United States Patent

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[54] **CLOSURE CONSTRUCTION**
14 Claims, 4 Drawing Figs.

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[51] **Int. Cl.** **A47g 05/02**
[50] **Field of Search** 160/243, 382–404, 250, 263, 310; 29/124, 125, 129, 130; 287/52 03

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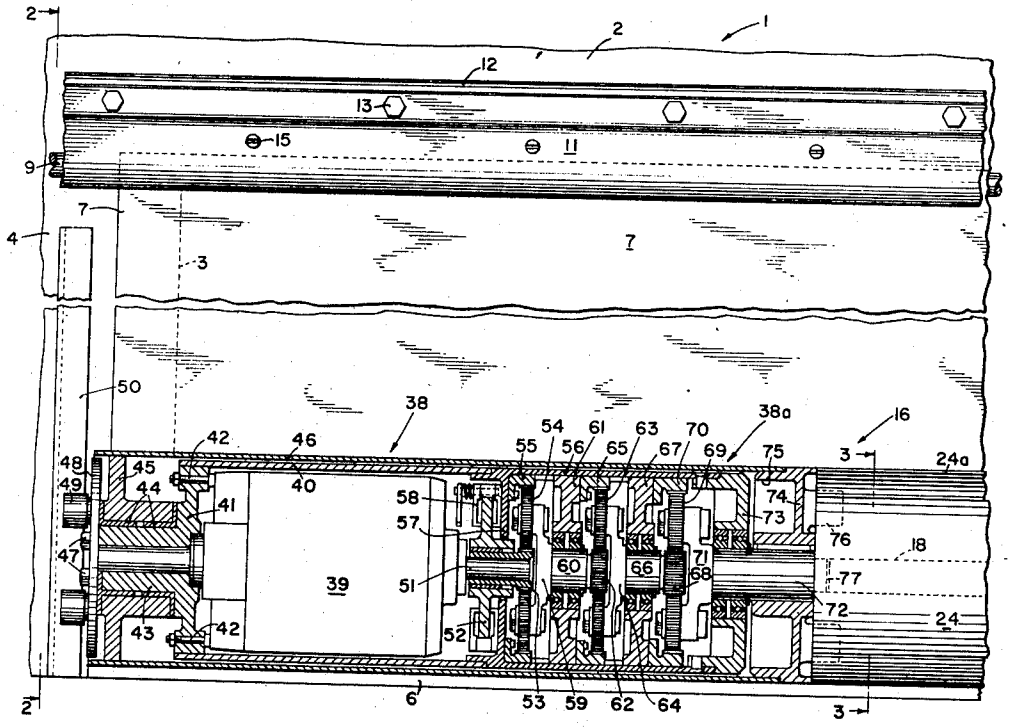
ABSTRACT: A closure for a vertical doorway comprises a sheet of flexible material secured at the top of the doorway in the plane of the latter and fixed at its lower edge to a roller within which is mounted a driving motor for rotating the roller to wind and unwind the flexible sheet about the roller. The roller includes a plurality of end-to-end cores surrounded by a plurality of sector-shaped members each of which has an arcuate surface which together form a cylinder. The sectors have a length less than the total length of the roller and are arranged in end-to-end relation to form a combined length spanning the length of the core. The length of individual sectors is such that the joints between adjacent sectors are staggered circumferentially of the roller and of the core.



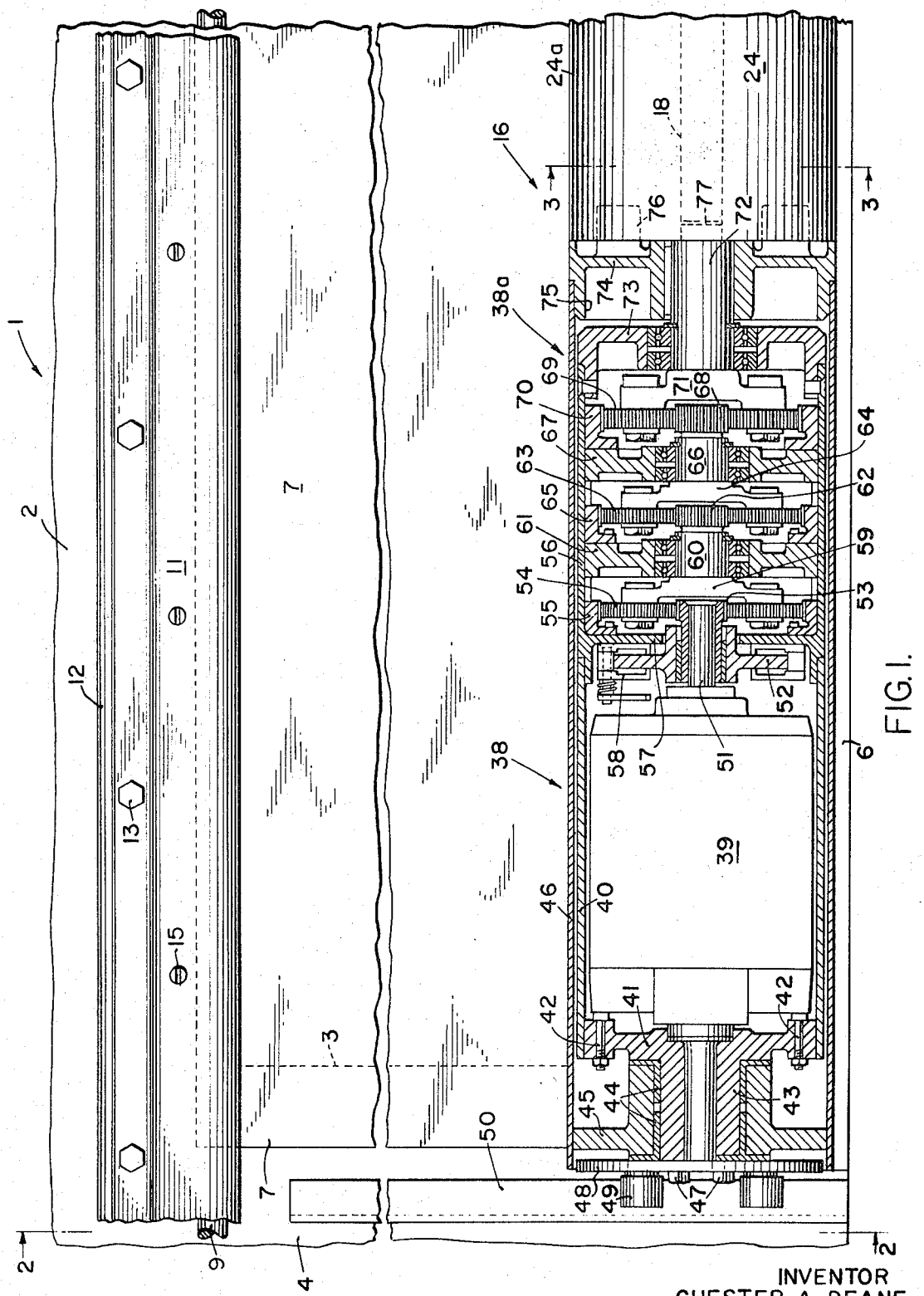


FIG. 1.

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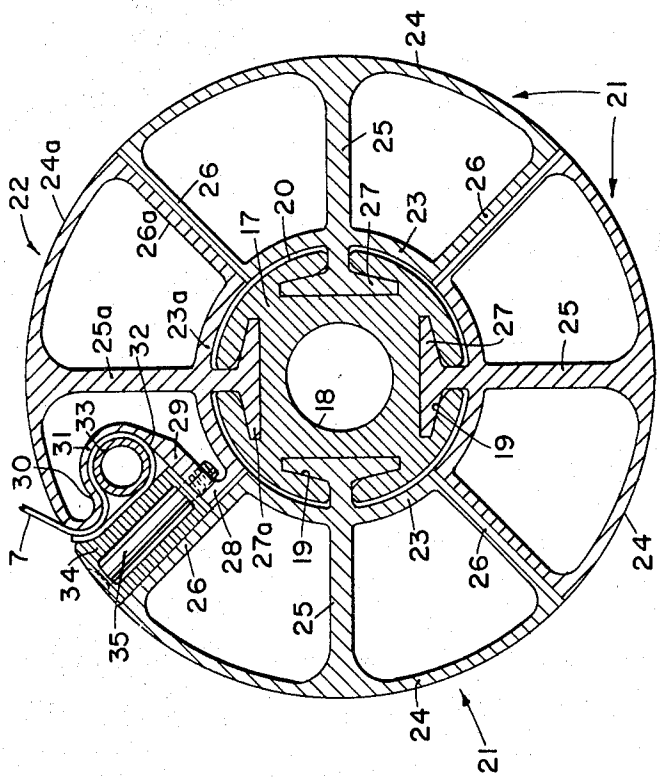

FIG. 3.

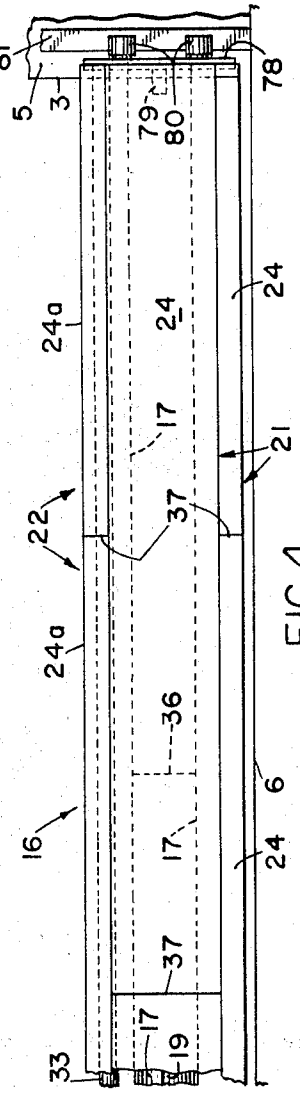

FIG. 4.

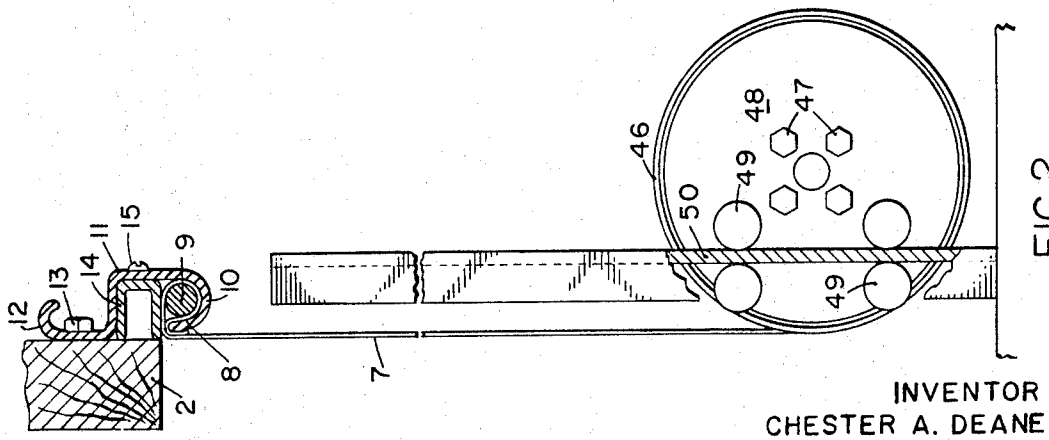

FIG. 2.

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CLOSURE CONSTRUCTION

This invention relates to a flexible sheet closure construction for a doorway and more particularly to a motor-driven roller secured to the bottom edge of a vertical closure sheet so as to enable the doorway to be opened and closed in response to the winding and unwinding of the sheet about the roller.

Flexible sheet closure members have many applications for use as doorway closures, room dividers, partitions and the like. A flexible, thin sheet makes an ideal closure or partition, particularly if the sheet can be wound about and unwound from a roller by power means, and such constructions have been proposed in the past. There are, however, certain disadvantages to the known constructions. For example, some of the motor-driven constructions have had to rely upon chains and sprocket driving means, which not only are dangerous but also are noisy, unsightly and subject to malfunction. Others of the known constructions have the disadvantage that the winding and unwinding of the sheet about a roller causes the edges of the sheet to rub against some stationary member, causing wear and fraying of the flexible sheet.

Another objection to some of the known constructions is that it is not possible to maintain the flexible sheet flush against the edges of the opening, thereby making it possible for dust and debris to pass around the sides of the closure sheet. In all of the known constructions of the class referred to, the roller on which the sheet is to be wound must extend the full width of the opening, but the width of doorways, partitions and the like rarely are uniform. Accordingly, it has been the practice heretofore to purchase a roller of steel, aluminum, or the like, and of a specified length each time a closure was to be installed, but it frequently happens that rolls of the desired length are not available at the time they are required, thereby resulting in delays or requiring the purchase of unnecessarily long rolls for subsequent cutting. As a result, the construction and installation of flexible sheet closures are often delayed and unduly expensive.

An object of this invention is to provide a flexible closure construction which overcomes the disadvantages of the known constructions for similar purposes.

Another object of the invention is to provide a roller-type, flexible sheet closure and in which the roller has power-driving means totally enclosed within the roller.

A further object of the invention is to provide a roller construction composed of component parts which may be assembled with one another to form a roller of any length.

Another object of the invention is to provide a roller construction of the kind referred to and in which the roller is composed of multiple parts which cooperate with one another to rigidify the roller.

Other objects and advantages of the invention will be pointed out specifically or will become apparent from the following description when it is considered in conjunction with the appended claims and the accompanying drawings, in which:

FIG. 1 is a fragmentary view partly in elevation and partly in section of apparatus constructed in accordance with the invention and applied to the inside of a building having a doorway or other opening therein which is adapted to be opened and closed by a flexible sheet closure;

FIG. 2 is a fragmentary, sectional view taken on the line 2–2 of FIG. 1;

FIG. 3 is an enlarged sectional view taken on the line 3–3 of FIG. 1; and

FIG. 4 is a fragmentary, elevational view on a reduced scale of the roller.

Apparatus constructed in accordance with the invention is adapted for use in conjunction with a building 1 having a vertical wall 2 in which there is an opening 3 bounded at the top by the wall 2 and at the sides by vertical frame members 4 and 5, and at the bottom by a sill 6. Adapted to serve as a closure for the opening is a flexible, thin, tough sheet 7 of suitable material such as calendared vinyl reinforced with nylon cord. The sheet has an area larger than the area of the opening 3 so as to enable the sheet to extend beyond the top and both sides of the opening.

At the upper end of the sheet 7 is formed a loop 8 within which is accommodated a rod 9 which extends the full width of the sheet. The loop 8, together with the rod 9, is fitted into a socket 10 forming part of a bracket 11 having a flange 12 which may be fixed by screws 13 or the like to the inner surface of the wall 2. Also supported within the bracket 11 is a U-shaped clamp 14 which bears against the loop end of the sheet and prevents inadvertent withdrawal of the latter from the socket 10. The clamp 14 may be secured in place by screws 15. The construction of the bracket 11 is such that the sheet 7 may hang vertically from the lower edge of the wall 2 and lie in the plane of the opening 3. Thus, the sides of the sheet 7 will lie snugly against the frame members 4 and 5 at the sides of the opening 3.

As is apparent from FIGS. 1 and 2, the bracket 11 extends a short distance only above the upper edge of the opening 3. Consequently, it is possible for the opening 3 to extend substantially the entire height of the wall 2.

The lower end of the sheet 7 is attached, in a manner which subsequently will be explained, to an elongated roller designated generally by the reference character 16. The roller 16 is composed of a plurality of one or more identical, elongated cores 17 (see FIG. 3) in end-to-end relation, each of the cores having a central opening 18 and a plurality of longitudinally extending, circumferentially spaced, T-shaped grooves 19. The outer surface 20 of the core 17 between adjacent grooves is formed on the arc of a circle having its center at the center of the opening 18.

The roller 16 also includes a plurality of elongated members sector-shaped in cross section, the number of such members corresponding to the number of grooves 19 in the core. In the disclosed embodiment there are four grooves 19 and, accordingly, there are four sector members, three of which are identical and are indicated by the reference character 21 and the fourth of which is identified by the reference character 22. Each of the sector members 21 has inner and outer concentric arcuate walls 23 and 24, respectively, spaced apart by a radially extending rib 25, the walls 23 and 24 being formed on the arc of a circle having its center at the center of the core opening 18. Corresponding ends of the walls 23 and 24 are joined by radial ribs 26 which are half the thickness of the rib 25. Fixed to the inner wall 23 of each of the sector members 21 and extending in prolongation of the central rib 25 is a T-shaped tongue or projection 27 which slideably may be accommodated in any one of the slots 19 so as to interlock the sector 21 and the core 17.

The sector member 22 is generally similar to the sector members 21 and corresponding parts are identified by corresponding reference characters, followed by the suffix *a*. The difference between the two kinds of sector members is that the member 22 has a shortened radial sidewall 28 which terminates at its radially outer end in a substantially tangential flange 29 which merges with a generally S-shaped wall 30 that forms a socket 31 extending axially of the member 22. The radially outer end of the wall 30 merges smoothly with the arcuate outer wall 24*a*.

The socket 31 is adapted to receive the lower end of the sheet 7 which is provided with a loop 32 within which is fitted an elongated rod 33. The sheet is retained in the socket 31 by an elongated clamp 34 which is secured at intervals along its length to the flange 29 by screws 35.

The sector members 21 and 22 may be assembled with the core 17 by sliding the projections 27 and 27*a* into the respective grooves 19 of the core. When the parts are assembled, the sidewalls 26, 26*a* and 28 will abut one another and the walls 24, 24*a*, with the outer surface of the clamp 34, together will form a cylinder.

The interlocking construction of the core 17 and the sector-shaped member enables a roller of any desired length to be assembled. It is important, however, that the joints between core members on the one hand and sector members on the other hand be staggered axially of the roller. This characteristic of the construction is best illustrated in FIG. 4 wherein two end-to-end core members 17 abut one another and form a joint 36

and wherein the lengths of the sector members 21 and 22 are different so as to form joints 37, respectively, which are staggered axially with respect to the joint 36 and to one another. By means of the disclosed construction it is possible to stockpile component parts of the roller from which rollers of any desired length can be assembled.

Means 38 is provided for rotating the roller 16 and comprises a reversible electric motor 39 (FIG. 1) that is accommodated within a sleeve 40 at one end of which is fixed a mounting member 41. The motor is secured to the mounting member 41 by bolts 42. The mounting member 41 includes a hub 43 journaled by bushings 44 in a spider 45 which is secured to a sleeve 46 that overlies and is spaced from the sleeve 40. The hub 43 is secured by bolts 47 to a disk 48 that is accommodated rotatably within the sleeve 46 and which carries at its outer surface four rollers 49 which straddle and ride upon a vertical guide rail 50 that is fixed to the inner surface of the building wall 4. The construction thus far described is such that the motor 39 disabled from rotating by the rollers 49 and the guide 50, but the sleeve 46 is free to move vertically and also is free to rotate about the motor for a purpose presently to be explained.

The motor 39 includes a rotatable armature shaft 51 on which is keyed a brake disk 52. Also fixed on the shaft 51 is a pinion 53 that meshes with a plurality of planet gears 54 that also mesh with a ring or sun gear 55 carried by a sleeve 56 fixed to the sleeve 40 and mounted within and spaced from the sleeve 46. At that end of the sleeve 56 which is adjacent the motor 39 is a flange 57 on which is mounted a plurality of brake shoes 58 of known construction and which act on the brake disk 52 in a manner to be explained.

The planetary gears 54 are journaled on a spider 59 having a hub 60 which in turn is journaled in a support 61 fixed to the sleeve 56. The shaft 60 supports a pinion 62 in mesh with planetary gears 63 journaled on a spider 64 and also in mesh with a sun gear 65 fixed to the sleeve 56. The spider 64 has a shaft 66 journaled in a support 67 similar to the support 61 and has a pinion 68 in mesh with planetary gears 69 and with a sun gear 70 fixed to the sleeve 56. The gears 69 are journaled on a spider 71 having a shaft 72 journaled in a support 73 and on which is keyed a driving member 74 having a terminal and flange 75 which fits within and is secured to the sleeve 46. The diameter of the driving member 74 corresponds to the diameter of the roller 16 and abuts the end of the latter. Driving dogs 76 extend axially of the member 74 and fit into the spaces between the radial ribs 25 and 26 of selected sector members 21. The shaft 72 also preferably includes an end portion 77 which fits into the opening 18 of the core 17.

The apparatus between the motor 39 and the adjacent end of the core 17 is a speed reduction, drive transmitting or coupling mechanism and is indicated generally by the reference character 38*a*.

In the embodiment disclosed in the drawings, that end of the roller 16 which is opposite the end in which the motor 39 is housed is provided with an end plate 78 similar to the end plate 48 and having a centrally located stub shaft 79 which is rotatably accommodated in the opening 18 of the core 17. Journaled on the plate 78 are two pairs of rollers 80 which straddle a vertical guide rail 81 similar to the guide rail 50. It will be understood that a motor like the motor 39 and a drive transmitting mechanism like the mechanism 38*a* can be provided at both ends of the roller 16.

As is best shown in FIG. 1, the sheet anchor cavity 30 does not extend the full length of the roller 16, but the sheet 7 does extend substantially the full length of the roller. That portion of the sheet 7 which overlies the roller from the terminal end of the core 17 to the adjacent end of the roller thus will not be accommodated in a slot, but instead will be secured by adhesive or other means to the sleeve 46.

Although the wiring for the motor 39 is not disclosed in the drawings, it will be understood that wires leading from the motor can be passed through the hollow hub 43 and through an opening in the plate 48 for connection to a suitable source of power.

When the apparatus is in the condition illustrated in FIG. 1, operation of the motor 39 to rotate the shaft 51 in one direction will cause rotation of the roller 16 in such direction as to wind sheet 7 around the roller, thereby causing the roller 16 to move upwardly toward the bracket 11 so as to permit free movement through the opening 3. Operation of the motor in the opposite direction will cause the roller to unwind the sheet, thereby restoring the sheet 7 to a position in which it closes the opening 3. The brake shoes 58 cooperate with the disk 52 to maintain the roller 16 in any selected position of vertical adjustment.

The sheet 7 at all times supports the roller 16 and the latter always is maintained by the guide rails 50 and 81 in a position such that the front face of the roller 16 is flush with the plane of the opening 3. Thus, the closure sheet 7 forms an effective closure for the opening. Inasmuch as the sheet is wound onto and unwound from the roller 16, however, there never is any scraping of the sheet 7 against the rolling walls about the opening. Consequently, there will be no chafing of the sheet.

The complete enclosure of the operating motor and its associated driving mechanism within the roller has several important advantages, among which are the avoidance of driving parts externally of the roller, protection of the motor and driving mechanism from dirt and weather, and avoidance of safety hazards. In addition, the mounting of the motor and driving mechanism within the roller avoids the imposition of unbalancing forces on the sheet 7, thereby making it possible for the winding and unwinding of the sheet about the roller to be true.

The disclosed embodiment is representative of a presently preferred form of the invention, but is intended to be illustrative rather than definitive thereof. The invention is defined in the claims.

I claim:

1. A cylindrical roller construction comprising a plurality of elongated core members arranged in end-to-end abutting relation; a plurality of elongated sector members each having an arcuate surface; and means securing said sector members to said core members in edge-to-edge abutting relation and in end-to-end abutting relation, the lengths of said core members and the lengths of said sector members being so selected that the joint between abutting ends of adjacent core members is located at a different point axially of said roller than the joints between abutting ends of adjacent sector members and the joints between adjacent abutting ends of said sector members are staggered peripherally of said roller.

2. The construction set forth in claim 1 wherein the combined lengths of said sector members is such as to span the combined lengths of said core members.

3. The construction set forth in claim 2 wherein said sector members are of different length.

4. The construction set forth in claim 1 wherein said securing means comprises interlocking tongue and groove elements on the respective members.

5. The construction set forth in claim 1 wherein the arcuate surface of one of said segment members is interrupted by an axially extending slot.

6. The construction set forth in claim 5 including an insert removably accommodated in said slot; and means for releasably anchoring said insert in said slot.

7. The construction set forth in claim 1 wherein there are four of said sector members circumferentially of said core member.

8. A roller construction comprising a plurality of elongated core members in axial alignment; a plurality of sector members each having an arcuate surface, the length of a selected number of said sector members being less than the length of one of said core members, the length of the remaining sector members being different from the length said selected number thereof, the number and length of the respective sector members being such that they may be assembled end-to-end with one another and in encircling relation about said core members to form an elongated cylinder of such length as to span the combined length of said core elements, the abutting ends

of said sector members being staggered and spaced axially from the abutting ends of said core members; and means securing said sector members to said core members.

9. A closure for a vertical opening bounded at the top and sides by a vertical frame, said closure comprising a flexible sheet of such size as to cover said opening and lie in the plane of said opening; means securing one edge of said sheet to the frame at the top of said opening and flush with the plane thereof; a roller; said roller comprises at least one core member and a plurality of elongated, independent section members, at least one of which is of an unequal length, corrected to said core member and together encircling said core member; means securing the opposite edge of said sheet to said roller; rotary driving means; means mounting said driving means within said roller for rotation relative thereto; means drivingly coupling said driving means to said roller for rotating the latter in response to rotation of said driving means; vertical guide means on said frame adjacent at least one side of said opening; and means reacting between said guide means and said mounting means operable in response to rotation of said driving means to restrain rotation of said mounting means whereby said roller is enabled to move vertically and effect winding or unwinding of said sheet about said roller, said guide means being so constructed and arranged that all portions of said sheet unwound from said roller remain at all times flush with the plane of said opening.

10. The construction set forth in claim 9 wherein said roller comprises a plurality of sectors of unequal length arranged end-to-end.

11. The construction set forth in claim 9 wherein there are a plurality of said core members in end-to-end relation and wherein said sector members span the combined length of said core members.

12. The construction set forth in claim 9 wherein there are a plurality of said core members in end-to-end relation and wherein said sector members of different lengths have a combined length to span the combined length of said core members.

13. The construction set forth in claim 9 wherein said securing means comprises an elongated member secured to said frame and having a groove therein in which the upper edge of said sheet is accommodated, said sheet emerging from said groove in the plane of said opening.

14. The construction set forth in claim 9 wherein said vertical guide means comprises an elongated rail and wherein said reacting means comprises guide members supported by said mounting means and in tracking relation with said rail.