

June 4, 1968

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3,386,489

CLOSURE APPARATUS

Filed April 15, 1965

2 Sheets-Sheet 1

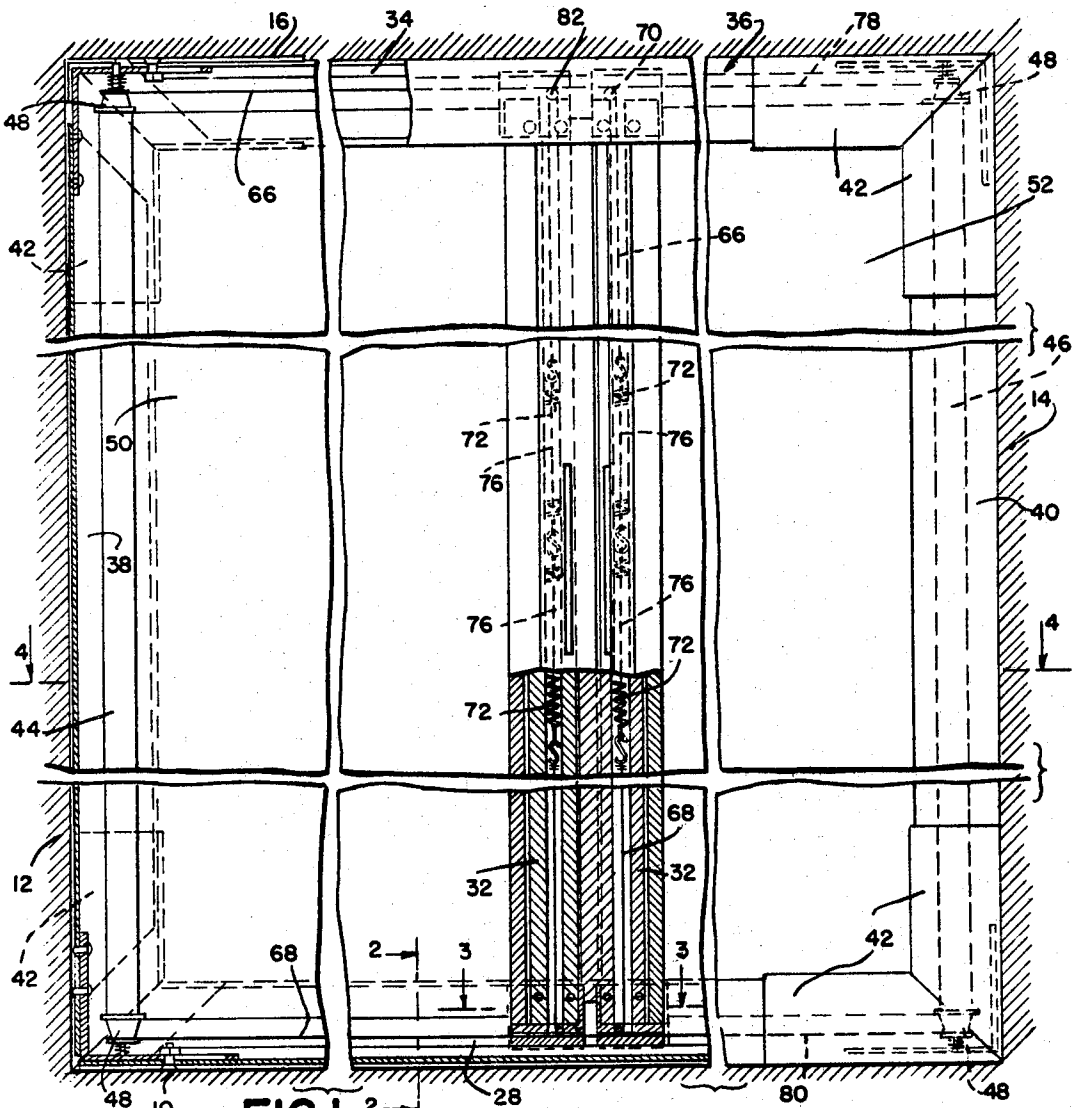


FIG. 1

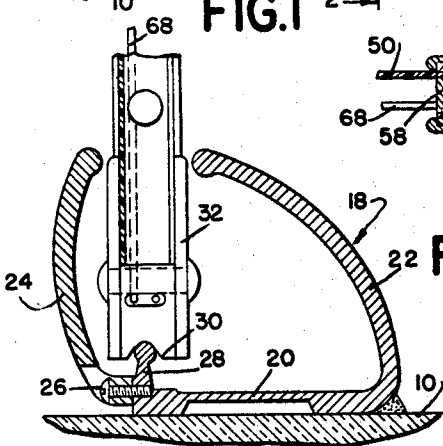


FIG. 2

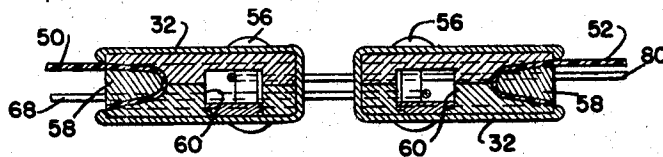


FIG. 3

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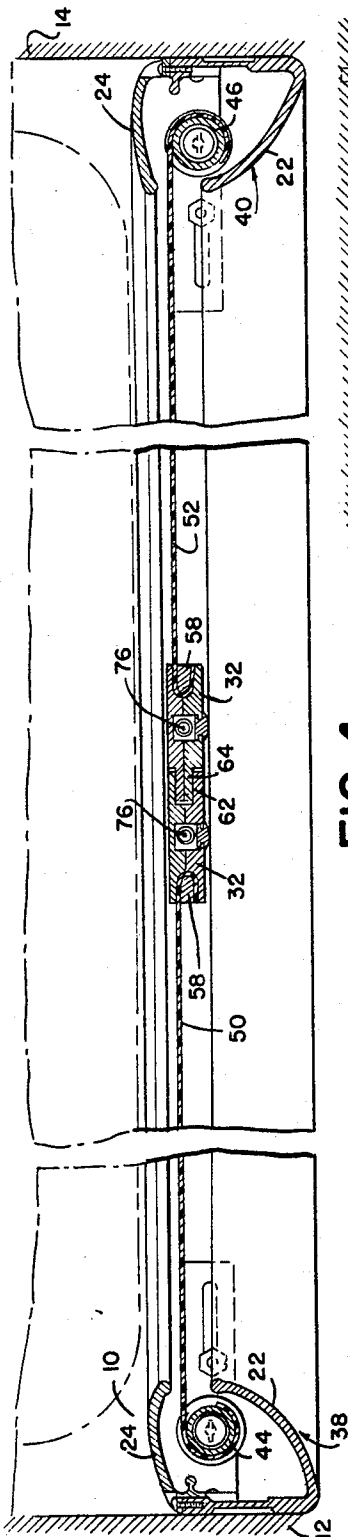


FIG. 4

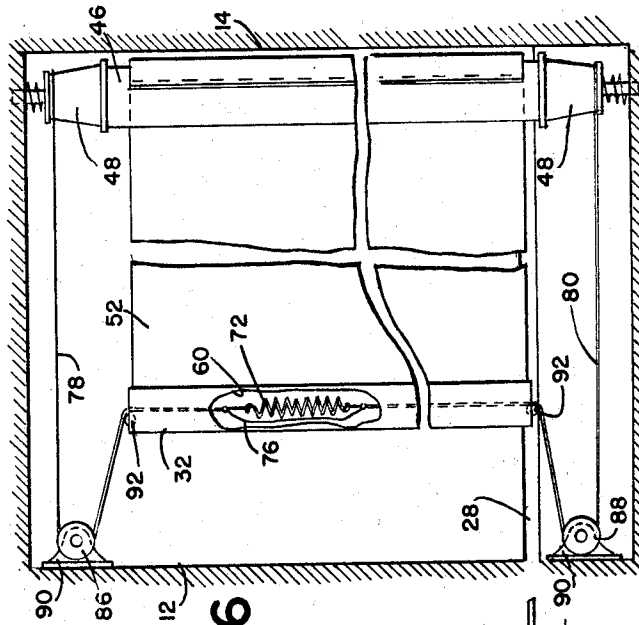


Fig. 6

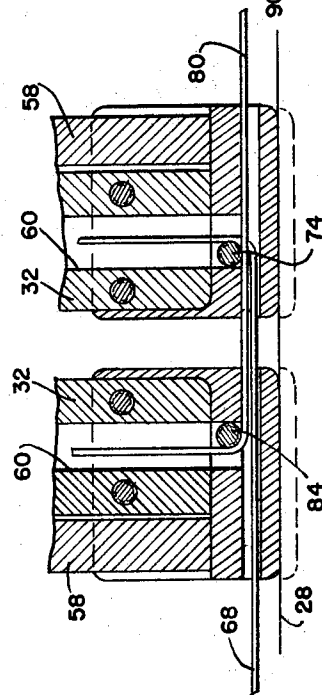


FIG. 5

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CLOSURE APPARATUS

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1 Claim. (Cl. 160—25)

ABSTRACT OF THE DISCLOSURE

A flexible closure apparatus having a pair of flexible closure elements having edge supporting elements through which spring means are connected to tension elements on opposite sides of the closure to provide an ungrounded connecting path between the tension elements.

This invention relates to closure apparatus and particularly to such apparatus involving a flexible closure which will remain in any adjusted position and which avoids the disadvantages of conventional spring rollers.

Closures of the general type under consideration have been known in the art for quite a long time, as will be evidenced by the disclosure of the patent to Lugin, 520,065, dated May 22, 1894. The present invention provides a number of improvements over the disclosure of the Lugin patent including the provision of positive movement at opposite edges of the flexible closure and interconnecting tension means for such opposite edges through spring means housed in a hollow support secured to an adjustable edge of the flexible closure member.

It is among the objects of the present invention to provide closure apparatus for a rectangular opening comprising a roller pivotally mounted adjacent one edge of the opening, a flexible closure member having an edge secured to and wrapped about the roller in one direction, a hollow supporting element secured to an opposite edge of the closure member, spring means housed within the supporting element, a pulley secured at each end of the roller for rotation therewith, tension means having first end portions wrapped about the pulleys in a direction opposite to the one direction, the tension means extending to an edge of the opening opposite the one edge and having second end portions connected to and tensioning the spring means.

The invention also contemplates such closure apparatus comprising a roller pivotally mounted adjacent one edge of the opening, a flexible closure member having an edge secured to and wrapped about the roller in one direction, a hollow supporting element secured to an opposite edge of the closure member, spring means housed within the supporting element, a pulley secured at each end of the roller for rotation therewith, tension means including strands having first end portions wrapped about the pulleys in a direction opposite to the one direction, the strands having second end portions connected to and tensioning the spring means, and intermediate portions of the strands being threaded about guides disposed adjacent an edge of the opening opposite the one edge.

Closure apparatus for a rectangular opening according to the present invention also contemplates a pair of rollers pivotally mounted adjacent opposite edges of the opening, a pair of flexible closure members having their remote edges secured to and wrapped about the rollers respectively, a pair of hollow supporting elements secured to the proximate edges of the closure members respectively, spring means housed within the supporting elements, pulleys secured at opposite ends of each of the rollers, tension means having first end portions wrapped about the pulleys in directions opposite to the direction of wrapping of the closure members, the tension means wrapped about

2

the pulleys of one of the closure members having second end portions connected to and tensioning the spring means housed within the supporting element secured to the other of the closure members.

The spring means in each case preferably assumes the form of one or more helical springs provided with means for limiting the extension of such springs so that they will not be stretched beyond their elastic limits. A track is preferably provided for engagement with the lower edges of the supporting elements so as to constrain the movement of the closure member to its desired path.

A more complete understanding of the invention will follow from a description of the accompanying drawings wherein:

FIG. 1 is a fragmentary elevation, partially broken away and partially in section, depicting an embodiment of the invention;

FIG. 2 is a fragmentary elevation on an enlarged scale taken along line 2—2 of FIG. 1;

FIG. 3 is a sectional elevation on an enlarged scale, taken along line 3—3 of FIG. 1;

FIG. 4 is a sectional elevation on a somewhat enlarged scale, taken along line 4—4 of FIG. 1, and depicting the closure as applied to a bathtub;

FIG. 5 is a fragmentary sectional elevational on an enlarged scale depicting a detail of FIG. 1; and

FIG. 6 is a fragmentary elevation, partially broken away depicting a modification of the invention.

Closures of the types depicted in the drawings are eminently suited for use with closets, bathtubs, shower stalls, as room dividers, and various other applications. For purposes of illustration, the form of the invention depicted in FIGS. 1 to 5 inclusive, is in conjunction with a bathtub having a rim 10, end walls 12 and 14 extending to a ceiling 16, defining a rectangular opening. Supported on the tub rim 10 there is a composite channel member 18 having a web 20, an internal flange 22, and an external flange 24 secured to the web by means of screws 26. Upstanding from the web 20 there is a track 28 received in a groove 30 formed at the lower ends of supporting elements 32 which extend vertically and have similarly grooved upper ends for engagement with a similar track 34 suitably secured to an upper channel member 36. The lower and upper channel members 18 and 36 are interconnected by similar vertical channel members 38 and 40 abutting the walls 12 and 14 respectively. The adjacent ends of the various channel members are interconnected by means of corner channel members 42.

In the frame defined by the interconnected channels, adjacent the end walls 12 and 14, respectively, a pair of rollers 44 and 46 are suitably journaled for rotation, each end of each roller having secured thereto an outwardly convergent spool or pulley 48. A flexible closure member 50 has its left vertical edge secured to the roller 44 and wrapped thereabout in one direction, and similarly, a flexible closure member 52 has its right vertical edge secured to and wrapped about the roller 46 in one direction. The right hand edge of the flexible closure member 50 is secured to the vertical edge of the proximate support element 32, as best depicted in FIGS. 3 and 4. As will be evident, these support elements are composite, assembled by bolts or rivets 56 so as to embrace the edges of the flexible closure members which are folded about blocks 58 against which the closure members are clamped. Each of the support elements 32 provides a hollow portion 60 extending throughout its length. The proximate vertical edges of the support elements 32 are shown in FIG. 4 as complementary to define a seal. As illustrated, the left hand support element contains a groove 62 for reception of a tongue 64 formed on the right hand support element.

The spools or pulleys 48 carried by the roller 44 have secured thereto and wound thereabout in a direction opposite to the direction in which the flexible closure member 50 is wound on the roller itself, the ends of strands or cables 66 and 68. The opposite end of the strand or cable 66 is threaded over a pulley 70 carried at the upper end of the support element 32 for the flexible closure member 52 and directed downwardly and secured to the upper end of a helical tension spring 72. The strand or cable 68 extends to a pulley 74 carried at the lower end of the support element 32 attached to the flexible closure member 52 and then extends upwardly through the passage 60 where it is secured to the lower end of the helical tension spring, or series of springs, 72. The attachment of these strands to the spring or springs is adjusted so that the springs will preferably be under some tension at all times regardless of the position assigned to the closure member. To avoid damage to the springs, in the event that the adjustment might be made incorrectly, a flexible restraining strand or cable 76 is secured at its ends to the ends of the spring or springs, providing enough slack to permit the springs to perform their intended functions yet preventing overstretching of the springs to a degree that would permanently deform them.

In a similar fashion, strands or cables 78 and 80 have their ends secured to the frusto conical spools or pulleys 48 carried by the roller 46 and wound thereabout in a direction oppositely to the direction of winding of the flexible closure member 52 about the roller 46. The opposite end of the cable 78 extends over a pulley 82 carried at the upper end of the support element 32 secured to the closure member 50, and then down through the passage 60 where it is secured to the upper end of a spring or series of springs 72. The other end of the cable 80 is similarly threaded over a pulley 84 carried by the lower end of the support element 32 secured to the closure member 50, whereupon the cable 80 extends upwardly through the passage 60 and is secured to the lower end of the spring or springs 72 so as to produce the desired degree of spring tension.

The configuration of the spools or pulleys 48 will depend upon the size of the rollers 44 and 46 and upon the thickness of the flexible closure members 50 and 52. These configurations will be designed so that the rate of winding of the cables on the spools will conform with the rate of winding of the flexible closure members on their rollers, bearing in mind that the more of the closure members that may be wrapped on their rollers at any particular time, the greater will be the lineal movement of the closure members corresponding to a given angular movement of their rollers.

It will be clear from the foregoing description that as a support member is moved towards its proximate roller, it will impart rotation to the remote roller, applying the same amount of force and the same degree of movement at both the upper and lower ends. The flexible closure members will separate at an equal rate and will maintain any assigned position with respect to their rollers. The presence of the springs 72 will assure such equal motion at the upper and lower ends so as to prevent cocking or binding of any type.

In the form of the invention depicted in FIG. 6, the ends of the cables 78 and 80 extend from their respective pulleys 48 over pulleys 86 and 88 respectively, secured

to the opposite wall 12 by means of brackets 90. Then the ends of these cables are threaded over pulleys 92 carried by the ends of the support element 32, through the passage 60 where they are secured to the opposite ends of the springs 72. Here again, over extension of the springs 72 is prevented by the flexible strand 78 which is secured in this case, to the cables 78 and 80 beyond the ends of the spring 72. This arrangement likewise assures equal movement of the upper and lower edges of the flexible closure member 52 and will maintain the closure member in any adjusted position to which it is moved.

Whereas only two forms of the invention have been described with reference to the accompanying drawings, such variations as will be suggested thereby to those skilled in the art are contemplated as coming within the scope of the appended claim.

We claim:

1. Closure apparatus for a rectangular opening comprising:
 - a pair of rollers pivotally mounted adjacent opposite edges of said opening;
 - a pair of flexible closure members having their remote edges secured to and wrapped around said rollers respectively;
 - a pair of hollow supporting elements, one of said elements, one of said elements being secured to the proximate edge of each of said closure members;
 - spring means housed within each of said supporting elements;
 - pulleys secured at opposite ends of each of said rollers;
 - flexible means housed within each of said supporting elements and connected to the spring means therein;
 - tension means having first end portions wrapped about said pulleys in directions opposite to the directions of wrapping of said closure members about said rollers, said tension means having first ends wrapped about the pulleys of one of said closure members and having second ends interconnected by and tensioning the spring means housed within the supporting element secured to the other of said closure members, said spring means and said flexible means forming a continuous ungrounded connecting path between said second ends of said tension means;
 - track means spanning said opening adjacent the top and bottom thereof; and
 - means defining a track engaging section at the opposite ends of said supporting elements.

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