Dec. 31, 1968 A. DONKERSLOOT 3,418,967

FLAGPOLE ASSEMBLY

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Fig. 2.

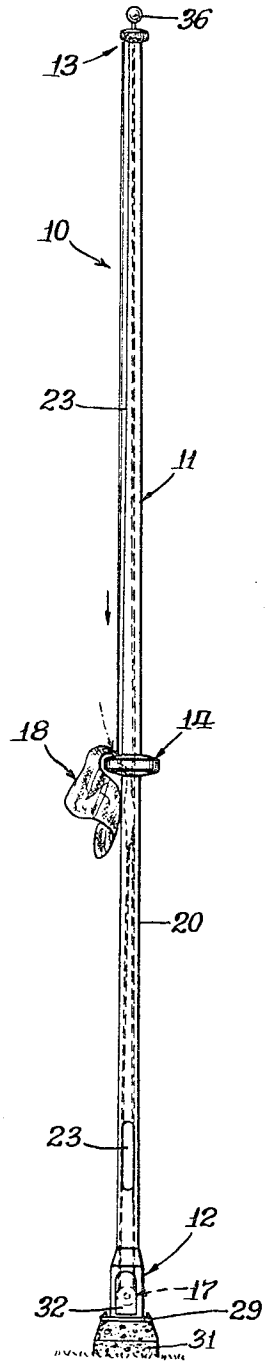


Fig. 1.

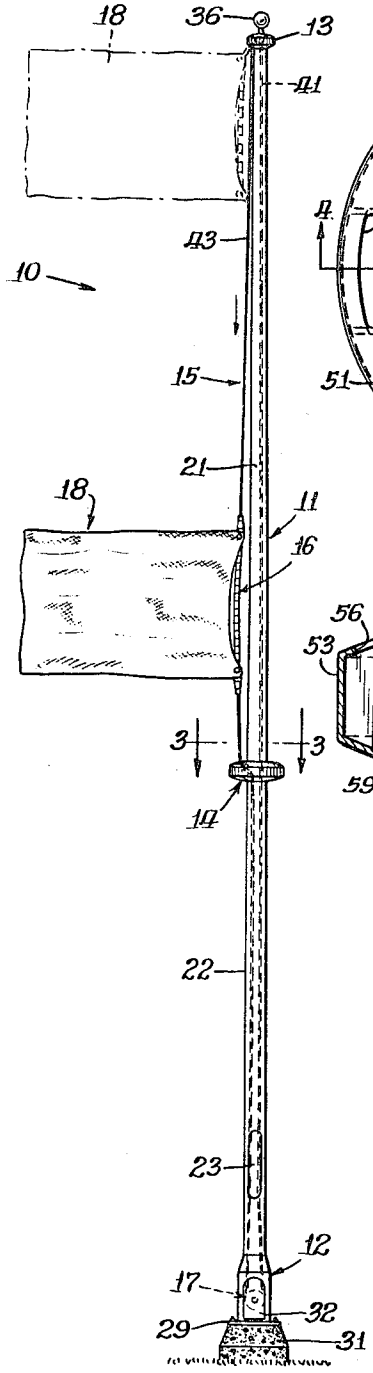
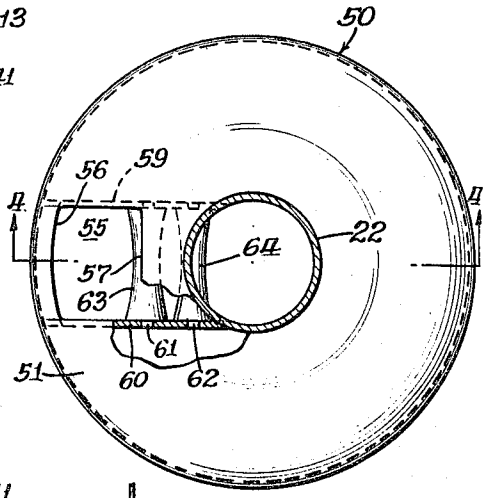


Fig. 3.



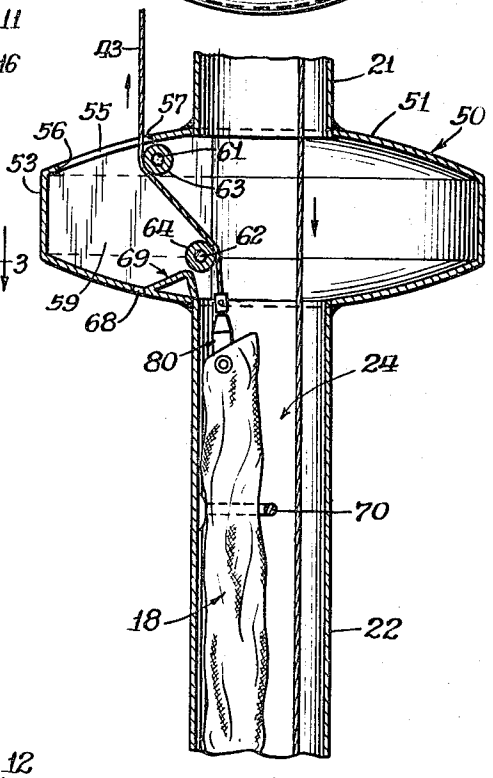


Fig. 4.

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FLAGPOLE ASSEMBLY

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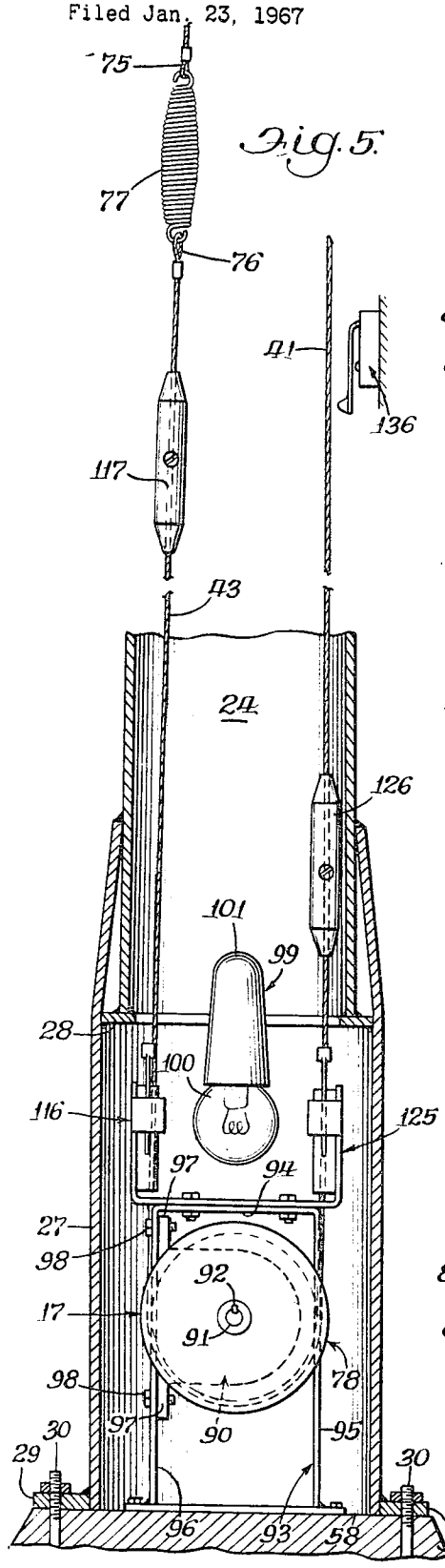
Fig. 5.



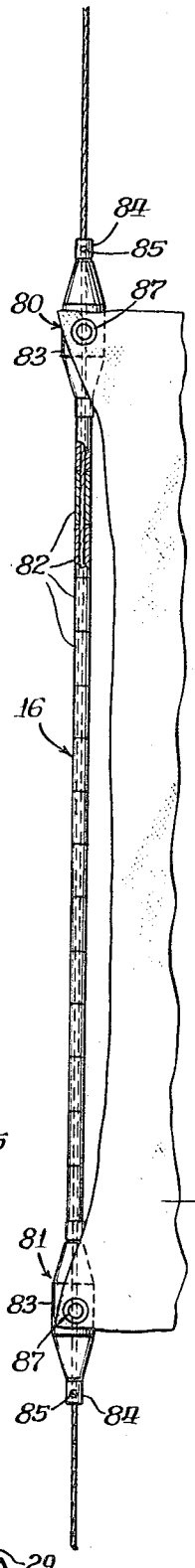


Fig. 7.

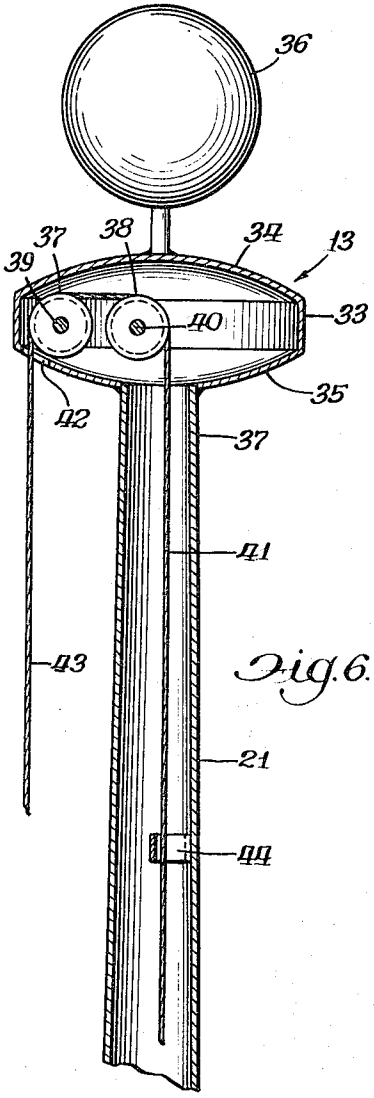


Fig. 6.

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FLAGPOLE ASSEMBLY

Filed Jan. 23, 1967 Sheet 3 of 3

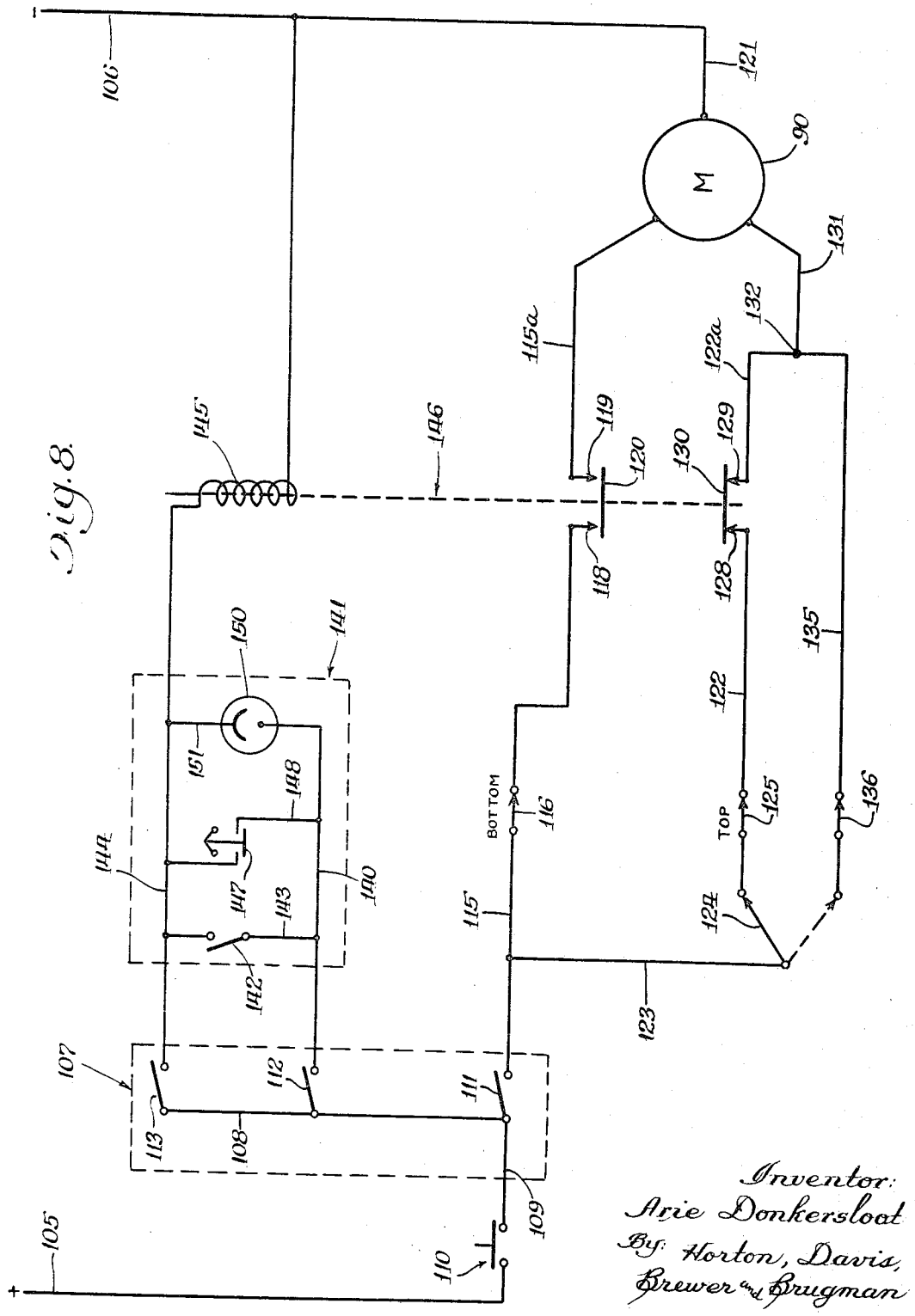

Fig. 8.

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United States Patent Office

3,418,967

Patented Dec. 31, 1968

3,418,967

FLAGPOLE ASSEMBLY

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Filed Jan. 23, 1967, Ser. No. 610,904

8 Claims. (Cl. 116—173)

ABSTRACT OF THE DISCLOSURE

A flagpole assembly wherein the pole is provided with an internal flag storage compartment and an endless halyard movable between the storage compartment and the exterior peak of the flagpole; flag furling and guiding apparatus operating responsively with movement of the halyard for automatically furling the flag in longitudinal folds substantially paralleling and trailing the halyard's direction of movement without entangling the flag and halyard; the halyard being power driven to raise or lower the flag either automatically, according to predetermined climatic conditions and/or manually controlled.

This invention relates generally to flagpole assemblies and particularly to improvements therein for effecting the unobstructed movement of a flag, while attached to a halyard, between stored and display conditions.

Flagpole assemblies having means for moving a flag between a protective storage compartment therefor and selected display positions on the exterior of the flagpole, either manually or by power driven means, automatically or selectively controlled are generally known in the art. However, heretofore the success of such previous assemblies has been relatively limited and of negligible acceptance primarily because the same failed to provide operationally dependable means for automatically furling, folding and aligning the flag to avoid its entanglement with the flag halyard. Thus, such previous devices did not perform satisfactorily in moving a flag into and out of protective storage compartment therefor and to and from display conditions without the need for periodic human assistance. Additionally such prior known devices were particularly lacking in dependable means for maintaining the flag in a display condition, free of entanglement with its halyard, so as to enable the flag to be arranged and aligned for automatic entry and movement into a protective storage compartment therefor. Consequently, the meritorious advantage of being able to protectively store, raise a flag to a display condition and return the same to its protective storage compartment without manual assistance from an attendant or operator has not been successfully carried out by heretofore known devices for this purpose with any acceptable degree of operating dependability.

It is to the above-outlined difficulties and short-comings of prior flagpole assemblies that the present invention is addressed. Briefly, this invention comprises a combination of elements wherein a protective flag storage compartment is provided within the lower interior of a hollw flagpole and between which compartment and the truck at the external peak of the flagpole, a suitable continuous halyard is trained for selected movement according to the desired flag raising and lowering functions. Improved antifouling means are provided along the halyard to prevent entanglement of the flag therewith, particularly when the latter is in display condition. Novel flag furling and guiding means are provided intermediate the flagpole ends for sequentially furling the flag in longitudinal folds substantially paralleling the halyard as the same is moved with the latter from the exterior of the flagpole into the interior storage compartment thereof and vice versa. Power drive means are preferably provided for effecting selected directional movement of the halyard to raise and lower the flag, such power drive means being controlled by suitable manual control means and/or climatic responsive control means; the latter serving to effect raising or lowering of the flag in accordance with predetermined atmospheric light, moisture and wind conditions.

An important object of the present invention is to provide a flagpole assembly comprising means for attendant free striking, furling, storing and raising a flag on a flagpole.

An additional object of this invention is to provide a flagpole assembly as aforesaid comprising novel means for furling a flag into longitudinal folds generally paralleling the axis of a halyard to which the same is attached and which means is operatively responsive to movement of the halyard.

Still another important object of this invention is to provide a flagpole assembly including a flagpole having an interior flag storage compartment and means for transposing a flag attached to a halyard from a stored condition within said compartment to a flying condition exteriorly of the flagpole and vice versa.

Still another object of this invention is to provide means for automatically raising and lowering a flag on a flagpole in response to preselected environmental conditions.

A further important object of this invention is to provide improved means for preventing a flag from becoming entangled with a supporting halyard therefor, particularly when the flag is in a flying condition.

Still another important object of this invention is to provide an improved flagpole assembly having automatically operable means for the attendant free raising, lowering and storing of a flag on a flagpole.

Having thus described the present invention the best mode presently contemplated for carrying out its features and concepts so as to enable those skilled in the art to practice the same will now be described in association with a preferred embodiment thereof illustrated in the accompanying drawings in which:

FIGURE 1 is an elevational view of a flagpole assembly according to this invention illustrating the flag thereof in flying condition;

FIGURE 2 is another elevational view of the assembly shown in FIGURE 1, illustrating the flag being drawn into the interior of the flagpole according to this invention;

FIGURE 3 is an enlarged top plan view, with parts in cross-section taken substantially along vantage line 3—3 of FIGURE 1 and looking in the direction of the arrows thereon;

FIGURE 4 is a partial enlarged sectional view taken substantially along vantage line 4—4 of FIGURE 3, and looking in the direction of the arrows thereon;

FIGURE 5 is an enlarged partial sectional view taken along a central axis of the base end of the flagpole illustrated in FIGURES 1 and 2;

FIGURE 6 is an enlarged partial sectional view, with portions in full elevation, of the upper end of the flagpole illustrated in FIGURES 1 and 2;

FIGURE 7 is an enlarged elevational view of a portion of the flag halyard and the means attaching the flag thereto; and

FIGURE 8 is a schematic circuit diagram of a suitable electrical control means useful with the present invention.

Turning now to the preferred embodiment of the present invention illustrated in the accompanying drawings, reference is initially made to FIGURES 1 through 7 thereof. As best shown in FIGURES 1 and 2, an upright or vertical flagpole assembly **10**, according to this invention, comprises an upright tubular staff or flagpole means **11** supported at its lower end by a ground anchored base means **12**. A truck assembly **13** is mounted over the

outer or peak end of the pole means **11** and flag furling and guiding means **14** are provided substantially at or slightly below the midpoint thereof. Flag moving halyard means **15** comprising an endless or continuous loop member equipped with anti-fouling flag mounting means **16**, is trained between the truck means **13** and power drive means **17** located protectively within the base means **12**, the halyard means passing through the flag furling and guiding means **14** and operationally carrying flag means **18** thereon.

With special reference to FIGURES 1, 2 and 3 of the drawings, it will be understood that the staff or flagpole means **11** illustrated, constitutes an elongated tubular structure preferably made up of two tapered pole sections **21** and **22** disposed coaxially on opposite sides of the flag furling and guiding means **14** so that the upper section extends vertically above the latter while pole section **22** extends vertically therebelow. In practice it is preferred that the tubular sections **21** and **22** be constructed of light weight weather resistant material for which purpose aluminum tubing has proven highly satisfactory. It is also contemplated that the two section flagpole structure illustrated, may be replaced by an alternative single unitary tubular member having the flag furling and guiding means **14** mounted about its exterior. In such an alternative pole structure, an enlarged opening is provided through one side wall of the unitary tubular pole member opposite the means **14** thereon to permit passage of the halyard and flag therethrough as will be more understandable from descriptive materials appearing later herein.

As shown in FIGURES 1 and 2 of the drawings, the lower pole section **22** is equipped with an elongated access hatch **23** and associated opening at convenient elevation adjacent the lower end thereof to provide entry into the interior of the lower pole section **22**. It is to be noted that the hollow interior of the lower pole section **22** encloses an elongated tubular compartment means **24** (see FIG. 4) for the storage and protection of the flag means **18** therein and for housing portions of the halyard means **15**. The hatch **23** thus permits ready access to portions of the halyard and flag in chamber **24** opposite thereto, principally for the purpose of attaching the flag to the halyard and/or replacing the same as occasion requires.

The lower or base end of the pole section **22**, as shown best in FIGURES 1, 2 and 5 of the drawings is coaxially inserted within the upper end of a generally tubular base sleeve member **27** formed as a substantially cylindrical sleeve having an inwardly tapered upper end portion which forms the major external component of the base means **12**. The extreme lower end of the tubular pole section **22** is fixed, as by welding, to an annular transverse platform portion **28** mounted inside the sleeve member **27** adjacent the latter's upper end. In a similar fashion, the outer or upper end of the sleeve member **27** is welded or otherwise rigidly fixed to the exterior of the tubular pole section **22** (see FIG. 5). Thus, the pole section **22** and the tubular base member **27** are rigidly unified. An external annular flange member **29** is provided about the lower exterior end of member **27** and formed with spaced openings receptive of conventional hold down studs or similar connector devices **30** which in turn are secured in an underlying concrete pedestal or anchor **31** burried in the ground in a known manner. A removable door **32** is mounted over an enlarged opening in one side of the sleeve member **27** (see FIGS. 1 and 2) to provide access to the interior of the base structure and the power drive means **17** therein particularly for repairing or removing the latter.

Truck assembly **13**, as best shown in FIGURE 6 of the drawings, is affixed to and over the top of the upper tubular pole section **21** and preferably comprises, as illustrated, a substantially annular truck housing formed by a cylindrical side wall portion **33** and outwardly domed upper and lower walls **34** and **35**, respectively, all suitably fabricated and interjoined as a unit. Decorative ornamentation, such as the illustrated ball means **36** may, if desired, be mounted atop the truck housing as shown in FIGURES 1, 2 and 6.

Mounted interiorly of the truck housing are a pair of aligned sheave wheels **37** and **38**, respectively, supported on laterally spaced coplanar axles **39** and **40**, extending horizontally across the interior of the annular truck housing. It will be particularly recognized from FIGURE 6 that sheave wheel **38** is located so that its periphery intersects the longitudinal axis of the pole section **21**, whereby one inboard reach **41** of the endless halyard means, trained thereover, correspondingly passes to one side of the central axis of the flagpole. Sheave wheel **37** on the other hand, is positioned radially outwardly of the tube section **21** and aligned over an opening **42** formed in the lower dome wall **35** of the truck housing for the passage centrally therethrough of an upper external portion of an outboard reach **43** of the halyard means.

As illustrated in FIGURE 6 in particular, a guiding ring **44** is preferably welded or otherwise suitably affixed transversely to the interior side wall of the upper pole section **21** slightly below truck assembly **13** for guiding the inboard halyard reach **41** interiorly of the flagpole.

As heretofore noted, the flag furling and guiding means **14** is mounted intermediate the ends of the flagpole or staff **11** and in the preferred embodiment illustrated, serves to axially separate and interjoin the upper and lower pole sections **21** and **22** as best shown in FIGURES 1, 2 and 4 of the drawings. From these latter figures, it will be understood that such means **14** comprises a generally annular rigid metal housing **50**, mounted coaxially with and between the two separated pole sections **21** and **22**. In case a one piece flagpole is used instead of the two part pole illustrated, housing **50** concentrically surrounds such flagpole in a similar medial position. In either event the housing member **50** shown, is made up of a dome shaped annular upper metal wall member **51**, a corresponding, but oppositely domed annular lower wall member **52** and an intervening cylindrical side wall member **53** suitably interconnected to form a generally doughnut shaped unitary structure as illustrated. It is to be understood that the particular configuration of the housing **50** is of no critical importance except for the fact that the same should be of pleasing appearance and must necessarily project radially outwardly of the exterior of the flagpole to provide a guide surface or platform of smooth configuration generally adjacent an opening or entry into the flagpole's interior; such guide surface acting to support the flag **18** as the same is furled and transferred into the interior of the flagpole, in the manner depicted in FIGURE 2 of the drawings. As shown best in drawing FIGURE 4, the inner annular peripheries of the two dome shaped wall sections **51** and **52** of housing **50**, are rigidly fixed, as by welding or like attachment means, to the adjacent spaced ends of the tubular pole sections **21** and **22**, respectively. Housing **50** is aligned generally transversely to the coaxially aligned pole sections **21** and **22** and serves to interconnect the same to unify the pole structure and also to provide an enlarged entry and passageway into the upper end of the internal storage chamber **24**.

As mentioned previously, the outer upper surface of the disc shaped wall member **51** provides a supporting guide surface for the flag means during the latter's transition from the exterior to the interior of the flagpole. To this end, the upper wall member **51** is provided with an enlarged and generally quadrangular shaped opening **55** which performs as a flag furling means with the guide surface in question comprising approximately one-third of the total upper or exterior surface area of wall member **51**, adjacently surrounding opening **55** therein. Opening **55** extends from adjacent the housing's cylindrical side wall member **53**, whereat it is defined by a curvilinear end boundary **56** to an opposite limiting end boundary **57** therefor, located adjacent the exterior of the flagpole section **21**. As also shown in FIGURE 3, opening **55** is

aligned generally along a diameter of the annular housing member 50 and has its peripheral boundaries smoothed off to avoid any snagging or catching of the flag material as the latter passes therethrough. Side boundaries for opening 55 extending between the end boundaries 56 and 57 thereof are generally spaced parallel with all intersections of the boundary edges thereof preferably being radiused to avoid sharp corners.

Aligned vertically with and beneath the parallel side boundaries of opening 55 are a pair of parallel spaced partition wall members 59 and 60 which extend between and are securely fastened to the inside surfaces of the upper and lower wall portions 51 and 52 and side wall 53 of the housing 50, thereby defining therewith an elongated passageway means for confining the flag as the same is moved through the housing 50. The spaced walls 59 and 60 also extend radially inwardly from the periphery of the housing 50 to intersect the circumferential limits of the two tubular pole sections 20 and 22 (see FIG. 3).

Two horizontal and parallel spaced axle rods 61 and 62, which respectively rotatably support roller members 63 and 64 having concave exterior configuration, are mounted transversely between and supported by the spaced partition wall members 59 and 60. As seen best in FIGURE 4, roller member 63 is located immediately adjacent and below the inner end boundary 57 of access opening 55 extending slightly past such edge and thereby interferingly across one end of opening 55. Roller member 64 on the other hand is located below and radially inwardly of roller 63 in general chordal disposition with the internal circumference of the lower pole section 22 (see FIG. 3). The two roller members 63 and 64 are mounted to rotate freely on their respective parallel axles and their concave configuration effectively guides and aligns the halyard centrally thereover as the same transits between the exterior and interior of the flagpole. In this latter respect it will be noted from FIGURES 1 and 2, that the external portion of the outboard halyard reach 43 passes parallel to the exterior of the upper flagpole section 21 between the truck means 13 and guide means 14, passing through opening 55 of the latter, then engagingly between the two guide rollers 63 and 64 and downwardly into the interior of the flagpole generally parallel to the walls of storage chamber 24. The transitional disposition of the halyard through the guide means 14 is at approximately 45° with respect to the horizontal as determined by the vertical and lateral spacing of the rollers 63 and 64 (see FIG. 4). It will be recognized also that external portion of reach 43 between the truck means and opening 55 of means 14 is maintained out of contact with the inner peripheral edge 57 of such opening by the roller member 63. In a similar fashion, the portion of halyard reach 43, which extends into chamber 24 is maintained out of contact with the internal walls of the lower pole section 22, and aligned substantially parallel thereto by the presence and location of the guide roller 64.

Immediately below and opposite opening 55 one or more drain openings 68 are formed in the lower disc shaped wall 52 of housing 50. Immediately adjacent opening 68 is an upwardly inclined dam member 69 of general L-shaped cross section; the latter extending between partition walls 59 and 60 adjacently beneath the lower guide roller 64 and between the openings 68 and the open upper end of pole section 22. The drain opening 68 and dam member 69 cooperate to prevent any moisture, such as rainwater, snow and the like, entering opening 55, from flooding the interior of the flag storage chamber 24.

In addition to the foregoing described portions of the flag furling and guiding means 14, a cooperating furling ring 70 is provided within chamber 24, spaced slightly beneath roller 64. As shown, ring 70 is affixed to the interior chamber walls of pole section 22, and cooperatively aligned with roller 64 to receive the halyard and flag means substantially centrally therethrough. The functioning of ring 70 will be set out fully in the operational description of this invention, appearing hereinafter.

Halyard means 15 as best shown in FIGURES 5, 6 and 7 of the drawings, comprises an elongated endless loop member formed by a length of steel cable, rope or other suitable halyard material, having looped over terminal end portions 75 and 76 joined by an intervening coil spring means 77. In assembly, the halyard means 15 is trained over the sheave wheels 37 and 38 of the truck means at the upper end of the flagpole, with the inboard reach 41 thereof extending interiorly the length of the flagpole between the truck sheave wheel 38 and a drive sheave wheel 78 associated with the power drive means 17, located within the supporting base means 12 of the flagpole (see FIG. 5). A second run or outboard reach 43 of the halyard means comprises the previously mentioned external reach portion which passes downwardly from the outboard truck sheave wheel 37 along the exterior of upper pole section 21 to and through opening 55, passing beneath guide roller 63 and over guide roller 64 of the flag furling and guiding means 14 as previously related. From roller 64, the remainder of the secondary reach of the halyard means extends vertically downwardly through the flag storage chamber 24 interiorly of the lower pole section 22 to and around the drive sheave wheel 78 as best shown in FIG. 5. Upon initial installation of the halyard means as described, spring means 77 is placed under slight tension by enlongating the same thereby tensioning the halyard means 15. Such tensioning of the halyard means serves to maintain the same in effective driving engagement with the drive sheave wheel 78, and to accommodate dimensional changes in the halyard and flagpole as produced by operational wear and ambient temperature changes.

It will be noted particularly from FIGURES 2 and 7 of the drawings, that halyard means 15 is equipped with novel anti-fouling flag connector means 16 by which the flag means 18 is attached to the halyard and entanglement therebetween is successfully avoided. Specifically as shown in FIGURE 7 of the drawings, connector means 16 comprises a pair of identical, torpedo shaped connector spools 80 and 81 rotatably mounted coaxially about the halyard means 15 and held apart in a selected spaced position by means of a selected plurality of substantially cylindrical shaped spacer bushings 82, 82 also rotatably mounted on the halyard means 15. It will be noted specifically that each of the spools 80 and 81 has a cylindrical mid-section 83 having frusto concial tapered end portions. Located axially beyond the outer end of each of the connector spools is a cylindrical locking collar means 84 adapted to be fixed to the halyard at a selected position by set screw means 85. Thus, the two spools 80, and 81 are held on the halyard between the locking collar means 84 which are fixed to the halyard and are maintained in their selected spaced positions by the intervening series of articulately related spacer bushings 82, 82.

Connecting the flag means 18 to the aforedescribed connector and anti-fouling means 16 is accomplished by any suitable means such as the illustrated flat headed locking studs 87 which pass through the usual flag connector grommets located at the base corners of the flag; the studs threading into appropriate threaded openings formed for that purpose in the cylindrical mid-portions 83 of the two spool members 80 and 81 (see FIG. 7). In this manner the flag means 18 is coupled to the halyard so as to move responsively therewith during flag raising and lowering operations. The presence of the rotatable spools 80 and 81 and the articulately related intervening bushings 82 guard and effectively prevent the flag from entangling with the halyard, particularly when in a flying condition and when passing over and between rollers 63 and 64. In this respect, movement of the halyard over the sheave wheels 37, 38 and wheel 78, causes the halyard to rotate about its longitudinal axis in a known manner.

Thus in effect, the flag is mounted to rotate relative to and about the longitudinal axis of the halyard by virtue of the novel connector means **16**. Regarding the particlar embodiment of means **16** hereinabove described and shown in the drawings, it is to be recognized that the plurality of cylindrical spacer bushings are related in a generally axially loose or spaced manner to permit ready articulation thereof as they pass with the halyard means **15** through the flag furling and guiding means **14** and the latter's guide rollers **63** and **64**. Likewise, it is to be recognized that the several bushings **82** may be replaced by a single length of tubing of a flexible character, rotatably mounted about the halyard means and capable of flexing and articulating with its serpentine coursing, especially through the guide means **14**.

It also is to be noted that the length of the spool members **80**, **81** is such as to permit trouble-free passage thereof between the rollers **63** and **64** of the guide means **14** with frusto conical or tapered end portions thereof serving to effectively guide such members past and through the rollers **63** and **64** as the same travel with the halyard and the flag means through the guide means. Of additional importance is the previously alluded to enlarged diameter of the cylindrical mid-sections of members **80** and **81** which support the flag connectors **87**. By virtue of such enlarged diameters, the flag means is effectively held away from the connector collars **84**, particularly to avoid entangling the flag therewith as the same rotate with halyard to which they are attached.

It is further to be noted that despite the fact that the preferred embodiment of the anti-fouling connector means herein illustrated and above described shows the bushing members **82** located only between the connector spools **80** and **81**, it is contemplated that additional bushings may be employed about the halyard **15** axially beyond the connecting members **80** and **81** to protect the flag from entangling with the twisting or rotating halyard especially during the furling and unfurling of the flag. Also, the number of bushings **82** obviously may be varied to selectively vary the spacing between the connector sleeve members **80** and **81** in accordance with the dimension of any flag or pennant to be attached to the halyard means.

The movement of the halyard means **15** is effected periodically according to desired raising or lowering of the flag. As previously mentioned, such halyard movement, according to the present invention, is carried out by power drive means **17** conveniently located within the lower interior of the base means **12** for the flagpole. It readily will be understood and appreciated by those familiar with the art, that the power drive means **17** may comprise any suitable means capable of motivating the halyard means **15**, including manhandling the halyard or manipulating hand-powered crank means, for example, appropriately associated with the drive sheave wheel **78** for rotatably driving the same in both clockwise and counterclockwise directions.

In the preferred embodiment illustrated however, an electrically powered motor means **90** is provided to reversibly drive a shaft means **91** to which the sheave wheel **78** is coupled as by key means **92** (see FIG. 5). An inverted U-shaped mounting bracket **93** is provided for supporting the motor means **90**; such including an upper horizontal platform portion **94** and pairs of parallel spaced depending legs **95** and **96**. Motor means **90** is equipped with a typical mounting frame having mounting pads **97** receptive of mounting bolts **98**, by which the same is attached to the vertical legs **96** of the bracket **93**.

The electrical motor may constitute any suitable unit capable of reversible driving rotation and productive of sufficient driving torque to drive the sheave wheel **78** in clockwise and counter-clockwise directions in accordance with selectively operable manual, or automatic control means therefor.

In order to protect the motor means **90** from dampness and cold, it is desirable, as illustrated in FIG. 5, to provide a heater means **99** adjacent thereto which may comprise, as shown, an incandescent lamp **100** and electrified socket **101** therefor supported adjacent the motor and preferably provided with an on-off control switch whereby the same may be selectively energized. It is generally contemplated that a heater means **99** of the order illustrated will preferably be energized continuously throughout the inclement periods, so as to maintain the motor in a favorable operating ambient.

As mentioned heretofore, operational control of the motor means may be carried out by suitable manual and/or an automatic control means. The automatic control means preferably includes climatic responsive control devices whereby the raising and lowering of the flag may be carried out automatically and in response to preselected weather conditions. For example, such control devices may include light, wind and precipitation responsive means in a suitable control circuit whereby the flag may be automatically raised and lowered at predetermined times of a day, such as sunrise and sunset, and automatically lowered and housed in chamber **24** during periods of excessive wind or rain. One preferred control circuitry and system for regulating operation of the flagpole of this invention in accordance with the above prescribed requirements is schematically set out in FIG. 8 of the drawings.

As shown in that figure, the motor means **90** is energized from a 2-cable power supply comprising positive line conductor **105** and negative line conductor **106**, typically supplied with 110 volt, 60 cycle AC power. The circuitry for controlling selected operation of the motor means **90** basically constitutes three parallel circuit networks selectively controlled by a multi-switch bank **107** having a common bus bar **108** coupled to the positive line supply **105** via conductor **109** and line control switch **110**. As indicated, the switch bank **107** comprises three normally open control switches **111**, **112** and **113**, each of which respectively controls one of the three basic control networks, above referred to.

It will be recognized that closing of line switch **110** and control switch **111** serves to supply energy to a 3-branch relay control network including primary motor supply conductor **115** having a normally closed lower limit micro-switch **116** coupled thereto. Switch **116** is adapted to be actuated (opened) in response to periodic engagement by an actuating lug **117** carried on the outboard halyard reach **43** and adjustably located thereon so as to engage the micro-switch **116** to open the latter and interrupt energy flow through conductor **115** when the flag means has been lowered to its stored position within the flagpole storage chamber **24**. In addition to micro-switch **116**, conductor **115** also is interrupted by a first pair of normally open relay contacts **118** and **119** adapted to be bridged or closed by movable relay contact **120** to complete the positive supply circuit over conductor **115** and its continuation **115***a* to motor **90** which is connected to the negative line conductor **106** by conductor **121**. Energization of the motor means **90** over the conductors **115** and **115***a* serves to drive the motor in a counter-clockwise direction as viewed in FIG. 5, thereby to drive the halyard appropriately to lower flag means **18** into storage chamber **24**. This lowering movement is halted when limit switch **116** is opened by lug **117** to de-energize motor **90**.

Arranged in parallel circuit with conductor **115** is a first branch circuit conductor **122** coupled to conductor **115** by conductor **123** and an intervening manually operated 2-position selector switch means **124**. Branch conductor **122** is interruptable by an upper limit micro-switch **125** mounted in the base of the flagpole and engageable by actuating lug **126** adjustably positioned on the inner reach **41** of the halyard means (see FIG. 5). Micro-switch **125**, like the lower limit micro-switch **116** is normally closed and is opened to interrupt energy flow-

through conductor 122 upon engagement with the actuating lug 126. This occurs when the flag means 18 has been elevated to its fully raised condition adjacent the truck means 13. Conductor 122 also includes a second pair of normally closed relay contacts 128 and 129 adapted to be closed by movable relay contact 130 to complete energy flow between conductor 122 and its continuation 122*a*. Conductor portion 122*a* is joined to a secondary motor supply conductor 131 at junction 132. Energization of the motor means over conductors 122, 122*a* and 131 serves to rotate the motor in a reverse or clockwise direction, as viewed in FIG. 5. This serves to drive the sheave wheel 78 and halyard to elevate or raise the flag. Paralleling the circuit of conductor 122 is an alternate elevating circuit comprising conductor 135 and micro-switch 136 which is selectively energized by moving the manually operable selector switch means 124 to its dotted line position (see FIG. 8). Circuit conductor 135 joins the secondary motor supply conductor 131 at junction 132 to effect clockwise or flag raising rotation of the motor and sheave wheel 78.

With reference to FIG. 5 of the drawings it will be noted that the micro-switch 136 is mounted adjacent the inboard reach 41 of the halyard means at a selected position intermediate the ends of the flagpole to determine a half-mast flag flying limit. Switch 136 is opened by engagement with lug means 126 which also serves to operate upper limit micro-switch 125. When the one-half mast circuit is selectively energized by the appropriately positioning of switch means 124, as noted, engagement of micro-switch 136 by lug 126 intermediate the ends of the flagpole, serves to interrupt energy flow through conductor 135 and thus de-energize motor means 90, halting the flag at a selected half-mast position.

Referring now to switch block assembly 107, the closure of the switch means 112 thereof serves to energize a conductor 140 to supply a climatic control means 141 which is conveniently mounted in the base of the flagpole or at some other nearby location, in order to respond to pre-selected climatic conditions. Specifically, as illustrated in FIG. 8, the climatic control means 141 preferably includes a rain-sensitive device adapted to cause a normally open switch means 142 thereof to close in the presence of predetermined moisture or rainfall conditions, thereby completing circuit from conductor 140, over conductor 143 to a parallel circuit conductor 144. Conductor 144 extends between control switch means 113 and the negative line conductor 106 to energize an operating coil 145 of relay means 146 which operates the movable relay contacts 120 and 130 previously described.

In addition to the rain sensitive switch means 142, the climatic control means 141 also preferably includes a cup type anemometer responsive to predetermined wind velocities for closing a normally open switch means 147 thereof which is connected in circuit between conductors 140 and 144 by conductor 148. In practice it has been found that setting the anemometer to close switch means 147 at a sustained 20-mile per hour wind velocity and to open at wind velocities of approximately 8 miles per hour is satisfactory for preserving the flag from deterioration due to excessive wind conditions. The anemometer switching device also conventionally includes a delay means to prevent switch operation due to periodic wind gusts of short duration.

A third climatic sensitive control device preferably included in means 141 comprises a light sensitive cell and switching device 150 coupled between conductors 140 and 144 by conductor 151 and appropriately set to energize conductor 151 upon the occurrence of low intensity light conditions or darkness while conversely de-energizing conductor 151 in the presence of high intensity or daylight conditions.

Closing of switch means 113 of the block assembly 107 serves to control energization of conductor 144 and relay operating coil means 145 independently of the climatic control means 141.

In operation, the foregoing described circuitry performs substantially as follows:

AUTOMATIC CONTROL

Automatic control refers to the condition wherein flag raising and lowering operations are carried on automatically in response to the occurrence of pre-selected climatic conditions. In order to achieve this condition with the circuitry as set forth in FIG. 8, the line control switch means 110 is closed, energizing bus bar 108 of the switch block assembly. The selective circuit control switches 111 and 112 are likewise closed to respectively supply energy to the relay and micro-switch control network above described along with the normally open climatic control means 141 including means 142, 147 and 150. Under normal clear weather daylight conditions, as at sunrise, and providing the predetermined rain and wind limits for effecting closing operation of the respective switch means 142 and 147 are not prevailing, then all three climatic switches will be open and relay coil 145 is de-energized. In such condition, the movable relay contact 120 normally is disengaged with contacts 118 and 119, while the normally closed movable contact 130 completes circuit between contacts 128 and 129 associated with circuit conductor 122.

This would be the normal state of affairs on a clear, calm day with the flag means stored within chamber 24 within the lower interior of the flagpole ready for raising. As such, micro-switch 116 is open, having been opened by the actuating lug 117 the previous evening when lowering the flag into its stored position. Thus, motor 90 is energized over closed switch means 111, conductor 123, closed switch 124, positioned to energize circuit-conductor 122, the closed micro-switch 125, the closed relay contacts 128 and 129, conductor 122*a* and the secondary motor supply conductor 131. Energized motor means 90 rotates clockwise driving sheave wheel 78 accordingly to raise the flag until the lug means 126 engages the normally closed micro-switch 125, thereby de-energizing conductor 122 and motor means 90. It will be appreciated that if a half-mast flag flying condition is desired, manual positioning of switch means 124 to its secondary position between conductors 123 and 135, serves to shift control of the motor means to the micro-switch 136 which, when opened by the lug means 126, serves to likewise de-energize the motor means 90 to achieve an intermediate flag flying position.

In such automatic control condition wherein switch 112 is closed to feed supply energy to one side of the climatic control devices 142, 147 and 150, closing operation of any one or more of said devices in response to predetermined climatic occurrences, causes energization of conductor 144 and the relay coil 145. This activates the relay 146 to close the normally open contacts 118 and 119 and open the normally closed contacts 128 and 129. In such circumstances, with the flag raised, microswitch 116 will be in a closed condition, disengaged from lug 117, whereby the motor means 90 will be energized over conductor 115, closed switch 116, closed relay contacts 118, 119, and 120, and conductor 115*a*. The motor means is thus activated to rotate in a counter-clockwise direction to lower the flag means into the storage compartment 24 of the flagpole. Conversely, the flag having been lowered, when the previous flag lowering climatic condition abates the particular one or more of the climatic control devices 142, 147 or 150 will return to normal or open condition, de-energizing relay means 146 and again placing control of the motor means 90 over circuit conductors 122 or 135, as determined by the selective positioning of switch means 124 for again raising the flag to a flying condition.

MANUAL CONTROL

In the event it is desired to override the above described automatic control system, manual raising of the flag and clockwise operation of the motor means **90** is effected simply by closing control switch **111** and leaving switches **112** and **113** open, whereby energization of the motor means occurs over the secondary supply conductor **131** via either conductor **122** or alternate conductor **135** and the closed micro-switches **125** or **136** as previously explained. If it is desired to lower the flag by manual control, this is accomplished conveniently by closing control switches **111** and **113**, only, which serves to directly energize conductor **144** and relay coil **145**, closing the normally open contacts **118** and **119**, and thereby permitting energy supply to the motor over conductor **115** and related circuit components. Such raising and lowering operation of the motor means will continue until such time as the upper or lower limit micro-switches are appropriately engaged by their respective actuating lugs to de-energize the motor and halt continued movement of the halyard.

Having above described the various elemental portions which go to make up the improved flagpole assembly of this invention and having particularly set out in the functioning and operation of the manual and/or automatic control means therefor, the unique operating features of the flag furling and guiding means **14** will now be described in order to promote a better understanding thereof.

FLAG FURLING AND GUIDING

Referring to FIGS. 1 and 2 of the drawings, it will be appreciated that as the flag **18** is moved with the halyard downwardly from the peak of the flagpole toward the flag furling and guiding means **14**, such is effectively prevented from twisting about the halyard (which rotates slowly about its longitudinal axis in response to the movement thereof over the truck and drive sheave wheels) by virtue of its rotatable connection therewith via attachment means **16**, as previously described. As shown best in FIG. 1 of the drawings, when the flag means enters opening **55** of the flag furling and guiding means **14**, the adjacent surface **51** of the latter supports the flag body laterally of opening **55** and the upper guide roller means **63** to train the flag in longitudinal folds streaming rearwardly of the direction of movement of the lowermost connector spool **81** and responsively with halyard movement. Opening **55** cooperates with surface **51** in bringing about the above described rearward training and furling of the flag means alongside the outward halyard reach portion **43**. By virtue of the spring means **77** intermediate the ends of the halyard means, the latter is tensioned tightly over the two guide roller means **63** and **64** and consequently the flag means is substantially prevented from passing between the halyard and the surfaces of the two guide rollers. By providing the unique attachment means **16**, however, the flag rotates about the halyard and thus as it contacts roller means **63**, on lowering, the flag is rotatably shifted to one side of the halyard and passes in this manner over the two guide rollers **63** and **64**. This functioning is most important and is brought about principally by virtue of the rotatable connection between the flag and halyard means. As the flag means moves downwardly into the upper reaches of the storage chamber **24**, it is pulled through the furling ring **70** which, in conjunction with the entry opening **55** of the flag furling and guiding means **14**, serves thereby to maintain the furled flag in a plurality of rearwardly trained folds disposed relatively parallel to halyard means. Once the trailing or tail end of the flag passes through the ring **70**, the flag means is released and is thereupon relatively free of all restraining forces tending to maintain the same in a condition trailing the advancing or downward movement of the flag mounting means **16**. At approximately this stage of events, the lower limit micro-switch **116** is opened by its actuating lug **117**, as previously described, to de-energize motor means **90** and halt further lowering movement of the halyard. Since the flag now resides free of the guiding ring **70** and the guiding opening **55**, and is disposed alongside the halyard means within the chamber **24** instead of being wedged between the halyard and the nearest adjacent side wall of the lower flagpole section **22**, gravity forces readily take over and cause the flag means to drop freely between the two halyard reaches along the approximate central axis of chamber **24**. This activity effectively reverses the train of the flag to re-align the same so that the tail end thereof eventually comes to rest beneath the lower spool connector **81** near the base means **12** or at the bottom end of storage chamber **24**.

Upon energization of the motor means **90** to elevate the flag means from chamber **24**, the flag will once again trail the direction of advance of the connector means **16** and now hang downwardly from the uppermost connector **83** in a trailing and free folded condition in which the folds thereof substantially parallel the halyard means. As the flag and connector means **16** pass upwardly through the guiding and furling ring **70**, the latter serves to effectively guarantee the furl and train of the flag folds in the desired parallel state adjacent the halyard means. The rotatable connector means **16** again permit the flag to rotatably shift to one side of the halyard means as it passes over the roller means **64** and **63**. Thus as soon as the flag emerges through opening **55** and is free of the latter it is ready to fly outboard of the upper tubular portion **21** of the flagpole.

From the above brief description it will be recognized that the unique combination and functioning of the described elements provide an effective means for furling and training the flag in a substantially parallel state alongside the halyard means as the same both enters and exits from the flag furling and guiding means **14**. It will be understood also that during each of the raising and lowering movements of the flag, the same effectively trails the direction of movement of the connector means **16** and is maintained in a relatively free unentangled condition with respect to the halyard means, while nevertheless responding to the operational advance of the halyard means as imposed by the drive means connected thereto. Of particular importance is the ability of the flag to re-align itself within the storage chamber **24** so that the tail or bitter end of the flag means is disposed lowermost in said chamber during its static stored condition. Thus the ring means **77** may effectively furl the same into the desirable parallel folds alongside the halyard means prior to the passage thereof into and through the means **14**. These ascribed functions all serve to prevent the flag from balling or bunching up within the storage chamber. As a consequence, repeated flag lowering and raising operations in a flagpole assembly according to this invention have proven highly successful in practice permitting the automatic and unattended raising and lowering operations without fear or fouling the flag in the halyard means.

From the foregoing, it is believed that those familiar with this art will readily recognize and appreciate the unique features of the present invention which mark the same as a novel advancement in this field. While the particulars of the present invention have been described in association with a preferred embodiment thereof as illustrated in the accompanying drawings, it will be readily understood that such preferred embodiment is susceptible to numerous changes, modifications and substitutions of equivalents without departing from the spirit and scope of this invention. As a consequence, it is intended that the present invention be unlimited by the foregoing description, except as may appear in the following appended claims.

I claim:

1. A flagpole assembly comprising: tubular staff means

forming a flag storage chamber within the hollow interior thereof, truck assembly means mounted on the upper end of said staff means including halyard guiding sheave wheel means, drive means mounted within the base end of said staff means and comprising a rotatably driven sheave wheel, flag furling and guiding means mounted intermediate the said ends of said staff means comprising support means projecting radially outwardly of the exterior of said staff means and having an opening therethrough facing said truck means, and passageway means traversing the longitudinal axis of said staff means and communicating between said opening and one end of said storage chamber; endless halyard means mounted about and between said sheave wheel means and sheave wheel and comprising an inboard reach extending interiorly of said staff means, and an outboard reach having a portion extending exteriorly of said staff means between said truck assembly means and said flag furling and guiding means and another portion passing through said passageway means and said chamber to said drive means; and anti-fouling flag mounting means attached to said outbard reach for movement responsively with said halyard means and comprising spaced connector means rotatably mounted on said halyard means for movably attaching a flag thereto.

2. The combination of claim 1, in which said flag furling and guiding means comprises spaced rotatable guide roller means mounted transversely across said passageway means and arranged to guide said outboard reach, said mounting means and a flag attached thereto unobstructably through said opening and into and out of said chamber.

3. The combination of claim 1, wherein said anti-fouling mounting means comprises articulatable means rotatably mounted about said halyard means adjacent the base end of a flag attached thereto and extending between said connector means to maintain the latter in predetermined spaced relation on said outboard reach, and means axially beyond but adjacent said connector means and fixed to said halyard means for preventing movement of said connector means therepast whereby to locate said connector means in selected spaced positions on said halyard means.

4. The combination of claim 1, wherein said staff means comprises two tubular sections coaxially aligned with adjacent ends thereof separated, and means mounting and affixing said flag furling and guiding means between said adjacent ends to form a unified pole structure.

5. The combination of claim 4, wherein said flag furling and guiding means comprises annular housing means extending radially outwardly of the exterior of said two staff sections, said opening being formed through one wall of said housing means, facing said truck assembly means and having the radially innermost periphery thereof disposed outwardly of the exterior of said staff means; and said passageway means communicates with said opening and the spacing between the separated ends of said sections to provide access to one end of said storage chamber.

6. The combination of claim 5, wherein said flag furling and guiding means further comprising a furling ring mounted interiorly of said staff means adjacent the said one end of said chamber and through which said another portion of said outboard reach passes substantially parallel to the longitudinal axis of said staff means, said furling ring and said opening cooperating during the passage of the halyard means therethrough to furl a flag attached to said connector means into longitudinal folds substantially paralleling said halyard means and trailing the direction of advance of said connector means thereby to prevent entanglement of said flag and halyard means as the flag enters and exits from said storage chamber.

7. In a flagpole assembly of the class described, having an upright flagpole forming a flag storage chamber within the lower interior thereof and having an opening intermediate its ends for the passage of a flag into and out of said chamber in response to corresponding movement of halyard means to which the same is attached, said halyard means having one reach extending interiorly lengthwise of said flagpole and a second reach extending lengthwise of said chamber, through said opening and exteriorly of said flagpole to the upper end thereof, improved means for furling and guiding the flag into and out of the storage chamber comprising: housing means projecting outwardly of said flagpole opposite said opening therein and having an upper wall formed with an enlarged opening surrounded by a surface portion which serves to under-support a flag descending through said enlarged opening, means forming a flag receptive passageway extending from said enlarged opening through said opening in the flagpole and to the upper end of said chamber along an axis traversing the longitudinal axis of the flagpole, spaced roller means rotatably mounted across the interior of said passageway adjacent the inner radial periphery of said enlarged opening and the upper end of said chamber for guiding the halyard means and a flag attached thereto into and out of said chamber; and a furling ring surrounding the second reach of the halyard means within said chamber, said ring and enlarged opening cooperating to radially confine a flag passing therethrough, to furl the same into longitudinal folds substantially paralleling said halyard means and trailing the latter's direction of movement and to maintain such furled condition throughout passage of the flag wholly between the exterior and interior of the flagpole.

8. The combination in claim 7, and flag mounting means mounted rotatably on said halyard means and having means for attaching a flag thereto, said mounting means operating to prevent twisting rotation of the halyard means from being imparted to said flag whereby to maintain the same unentangled during the movement thereof, and to permit the body of the furled flag to move freely about the halyard means as the same descends into said chamber and passes over and between said roller means, whereby the flag is free to fall between the reaches of the halyard means within said chamber on release from said furling ring to thereby gravitationally re-align itself below said mounting means in said chamber in position for re-furling by said ring and said enlarged opening when acending toward the peak of the flagpole.

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U.S. Cl. X.R.

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