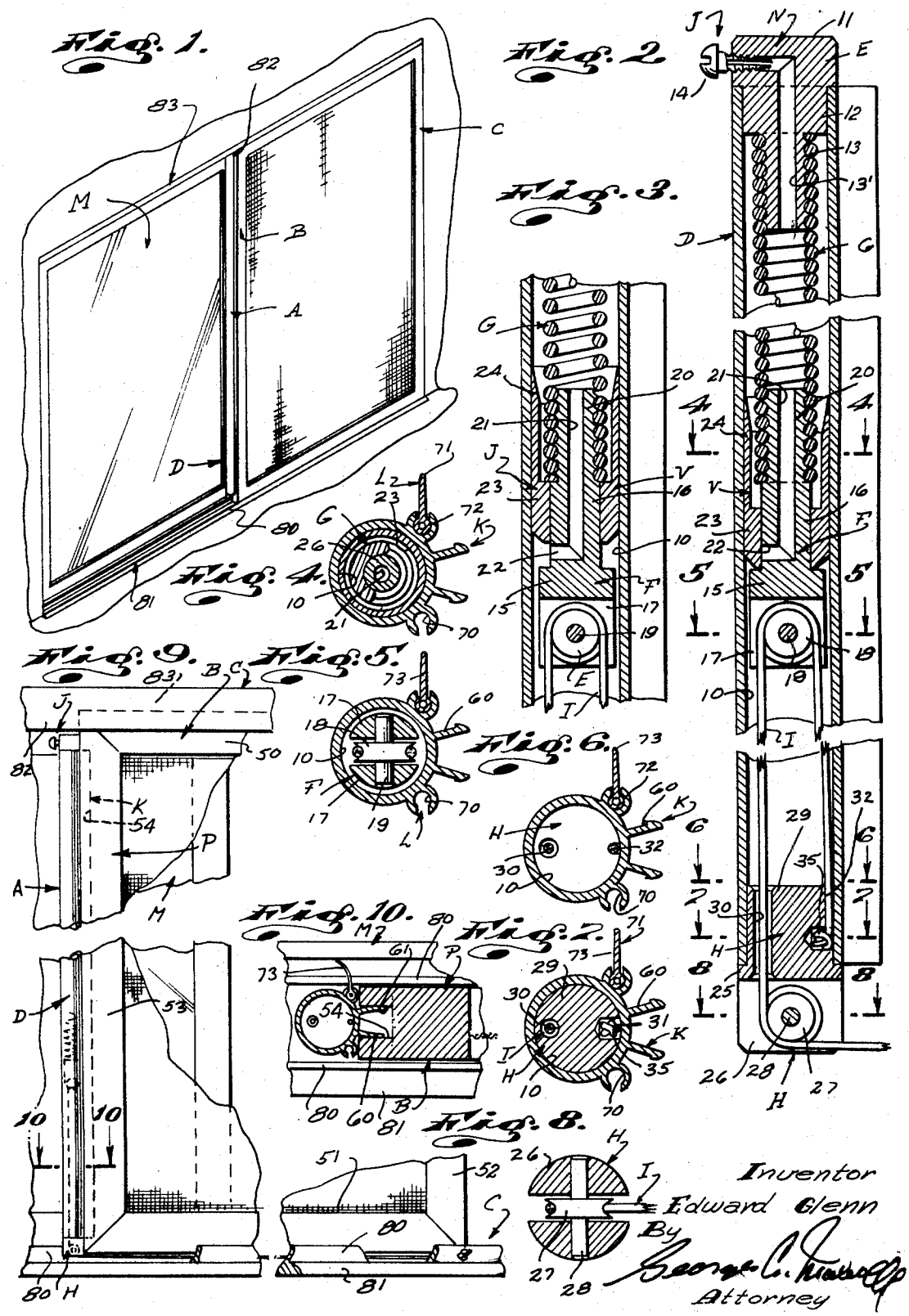
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SPRING MOTOR DOOR CLOSER

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SPRING MOTOR DOOR CLOSER

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Fig. 11.

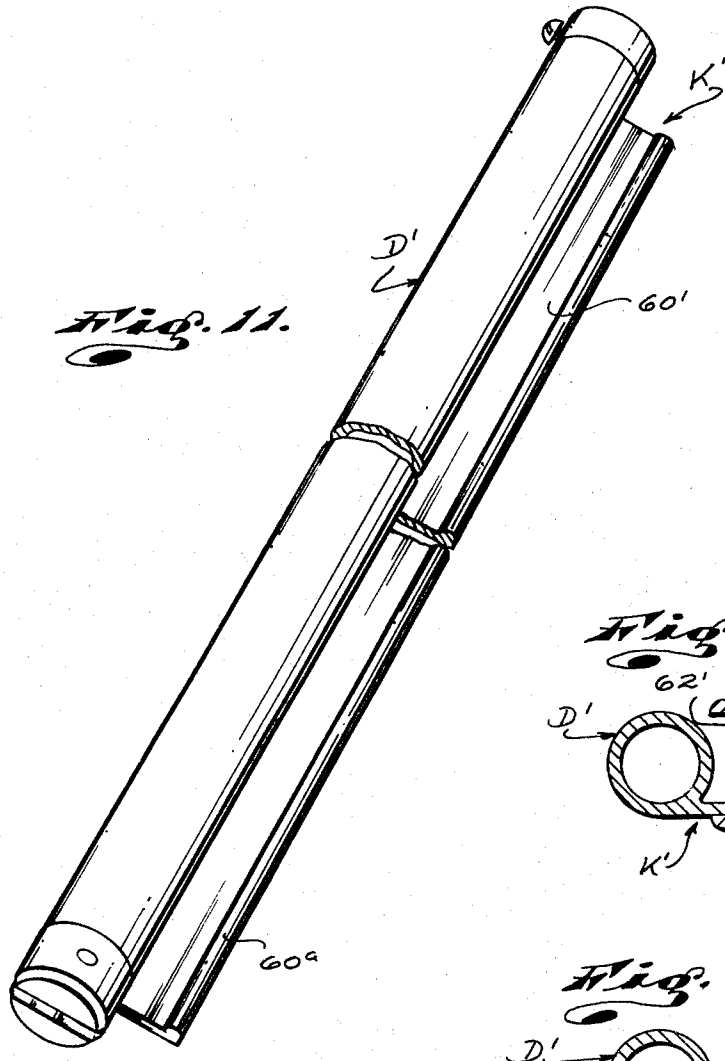


Fig. 12.

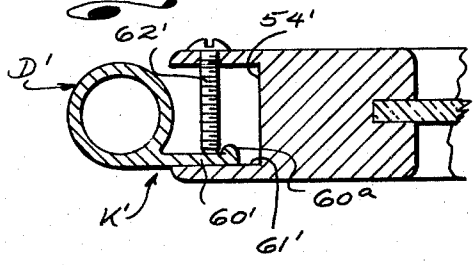
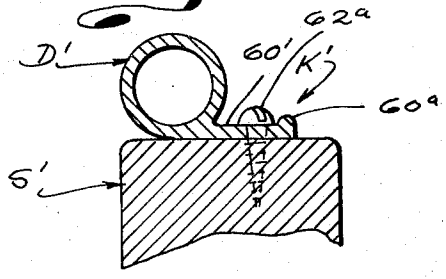


Fig. 13.



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3,389,422

SPRING MOTOR DOOR CLOSER

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Filed Oct. 22, 1965, Ser. No. 500,588
12 Claims. (Cl. 16—78)

ABSTRACT OF THE DISCLOSURE

A spring motor including, an elongate tube, an anchor block engaged in and closing one end of the tube, a guide block engaged in the other end of the tube, an elongate, helical tension spring arranged in and extending longitudinally through the tube and having one end coupled with the anchor block, a traveling block slidably engaged in the tube and coupled to the other end of the spring, and an elongate tow line having one end fixed to the guide block, extending longitudinally in the tube through the traveling block, thence longitudinally through the tube and the guide block to the exterior of the tube, and governing means to buffer the action of the spring including, an air bleed valve in the anchor block and a valve means related to the traveling block and which is operable to open and permit the free flow of air through the tube and by the traveling block when the block is moved towards said other end of the tube, and to prevent the flow of air through the tube and by the traveling block when the traveling block moves towards said one end of the tube.

This invention has to do with a spring motor and is more particularly concerned with a spring motor for use in combination with sliding door closures to normally, yieldingly urge and hold such closures in and to return such closures to their closed positions.

Throughout past years, many efforts have been made to provide an effective, dependable and inexpensive door closer for sliding glass doors, sliding screen closures and the like. Such efforts have resulted in spring actuated, hydraulically or pneumatically actuated and electrically operated door closer constructions which are of limited effectiveness, limited dependability and which are costly to manufacture.

It should be noted and kept in mind that in order to provide a closer mechanism for sliding door closures, the mechanism must be capable of exerting considerable force for a considerable distance, that is, a distance equal to the lateral extent of the door opening, over which the closures are to be engaged. This is often several feet. This distinguishes such closure mechanisms from those closer mechanisms provided for hinged door closures, and the like, where the mechanisms can be and normally are closely coupled to the pivotal axis of the closures and need only act and exert force through a distance of several inches.

It has been found that pneumatic, hydraulic and electric door closer mechanisms, for sliding glass doors or closures are undesirable and find little application since they require the establishment of special door and/or closure frames, require special power sources and connections and are ordinarily complicated and costly to manufacture and maintain.

Spring motor type sliding door closers have proven most satisfactory from the standpoint of cost and simplicity of installation. However, due to the extent of effective travel which must be provided by such mechanisms, few effective and practical spring motors for such purpose or application have been provided. One such spring motor is disclosed in my United States Patent No.

3,020,580, which motor involves a helical clock spring which drives a spool on or about which a tow line is wound. A suitable clutch means is provided to control and limit the speed of operation of the motor so as to prevent slamming the door when it is closed.

While the above patented door closer is effective, it is somewhat difficult to install, is not adapted for universal application and is not attractive, in appearance.

Attempts have been made to establish sliding door closures utilizing an elongate, helical tension spring arranged in a tube, or the like, carried by the closure or door frame and connected with a tow line anchored with or to the frame or closure. Such structures have proven to be extremely unsatisfactory since there is insufficient space within the door structure to accommodate a spring and carrier tube therefore of sufficient longitudinal extent to provide a mechanism having the necessary and desired length of travel. Such motors have been such that the springs have been overstressed, exerting too much force when the closures with which they are related are fully opened and exert too little force to urge the closures to their closed position when the springs reach their relaxed or unbiased position.

Further, and in order to obtain a most effective result, makers of spring motors of the character referred to above have been forced to use springs of the greatest possible or allowable diametric extent. This has resulted in the provision of large, bulky, cumbersome and unsightly devices or motors, the existence and presence of which cannot be overlooked, and the installation of which becomes a major problem.

An object of the present invention is to provide a novel spring motor construction.

Another object of my invention is to provide a novel spring motor of the character referred to which is such that it can be advantageously and easily engaged and related to most commercial, sliding glass door and sliding screen closure constructions in a minimum length of time and without the exercise of special tools and skill.

Yet another object of this invention is to provide a novel combination spring motor closer and sliding door construction.

It is to be understood and it will be recognized from the following disclosure that while the spring motor that I provide is shown related to a sliding glass door structure, it is such that it can be advantageously used or employed in a great number of other situations. For example, my new motor construction is such that it can be advantageously used to automatically open or close drawers, windows, hatches, traverse draperies and any other item or structure which is operated or moved, reciprocally along straight lines.

A feature of this invention is to provide a motor of the character referred to wherein an elongate coil spring is arranged and fixed in a tubular carrier and is coupled with a tow line extending into the carrier, by means of a traveling block secured to the free end of the spring, whereby the tow line can be advantageously doubled in such a manner that a two to one reduction of travel between the line and the spring is obtained.

An object of my invention is to provide a novel spring motor of the character referred to wherein the spring is biased a fraction of the distance of effective travel of the motor, whereby the spring is never over-stressed, the force exerted by the motor is maintained within allowable tolerances and the longitudinal and cross-sectional dimensions of the spring and the other structure related thereto can be maintained at a minimum.

Still another object of this invention is to provide a motor of the character referred to having novel means for anchoring the spring, novel means for coupling the

spring with the tow line, and novel means for guiding the tow line to the exterior of the construction.

It is a further object of this invention to provide a motor of the character referred to having novel governing means for buffering and controlling the action of the spring.

Yet another object is to provide a novel mounting means for mounting the motor to a door closure.

It is an object of this invention to provide a structure of the character referred to having novel sealing means to seal with adjacent door panels and to prevent the passage of insects, drafts, and the like, between the panels and closure.

Finally, it is an object of my invention to provide a structure of the character referred to which involves few parts, each of which is easy and economical to manufacture, a structure which is neat and compact in appearance, and a structure which is highly effective and dependable in operation.

The various objects and features of my invention will be fully understood from the following detailed description of typical preferred forms and applications of my invention, throughout which description reference is made to the accompanying drawings, in which:

FIG. 1 is an isometric view of a door construction with my new closer related thereto;

FIG. 2 is a sectional view of my new motor;

FIG. 3 shows a portion of the structure with parts in another position;

FIG. 4 is a sectional view taken as indicated by line **4—4** on FIG. 2;

FIG. 5 is a sectional view taken as indicated by line **5—5** on FIG. 2;

FIG. 6 is a sectional view taken as indicated by line **6—6** on FIG. 2;

FIG. 7 is a sectional view taken as indicated by line **7—7** on FIG. 2;

FIG. 8 is a sectional view taken as indicated by line **8—8** on FIG. 2;

FIG. 9 is an elevational view of portions of the door structure;

FIG. 10 is a view taken as indicated by line **10—10** on FIG. 9;

FIG. 11 shows another form of mounting means; and

FIGS. 12 and 13 are sectional views showing specific applications of the mounting means illustrated in FIG. 11.

The spring motor that I provide and which is illustrated in the accompanying drawings is suitable for wide and varied use and application. The motor is, however, particularly suitable for use in connection with an insect screen closure of a sliding glass door construction, to normally, yieldingly hold the closure in its closed position and to urge and shift the closure to said closed position, after it has been shifted open.

In accordance with the above, and for the purpose of illustration, I have illustrated the motor A related to a screen closure or panel B of a sliding glass door construction C.

The motor A includes, generally, an elongate, tubular body D, hereinafter referred to as the tube, an anchor block E engaged in and closing one end of the tube, a traveling block F in the tube, an elongate, tension spring G in the tube, between and connected with the blocks E and F, a guide block H engaged in the other end of the tube, and an elongate tow line I having one end fixed to the guide block and extending longitudinally through the tube to the traveling block then longitudinally back through the tube, to and through the guide block and thence to the exterior of the construction.

The motor A further includes a governing means J to control the action or rate of operation of the motor, mounting means K for the motor and sealing means L to seal between the motor and its related closure, and an adjacent or related door panel M.

The tube D is an elongate, cylindrical tube formed of extruded plastic, open at each end and defining a cylindrical bore **10**.

The anchor block E is a simple, molded plastic member having an enlarged, cylindrical head portion **11** seated against one end of the tube, a cylindrical plug portion **12** extending axially of the head portion and slidably engaged in and closing the adjacent end of the tube, and an elongate extension **13**, which extension is threaded to engage in an end portion of the spring G and to serve as a coupling means between the spring and the anchor block.

In addition to the foregoing, the anchor block E incorporates or defines an air bleed means N which forms a part of the governing means J.

The air bleed means N includes an elongate flow passage **13'** extending longitudinally through the block E and its extension to establish communication between the interior of the tube and the ambient atmosphere. The means N further includes a valve member **14** in the passage to control the rate at which air can flow therethrough.

In practice, as illustrated in the drawings, the outer end portion of the passage **13'** opens laterally outwardly and the valve member consists of a tapered screw fastener threaded into the outer end of the passage.

In practice, a self-topping screw fastener provided with a longitudinally extending groove or channel in its threaded shank provides an excellent valve member.

With the structure set forth above, it will be apparent that by advancing the valve member **14** into or out of the passage **13**, the rate at which air will flow through the passage can be advantageously controlled.

The traveling block F is an elongate, molded plastic member having an elongate, cylindrical body portion **15** arranged in the tube for free longitudinal shifting therein, an elongate, cylindrical shank portion **16** of reduced diameter projecting axially from the body portion **15** towards the anchor block, a pair of laterally spaced legs **17** projecting axially from the body portion **15**, and away from the anchor block. In practice, the legs **17** can be defined by a laterally and longitudinally opening slot established in the end portion of the body portion **15**.

The block F further includes a tow line engaging sheave **18** arranged between the legs **17** and rotatably supported by an axle **19** fixed to and extending between the legs, and a threaded extension **20** projecting axially from the shank portion **16** and adapted to engage in an end of the spring G to couple the spring to the block F.

The block F is further provided with a valve means V which forms or is a portion of the governing means J.

The valve means V includes a flow passage **21** entering the outer end of the extension **20** and extending longitudinally therethrough and through the shank portions **16**, a lateral port **22** in the shank portion adjacent the body portion **15** and communicating with the passage **21**, and a valve sleeve **23** slidably engaged about the shank and shiftable from a closed position, where it overlies the port (see FIG. 2 of the drawings) to an open position where it is shifted axially away from and is clear of the port (see FIG. 3 of the drawings).

The valve member or sleeve **23** is provided with a thin, flexible tube bore-engaging sealing skirt **24**, which projects axially from the sleeve towards the end of the tube in which the anchor block is engaged and establishes sliding, sealing engagement with the bore **10** of the tube D.

With the structure set forth above, it will be apparent that when the block F is urged or shifted away from the block E, the valve member, by virtue of the frictional contact between the skirt **24** and the tube, is shifted to its open position and permits the free flow of air through the block F and from the portion of the tube between the block F and block H into the portion of the tube between the block F and the block E.

Upon reverse movement of the block F, that is, shifting of the block F towards the block E, the sleeve is shifted by friction to the closed position, preventing the

flow of air through and/or by the block F and requiring that the air between the blocks E and F be exhausted through the bleed valve means N.

Accordingly, the block F can be pneumatically freely shifted away from the block E and its movement towards the block E is not free, but rather, is suitably buffered and controlled.

The spring G is a simple, elongate, helical tension spring. The spring is slightly less in inside diameter and is substantially the same pitch as the threaded extensions **12** and **20** of the blocks E and F, about which its end portions are yieldingly, threadedly engaged.

The coupling between the blocks E and F and their related end portions of the spring G is extremely easy and convenient to establish and is extremely sound and satisfactory in operation.

It is to be noted that the outside diameter of the spring G is slightly greater than the outside diameter of the shank **16** of the block F and establishes a suitable stop against which the sleeve of the valve means V stops when the valve sleeve is shifted open. The valve sleeve is stopped by the body portion **15** of the block E when the valve sleeve is shifted closed.

The guide block H is a molded plastic member having a cylindrical head portion **25** engaging and stopped against the other end of the tube D. The outer end portion of the head portion is slotted to define a pair of laterally spaced, axially outwardly projecting legs **26**, between which a tow line engaging sheave **27** is arranged. The sheave is rotatably supported or carried by an axle **28** fixed to and extending between the legs.

The block H is further provided with a plug portion **29** of reduced diameter which projects axially from the head portion and is slidably, frictionally engaged in the adjacent end portion of the tube.

The plug and head portions of the block H are provided with an axially extending cord receiving passage **30** which establishes communication between the interior of the tube and the space between the legs **26**. The axis of the passage **30** is tangential with one side of the sheave **27**.

The plug portion of the block is provided with a radially, outwardly opening knot or enlargement receiving socket **31** intermediate its ends and an axially extending, radially outwardly opening tow line receiving groove or channel **32** extending between the socket and the free end of the plug portion.

The tow line I is a simple, elongate piece or length of cordage, such as nylon cordage, and is provided with a knot or enlargement **35** at one end, which knot or enlargement is engaged in the socket **31** in the block H and is held captive therein by the tube D. The line extends from the socket **31** through the channel **32**, thence, longitudinally through the tube D, around the sheaves **18** of the block F, then longitudinally through the tube D, through the passage **30** in the block H, about the sheave **27**, and, thence, laterally from the construction.

With the construction set forth above, it will be apparent that a two to one mechanical advantage or ratio is obtained, that is, the spring G is drawn and biased one-half the distance that the tow line is drawn or moved. As a result of the above, the cord can be drawn and is effective through twice the distance the spring can be effectively drawn.

Further, it will be apparent that the means J is such that it affords little or no resistance when the spring is being biased and is such that it effectively buffers and slows the action of the spring when the tow line is released and the spring is permitted to shift to its unbiased position.

The means employed to mount the motor A can vary widely in practice. In the case illustrated, the mounting means K is particularly adapted for mounting the motor A on a conventional or standard screen door frame for sliding glass door constructions.

The ordinary or conventional screen door frame for sliding glass doors includes a frame P formed of aluminum sections and in which an insect screen fabric is suitably hung.

The frame P is a simple, fabricated, rectangular structure having a horizontal header or top rail **50**, a horizontal base or bottom rail **51**, a vertical front rail **52**, and a vertical rear rail **53**. The rear rail **53** is provided with a laterally, outwardly opening, longitudinal channel **54** adapted to cooperatively and frictionally receive the base portion of an elongate bug strip formed of plastic material, and having a laterally projecting, flexible, longitudinally extending web or brush projecting inwardly from the frame, towards the fixed glass panel M of the door construction. The web or brush serves as an insect seal and prevents insects at the exterior of panel M from finding their way between the screen and the panel to the inner side of the door construction.

In practice, the depth and lateral extent of the bug strip channels **54** in screen door frames is varied slightly by different manufacturers, but such variations are not so great as to prevent the insertion and use of standard, commercially available bug stripping material.

The arrangement and proportioning of the bug strip channel **54**, shown in FIG. 10 of the drawings, is not intended to be true or exact, but rather, is only illustrative of such channels.

The mounting means K that I provide includes a pair of laterally, forwardly and outwardly divergent, flexible gripping flanges **60**, formed integrally on the tube, which flanges are adapted to be urged into the channel **54** and to establish frictional, gripping engagement with the opposing side walls **61** of the channel.

In practice, the base portions of the flanges are closer together than the lateral extent of the narrowest bug strip grooves employed in the art and their outer ends are spaced farther apart than the lateral extent of the widest bug strip groove employed in the art. Accordingly, the mounting means can be advantageously engaged with or in substantially all bug strip receiving grooves.

Since the flanges are coextensive with the tube D, it will be apparent that great frictional engagement or holding power can be obtained, though the force exerted by the flanges in the groove at any one point may be slight.

In practice, the groove surface engaging sides and the free end portions of the flanges can, as illustrated, be provided with serrations or the like to enhance the gripping characteristics of the flanges.

The sealing means L that I provide is adapted to take the place of the bug strip ordinarily employed and engaged in the bug strip channel in which the mounting means K is engaged.

The means L is shown as including elongate, semicircular, inwardly and outwardly opening channels **70**, extending longitudinally along the forward quarter of the tube, clear of the flanges **60** and an elongate bug strip **71** formed of soft, flexible plastic material and engaged in the channel opposing the fixed door panel M with which the screen is related, and projecting inwardly to seal with said fixed panel M. The strip **71** has a cylindrical tubular base portion **72** slidably engaged in the channel and an inwardly projecting, thin, flexible, panel-engaging web **73**.

By providing two channels **70**, one at each side of the mounting means K, the construction is adapted for substantially universal application and can be used equally well on both left-hand pull and right-hand pull screen doors.

The strip **71** can be easily slidably engaged in the desired channel **70** from one open end of the channel.

In the particular case illustrated (see FIG. 9 of the drawings), the motor A is engaged in the bug strip channel **54** of the screen frame P with its guide block H at the lower end of the motor and adjacent the bottom edge of the closure of the frame. The lower edge portion of the screen frame is engaged between and guided by a pair of upwardly projecting ribs **80** on a threshold plate **81** of the door frame. The upper edge of the screen

closure is engaged between and guided by a pair of downwardly projecting ribs **82** on the header **83** of the door frame.

In practice, where it is desired to apply my motor to the rear or trailing vertical rail of a screen or door frame which is not provided with a bug strip channel, a separate channel of formed aluminum or plastic, to cooperatively receive the motor structure can be fixed to the outer side edge of the rail by means of screw fasteners or cement or the flanges **60** can be easily stripped from the tube, by means of a knife and the tube can then be cemented directly to the said outer edge of the rail. It will be apparent that if the flanges **60** are stripped or removed, the exterior of the semi-circular projections establishing the bug strip channels **70** are tangential with the tube and are such that when the tube is placed against the rear edge of the door frame rail, the said projections seat on the rail. Further, the said projections cooperate with the tube to define longitudinal cement receiving grooves which oppose the edge of the rail and enhance the ease and convenience of cementing the motor in place.

The tow line I extends horizontally from the lower end of the motor, beneath the closure and has its free end fixed to one of the ribs **80** on the threshold, at a point spaced from the lower end of the motor. The point of connection between the free end of the tow line and the rib **80** is spaced a sufficient distance from the motor to bias the spring so that when the closure is urged open, sufficient force is exerted by the spring to return it to its fully closed position.

In the case illustrated, the free end of the line I is engaged through an opening provided in the rib **80** and is suitably knotted to prevent its being disengaged therefrom.

In practice, the motor could be reversed so that the guide block H occurs at the top of the screen frame P, in which case, the line I would extend along the top of the closure P and its free end would be suitably fixed to the header **83**.

In practice, the screen closure B may be supported by rollers at its lower edge, or by hanger type roller means at its upper edge. Since the placement of the rollers or support means for the screen closure can be varied and does not affect the novelty of this invention, except for the possible requirement that the tow line be arranged at the top or bottom of the closure, I have selected not to illustrate such roller or support means.

From the foregoing, it will be apparent that my new spring motor door closer is such that it will effectively return the screen closure B from its open position to its closed position, at a controlled rate of speed.

It is to be noted that the spring G, valve or screw member **14** and the axles **19** and **28** are the only metal parts of my new motor construction, and that the remainder of the parts can be advantageously established of suitable plastic materials. The tube D and bug strip **71** are extruded plastic parts and the several blocks, sheaves and valve member V are molded plastic parts. The tow line is a woven plastic material. All parts are such that they can be easily and economically mass-produced and are such that they can be easily, quickly and economically assembled.

In FIGS. 11, 12 and 13 of the drawings, I have illustrated a modified form of mounting means K' which means is better adapted for substantially universal mounting of the motor.

The mounting means K' includes a single flange **60'** projecting tangentially from one side of the tube D' and having a bead **60ª** at and along its outer edge.

In FIG. 12 of the drawings, I have shown the means K' related to a channel **54'** in a door frame structure similar to the conventional type of frame structure previously described.

The flange **60'** enters the channel **54'** and is arranged in flat bearing engagement against one side wall **61'** thereof.

A plurality (for example, three) of longitudinally spaced screw fasteners **62'** are employed through the opposite side wall of the channel to bridge the channel and to engage the flange **60'**.

The screw fasteners **62'** engage and urge the flange into tight clamped engagement on its related side wall.

The screws engage the flange inward of the bead **60ª**, which bead prevents outward shifting and displacement of the flange in and from the channel.

In FIG. 13 of the drawings, the flange **60'** is arranged in flat bearing engagement on the flat top surface of a support structure S' and is secured thereto by means of screw fasteners **62ª**, as clearly illustrated.

Having described only typical preferred forms and applications of my invention, I do not wish to be limited or restricted to the specific details herein set forth, but wish to reserve to myself any modifications or variations that may appear to those skilled in the art and which fall within the scope of the following claims.

Having described my invention, I claim:

1. A spring motor of the character referred to including, an elongate tube, an anchor block engaged in and closing one end of the tube, a guide block engaged in the other end of the tube, an elongate, helical tension spring arranged in and extending longitudinally through the tube and having one end coupled with the anchor block, a traveling block slidably engaged in the tube and coupled to the other end of the spring, and an elongate tow line having one end fixed to the guide block, extending longitudinally in the tube through the traveling block, thence longitudinally through the tube and the guide block to the exterior of the tube, and governing means to buffer the action of the spring including, an air bleed valve in the anchor block and a valve means related to the traveling block and which is operable to open and permit the free flow of air through the tube and by the traveling block when the block is moved towards said other end of the tube, and to prevent the flow of air through the tube and by the traveling block when the traveling block moves towards said one end of the tube.

2. A spring motor of the character referred to including, an elongate tube, an anchor block engaged in and closing one end of the tube, a guide block engaged in the other end of the tube and having a tow line receiving passage extending therethrough, a tow line engaging sheave adjacent the outer end of said passage, and a tow line anchoring means, an elongate, helical tension spring arranged in the tube to extend longitudinally therethrough, coupling means on the anchoring block and connecting one end of the spring to the block, a traveling block having a tow line engaging sheave slidably engaged in the tube between the spring and the guide block and having coupling means connecting the traveling block to the other end of the spring, and an elongate tow line having one end engaged in said tow line anchoring means at the guide block and extending longitudinally in the tube about the sheave of the traveling block, thence about the sheave of the guide block and terminating and accessible at the exterior of the motor, and governing means to buffer the action of the spring including, an air bleed valve in the anchor block and valve means related to the traveling block and adapted to open and permit the free flow of air through the tube and by the traveling block when the block is moved toward the said other end of the tube and to stop the flow of air through the tube and by the traveling block when the traveling block is moved towards said one end of the tube.

3. A spring motor of the character referred to including, an elongate tube, an anchor block engaged in and closing one end of the tube, a guide block engaged in the other end of the tube and having a tow line receiving passage extending therethrough, a tow line engaging sheave adjacent the outer end of said passage, and a tow line anchoring means, an elongate, helical tension spring arranged in the tube to extend longitudinally therethrough, coupling means on the anchoring block and connecting one

end of the spring to the block, a traveling block having a tow line engaging sheave slidably engaged in the tube between the spring and the guide block and having coupling means connecting the traveling block to the other end of the spring, and an elongate tow line having one end engaged in said tow line anchoring means at the guide block and extending longitudinally in the tube about the sheave of the traveling block, thence about the sheave of the guide block and terminating and accessible at the exterior of the motor, and governing means to buffer the action of the spring including, an air bleed valve in the anchoring block and valve means related to the traveling block and adapted to open and permit the free flow of air through the tube and by the traveling block when the block is moved toward the said other end of the tube and to stop the flow of air through the tube and by the traveling block when the traveling block is moved towards said one end of the tube, said air bleed valve including a flow passage extending through the anchor block and communicating with the interior of the tube and a valve member screw threaded into the outer end of the flow passage.

4. A spring motor of the character referred to including, an elongate tube, an anchor block engaged in and closing one end of the tube, a guide block engaged in the other end of the tube and having a tow line receiving passage extending therethrough, a tow line engaging sheave adjacent the outer end of said passage, and a tow line anchoring means, an elongate, helical tension spring arranged in the tube to extend longitudinally therethrough, coupling means on the anchoring block and connecting one end of the spring to the block, a traveling block having a tow line engaging sheave slidably engaged in the tube between the spring and the guide block and having coupling means connecting the traveling block to the other end of the spring, and an elongate tow line having one end engaged in said tow line anchoring means at the guide block and extending longitudinally in the tube about the sheave of the traveling block, thence about the sheave of the guide block and terminating and accessible at the exterior of the motor, and governing means to buffer the action of the spring including, an air bleed valve in the anchor block and valve means related to the traveling block and adapted to open and permit the free flow of air through the tube and by the traveling block when the block is moved toward the said other end of the tube and to stop the flow of air through the tube and by the traveling block when the traveling block is moved towards said one end of the tube, said valving means including a longitudinal flow passage in said traveling block and opening towards said anchor block, a lateral port intermediate the ends of the traveling block and communicating with said flow passage, a valve sleeve slidably engaged about the traveling block and shiftable axially relative thereto and into and out of engagement over said port, an annular, axially extending tube bore engaging skirt on the sleeve to project axially towards said anchor block and slidably engaging and sealing in the tube, and axially spaced stop means on the traveling block to limit axial shifting of said sleeve relative thereto.

5. A spring motor of the character referred to including, an elongate tube, an anchor block engaged in and closing one end of the tube, a guide block engaged in the other end of the tube and having a tow line receiving passage extending therethrough, a tow line engaging sheave adjacent the outer end of said passage, and a tow line anchoring means, an elongate, helical tension spring arranged in the tube to extend longitudinally therethrough, coupling means on the anchoring block and connecting one end of the spring to the block, a traveling block having a tow line engaging sheave slidably engaged in the tube between the spring and the guide block and having coupling means connecting the traveling block to the other end of the spring, and an elongate tow line having one end engaged in said tow line anchoring means at the guide block and extending longitudinally in the tube about the sheave of the traveling block, thence about the sheave of the guide block and terminating and accessible at the exterior of the motor, and governing means to buffer the action of the spring including, an air bleed valve in the anchor block and valve means related to the traveling block and adapted to open and permit the free flow of air through the tube and by the traveling block when the block is moved toward the said other end of the tube and to stop the flow of air through the tube and by the traveling block when the traveling block is moved towards said one end of the tube, said valving means including a longitudinal flow passage in said traveling block and opening towards said anchor block, a lateral port intermediate the ends of the traveling block and communicating with said flow passage, a valve sleeve slidably engaged about the traveling block and shiftable axially relative thereto and into and out of engagement over said port, an annular, axially extending tube bore engaging skirt on the sleeve to project axially towards said anchor block and slidably engaging and sealing in the tube, and axially spaced stop means on the traveling block to limit axial shifting of said sleeve relative thereto, said air bleed valve including a flow passage in the anchor block and establishing communication between the interior of the tube and the exterior of the construction, and a valve member threadedly engaged in the outer open end of the flow passage.

6. A spring motor of the character referred to including, an elongated tube, an anchor block engaged in and closing one end of the tube, a guide block engaged in the other end of the tube and having a tow line receiving passage extending therethrough, a tow line engaging sheave adjacent the outer end of said passage, and a tow line anchoring means, an elongate, helical tension spring arranged in the tube to extend longitudinally therethrough, coupling means on the anchoring block and connecting one end of the spring to the block, a traveling block having a tow line engaging sheave slidably engaged in the tube between the spring and the guide block and having coupling means connecting the traveling block to the other end of the spring, and an elongate tow line having one end engaged in said tow line anchoring means at the guide block and extending longitudinally in the tube about the sheave of the traveling block, thence about the sheave of the guide block and terminating and accessible at the exterior of the motor, and governing means to buffer the action of the spring including, an air bleed valve in the anchor block and valve means related to the travel block and adapted to open and permit the free flow of air through the tube and by the traveling block when the block is moved toward the said other end of the tube and to stop the flow of air through the tube and by the traveling block when the traveling block is moved towards said one end of the tube, said coupling means securing the ends of the springs to the anchor and traveling blocks including, threaded extensions on the blocks projecting longitudinally therefrom and into threaded engagement in their related ends of the spring.

7. A spring motor of the character referred to including, an elongate tube, an anchor block engaged in and closing one end of the tube, a guide block engaged in the other end of the tube and having a tow line receiving passage extending therethrough, a tow line engaging sheave adjacent the outer end of said passage, and a tow line anchoring means, an elongate, helical tension spring arranged in the tube to extend longitudinally therethrough, coupling means on the anchoring block and connecting one end of the spring to the block, a traveling block having a tow line engaging sheave slidably engaged in the tube between the spring and the guide block and having coupling means connecting the traveling block to the other end of the spring, and an elongate tow line having one end of the spring, and an elongate tow line having one end engaged in said tow line anchoring means

at the guide block and extending longitudinally in the tube about the sheave of the traveling block, thence about the sheave of the guide block and terminating and accessible at the exterior of the motor, and governing means to buffer the action of the spring including, an air bleed valve in the anchor block and valve means related to the traveling block and adapted to open and permit the free flow of air through the tube and by the traveling block when the block is moved toward the said other end of the tube and to stop the flow of air through the tube and by the traveling block when the traveling block is moved towards said one end of the tube, said valving means including a longitudinal flow passage in said traveling block and opening towards said anchor block, a lateral port intermediate the ends of the traveling block and communicating with said flow passage, a valve sleeve slidably engaged about the traveling block and shiftable axially relative thereto and into and out of engagement over said port, an annular, axially extending tube bore engaging skirt on the sleeve to project axially towards said anchor block and slidably engaging and sealing in the tube, and axially spaced stop means on the traveling block to limit axial shifting of said sleeve relative thereto, said air bleed valve including a flow passage in the anchor block and establishing communication between the interior of the tube and the exterior of the construction, and a valve member threadedly engaged in the outer open end of the flow passage, said coupling means securing the ends of the spring to the anchor and traveling blocks including, threaded extensions on the blocks projecting longitudinally therefrom and into threaded engagement in their related ends of the spring.

8. In combination, a sliding door structure including a rectangular door frame arranged in a door opening in a wall and having an elongate, horizontal header with longitudinal, closure engaging guide means, an elongate, horizontal threshold with longitudinal closure engaging guide means and vertical jambs between the ends of the header and threshold, an elongate, vertically disposed, rectangular door closure having horizontal top and bottom edges slidably engaged and supported with said guide means and vertical side edges opposing said jambs, said closure being less in lateral extent than the door frame and shiftable laterally therein, a spring motor closer adapted to normally yieldingly urge and hold the closure adjacent one end of the frame and including, an elongate, vertically disposed tube, mounting means securing the tube to the edge of the closure remote from said one jamb, an anchor block engaged in and closing one end of the tube, a guide block engaged in the other end of the tube, an elongate helical tension spring engaged in and extending longitudinally of the tube and having one end coupled with the anchor block, a traveling block slidably engaged in the tube and coupled to the other end of the spring, and an elongate tow line having one end fixed to the guide block and extending longitudinally in the tube through the traveling block and thence longitudinally through the tube and the guide block with its other free end accessible at the exterior of the tube and extending longitudinally along a horizontal edge of the closure and fixed to the door frame, said mounting means including a longitudinal, laterally opening channel at said one side edge of the closure and defining flat, parallel opposing surfaces, and a pair of spaced, laterally outwardly divergent, resilient, longitudinal flanges on the tube and slidably engaged in the channel to establish tight, frictional engagement with the opposing surfaces.

9. In combination, a sliding door structure including a rectangular door frame arranged in a door opening in a wall and having an elongate, horizontal header with longitudinal, closure engaging guide means, an elongate, horizontal threshold with longitudinal closure engaging guide means and vertical jambs between the ends of the header and threshold, an elongate, vertically disposed, rectangular door closure having horizontal top and bottom edges slidably engaged and supported with said guide means and vertical side edges opposing said jambs, said closure being less in lateral extent than the door frame and shiftable laterally therein, a spring motor closer adapted to normally yieldingly urge and hold the closure adjacent one end of the frame and including, an elongate, vertically disposed tube, mounting means securing the tube to the edge of the closure remote from said one jamb, an anchor block engaged in and closing one end of the tube, a guide block engaged in the other end of the tube, an elongate helical tension spring engaged in and extending longitudinally of the tube and having one end coupled with the anchor block, a traveling block slidably engaged in the tube and coupled to the other end of the spring, and an elongate tow line having one end fixed to the guide block and extending longitudinally in the tube through the traveling block and thence longitudinally through the tube and the guide block with its other free end accessible at the exterior of the tube and extending longitudinally along a horizontal edge of the closure and fixed to the door frame, said mounting means including a longitudinal, laterally opening channel at said one side edge of the closure and defining flat, parallel opposing surfaces, and a pair of spaced, laterally outwardly divergent, resilient, longitudinal flanges on the tube and slidably engaged in the channel to establish tight, frictional engagement with the opposing surfaces, and governing means to buffer the action of the spring, including an air bleed valve in the anchor block and valve means related to the traveling block and which is operable to open and permit the free flow of air through the tube and by the traveling block when the block is moved towards the said other end of the tube and to stop the flow of air through the tube and by the traveling block when the traveling block moves towards said one end of the tube, whereby air in the tube between the traveling block and anchor block is urged through the bleed valve when the traveling block is urged towards said anchor block.

10. In combination, a sliding door structure including a rectangular door frame arranged in a door opening in a wall and having an elongate, horizontal header with longitudinal, closure engaging guide means, an elongate, horizontal threshold with longitudinal closure engaging guide means and vertical jambs between the ends of the header and threshold, an elongate, vertically disposed, rectangular door closure having horizontal top and bottom edges slidably engaged and supported with said guide means and vertical side edges opposing said jambs, said closure being less in lateral extent than the door frame and shiftable laterally therein, a spring motor closer adapted to normally yieldingly urge and hold the closure adjacent one end of the frame and including, an elongate, vertically disposed tube, mounting means securing the tube to the edge of the closure remote from said one jamb, an anchor block engaged in and closing one end of the tube, a guide block engaged in the other end of the tube, an elongate helical tension spring engaged in and extending longitudinally of the tube and having one end coupled with the anchor block, a traveling block slidably engaged in the tube and coupled to the other end of the spring, and an elongate tow line having one end fixed to the guide block and extending longitudinally in the tube through the traveling block and thence longitudinally through the tube and the guide block with its other free end accessible at the exterior of the tube and extending longitudinally along a horizontal edge of the closure and fixed to the door frame, said mounting means including a longitudinal, laterally opening channel at said one side edge of the closure and defining flat, parallel opposing surfaces, and a pair of spaced, laterally outwardly divergent, resilient, longitudinal flanges on the tube and slidably engaged in the channel to establish tight, frictional engagement with the opposing surfaces, and governing means to buffer the action of the spring, including an air bleed valve in the anchor

block and valve means related to the traveling block and which is operable to open and permit the free flow of air through the tube and by the traveling block when the block is moved towards the said other end of the tube and to stop the flow of air through the tube and by the traveling block when the traveling block moves towards said one end of the tube, whereby air in the tube between the traveling block and anchor block is urged through the bleed valve when the traveling block is urged towards said anchor block, said coupling means securing the ends of the spring to the anchor and traveling blocks including, threaded tubular extensions on said blocks and projecting longitudinally therefrom and into threaded engagement in their related ends of the springs.

11. In combination, a sliding door structure including an elongate rectangular door frame arranged in a door opening in a wall and having an elongate horizontal header with longitudinal closure engaging guide means, an elongate, horizontal threshold with longitudinal closure engaging guide means and vertical jambs between the ends of the header and the threshold, a fixed closure panel of less lateral extent than the frame and arranged within the frame adjacent one jamb and in lateral spaced relationship with said guide means, an elongate rectangular shiftable closure having horizontal top and bottom edges slidably engaged with said guide means and vertical side edges opposing said jambs, said closure being less in lateral extent than the frame and shiftable laterally from a normal closed position where it occurs adjacent the other jamb and closes the opening in the door frame defined by said frame and the fixed panel, to an open position where it occurs adjacent said fixed panel and remote from said opening, a spring motor door closer adapted to normally yielding urge and hold the closer in its normal closed position including an elongate vertically extending tube, mounting means securing the tube to the edge of the closure remote from said other jamb, anchor block engaged in and closing one end of the tube, a guide block engaged in the other end of the tube, an elongate, helical tension spring arranged in and extending longitudinally of the tube and having one end coupled with the anchor block, a traveling block slidably engaged in the tube and coupled to the other end of the spring and an elongate tow line having one end fixed to the guide block, extending longitudinally through the tube and the traveling block, thence longitudinally through the tube and said guide block and thence extending longitudinally along one horizontal edge of the closure and fixed to the door frame, governing means to buffer the action of the spring including, an air bleed valve in the anchor block and valve means related to and carried by the traveling block, said valve means including a flow passage in the traveling block communicating with the end of the tube with which the anchor block is related, a laterally opening port in the traveling block intermediate its ends and communicating with the flow passage, a longitudinally shiftable valve sleeve slidably engaged about the traveling block and shiftable from a closed position where it overlies the port and an open position where it is clear of said port, axially spaced stop means on the traveling block limiting the axial shifting of the sleeve and an annular longitudinal tube engaging sealing flange carried by the sleeve and projecting axially therefrom towards said anchor block and establishing sliding sealing engagement in the bore of the tube.

12. In combination, a sliding door structure as set forth in claim **11**, including coupling means securing the ends of the spring to the anchor and traveling blocks including threaded extensions on the blocks projecting longitudinally therefrom and into threaded engagement in their related ends of the springs.

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