What I claim is:

1. A flexible closure comprising a web of flexible sheet metal, and a plurality of metal reinforcing beams extending across the web and spot welded thereto in spaced relation to each other to leave a freely flexible portion of the web of substantial width between adjacent beams.

2. A flexible closure comprising a web of flexible sheet metal, and a plurality of metal reinforcing beams extending across the web and spot welded thereto in spaced relation to each other to leave a freely flexible portion of the web between adjacent beams, said web extending on each side beyond the ends of the reinforcing beams to form a continuous flange one at each side of the shutter, and weather sealing strips arranged in overlapping relation with said flanges.

3. A flexible closure comprising a flexible sheet metal web member and a plurality of sheet metal ribs of channel section secured through edge flanges thereon to the web member to form therewith ribs of box section, said ribs being spaced apart on the web parallel to each other leaving strips of the flexible web member of substantial width between the ribs to form flexible hinge joints.

4. A flexible closure comprising a web member of sheet metal, and a plurality of box section

beams having one wall formed by the web member, said beams being spaced apart along the web member in parallel relation to leave an intervening flexible hinge strip of the material of the web member between adjacent beams, and said web member being formed in sections joined by a seam lying in that portion of the web which forms a portion of a beam.

5. A flexible closure comprising a web of flexible sheet metal, and a plurality of channel beams joined to the web with the channels closed by the web and forming beams of closed box section, said beams being spaced apart in parallelism leaving flexible hinge strips of the web material between the beams, and stationary guides for the side edges of the shutter arranged to engage the ends of the beams.

6. A flexible closure comprising a web of flexible sheet metal, and a plurality of channel beams joined to the web with the channels closed by the web and forming beams of closed box section, said beams being spaced apart in parallelism leaving flexible hinge strips of the web material between the beams, stationary guides for the side edges of the shutter arranged to engage the ends of the beams, said web extending beyond the ends of the beams along each side of the shutter, and a stationary weather seal member arranged to overlap the said web extensions.

7. A flexible closure comprising a web of flexible sheet metal, and a plurality of channel beams joined to the web with the channels closed by the web and forming beams of closed box section, said beams being spaced apart in parallelism leaving flexible hinge strips of the web material between the beams, said web extending beyond the ends of the beams at the sides of the shutter, stationary guides arranged to receive the side edges of the shutter including the end portions of the beams, and a pair of stationary weather seal strips arranged to overlap a portion of the said web extensions.

8. A flexible closure comprising a web of flexible sheet metal, and a plurality of channel beams joined to the web with the channels closed by the web and forming beams of closed box section, said beams being spaced apart in parallelism leaving flexible hinge strips of the web material between the beams, and said web being formed of sections joined by a seam covered by one of said beams.

9. A flexible closure comprising a flexible web of thin gauge high tensile stainless steel reinforced by flanged channel beams of like material secured to the web by spot welding the flanges to the web, said beams being arranged in parallelism and spaced apart laterally to leave a free bending portion of the web of substantial width between the beams.

10. A flexible closure comprising a flexible web of thin gauge high tensile stainless steel reinforced by flanged channel beams of like material secured to the web by spot welding the flanges to the web, said beams being arranged in parallelism and spaced apart laterally to leave a free bending portion of the web between the beams, and a roller support for the shutter, said roller support and the thickness of the web being so proportioned in relation to each other that bending of the shutter around the roller will not result in stresses exceeding the elastic limit of the material of the web.

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