United States Patent

Lester, Jr.

[15] **3,680,622**

[45] **Aug. 1, 1972**

[54] **POWER-TRANSMITTING MECHANISM FOR SIDE-COILING DOOR**

[72] Inventor: **Russell H. Lester, Jr.**, Commack, N.Y.

[73] Assignee: **North American Door**, Lindenhurst, N.Y.

[22] Filed: **April 14, 1971**

[21] Appl. No.: **133,957**

[52] **U.S. Cl.** **160/25**, 160/133, 160/310

[51] **Int. Cl.** **E06b 9/204**

[58] **Field of Search**.....160/23–28, 133, 160/310, 193; 74/848

[56] **References Cited**

UNITED STATES PATENTS

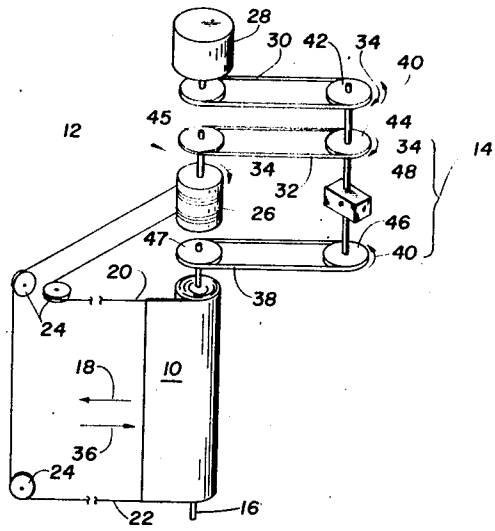
2,934,139	4/1960	Wardlaw et al.	160/26
2,958,083	11/1960	Shook et al.	160/26
3,019,450	2/1962	Karasiewicz	160/133 X
3,451,463	6/1969	Lyman	160/133 X
3,465,805	9/1969	Lyman	160/133 X

Primary Examiner—J. Karl Bell
Attorney—Bauer & Amer

[57] **ABSTRACT**

A side-coiling door powered through opening and closing movements by a reversible motor which operates through an improved power-transmission mechanism. The outer turns or helical wraps of the door are of a greater circumferential length, due to their larger diameter, than the inner wraps of the door. Accordingly, each revolution of the means causing either said door opening or closing movement cannot be correlated to a standard length of door being at that time either wound or unwound upon said means. The improved power-transmission mechanism hereof allows for this disparity, even though it has but a single power shaft for both a door-opening and a door-closing sprocket mounted on said power shaft. This is achieved by having only one said sprocket, during any interval of operation of the mechanism, drivingly connected to the power shaft while the other sprocket is freewheeling thereon. The freewheeling condition, of course, does not interfere with the driving requirements of the power shaft.

3 Claims, 5 Drawing Figures



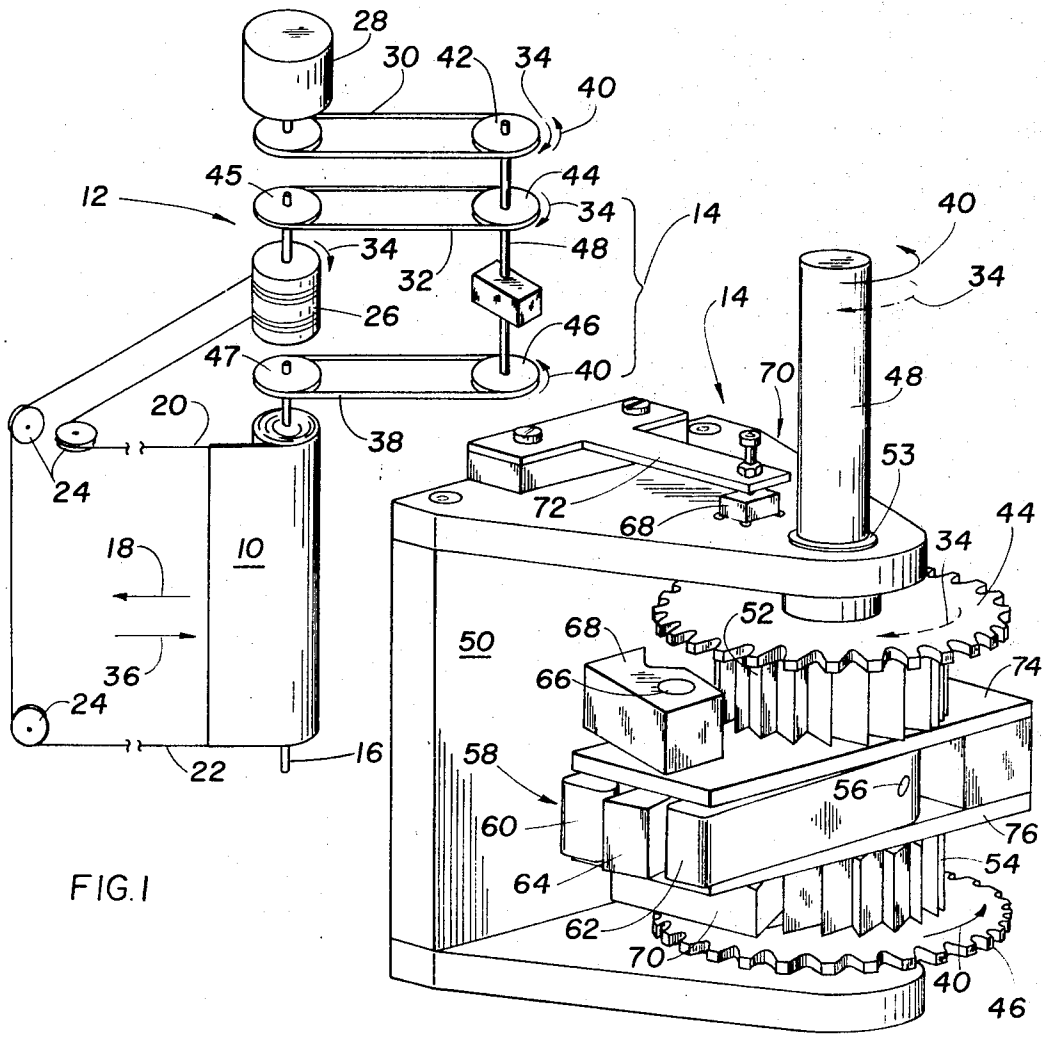


FIG. 1

FIG. 2

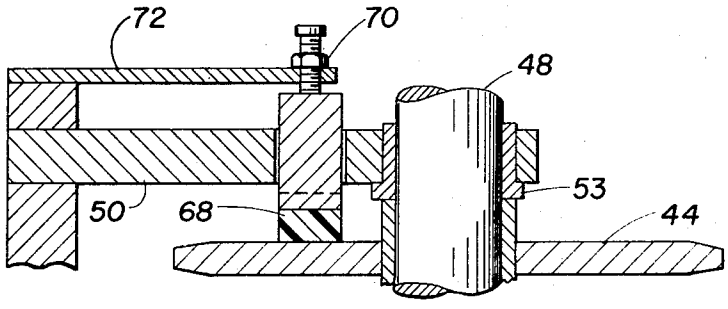


FIG. 5

INVENTOR
RUSSELL H. LESTER, JR.
BY Bauer & Amer
ATTORNEYS

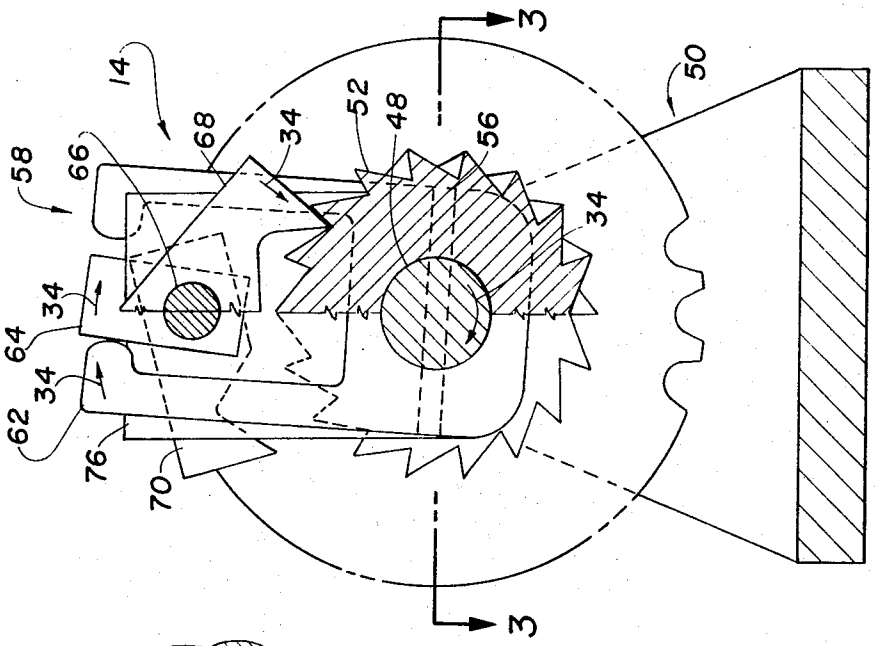


FIG. 4

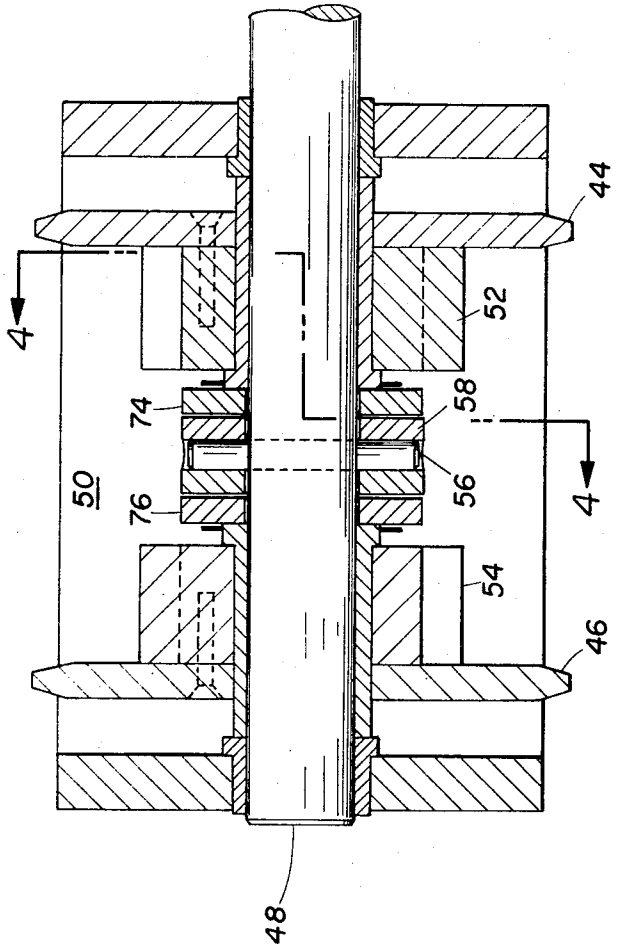


FIG. 3

INVENTOR
RUSSELL H. LESTER, JR.
BY Bauer & Amer
ATTORNEYS

POWER-TRANSMITTING MECHANISM FOR SIDE-COILING DOOR

The present invention relates to side-coiling doors, and more particularly to improved means for powering such doors through opening and closing movements.

It is desirable that a comparatively heavy side-coiling door be fully motor operated, that is urged by a reversible motor through both its opening and closing movements. In accordance with present practice, a separate door-opening means and door-closing means is provided, and the motor is arranged to selectively power one of these means while the other is disengaged therefrom. Moreover, this tandem or alternate engagement and disengagement of the motor with these separate door-opening and door-closing means is achieved through the operation of a sliding clutch which, according to its position of sliding movement, establishes the desired drive connection to one means and disengages a prior established drive connection to the other means. Although generally satisfactory, the aforesaid power-transmission mechanism, utilizing a sliding clutch, has several inherent shortcomings. Among the significance of these shortcomings is the requirement of sliding movement to establish the operative positions of the clutch, and also the requirement that there be an intermeshing of plural teeth preparatory to having a drive connection.

An object of the present invention is to provide an improved power transmitting mechanism for operating a side-coiling door overcoming the foregoing and other shortcomings of the prior art. Specifically, it is an object to provide a mechanism for transmitting the rotary power of the door motor which obviates a sliding clutch and, instead, uses cooperating pawl and rachet arrangements to make or disengage from the required drive connections. This minimizes the amount of intermeshing of teeth required, as well as eliminates extensive movement of parts to achieve the required drive connections.

In a power-transmitting mechanism which demonstrates objects and advantages of the present invention, there is included an operative arrangement of two rachets, each of which is operatively arranged to place in driving operation a cooperating door-opening and door-closing means. Otherwise, however, both these means are normally freewheeling on the power shaft of the mechanism. Thus, since the normal condition of both means for opening and closing the door is freewheeling, by merely selectively placing one or the other in driving relation with the power shaft, the simultaneous tandem driving and freewheeling conditions of the two means is automatically provided. Moreover, to achieve this selection of one of these two means, a cooperating one of two pawls is rotated by the power shaft into engagement with its associated rachet. The direction of power shaft rotation, therefore, determines which rachet is selected for driving operation, and such power shaft rotation is, in turn, correlated to what is required to open or close the door.

The above brief description, as well as further objects, features and advantages of the present invention, will be more fully appreciated by reference to the following detailed description of a presently preferred, but nonetheless illustrative embodiment in accordance with the present invention, when taken in conjunction with the accompanying drawings, wherein:

FIG. 1 is a diagrammatic view of a typical side-coiling door having an improved power-transmitting mechanism according to the present invention;

FIG. 2 is an isolated perspective view of the power-transmitting mechanism illustrating details of its construction.

FIG. 3 is a side elevational view projected from FIG. 2 showing further details of construction of the power-transmitting mechanism hereof;

FIG. 4 is a plan view, in section, taken on line 4—4 of FIG. 3, showing further details of construction; and

FIG. 5 is a partial view, in side elevation, of an exemplary drag-applying means for the power-transmission mechanism hereof.

Reference is now made to the drawings, and in particular to FIG. 1 wherein a typical side-coiling door, generally designated **10**, is shown operatively associated with door opening and closing means generally designated **12**. Included as a part of the opening and closing means **12** is a power-transmitting mechanism, generally designated **14**, having the noteworthy structural features and mode of operation according to the present invention. Mechanism **14** is shown in greater detail in FIG. **2**.

Still referring to FIG. **1**, however, it is helpful in understanding the construction and mode of operation of the mechanism **14**, to first understand the operating requirements of the door opening and closing means **12**. Specifically, door **10**, as clearly illustrated in FIG. **1**, is unwound from its coiled condition on a support shaft **16** through closing movement **18** under the urgency of cables **20** and **22** which are respectively entrained over pulleys, individually and collectively designated **24**. The pulling cables **20**, **22** are wound on a storage drum **26** which is powered in rotation by a motor **28** which is operatively connected to the drum **26** via a first pulley, chain or other power-transmission arrangement **30** and a second arrangement **32**. More particularly, closing movement **18** results when pulleys or the like of the arrangements **30**, **32** are driven in the direction **34** which, in turn, causes corresponding rotation **34** in the cable wind-up drum **26**.

Motor **28** also is effective in causing wind-up rotation in the shaft **16** and thus opening movement **36** of the door **10**. Specifically, this is also achieved via the first pulley means **30**, but is actually transmitted to the drum shaft **16** via still another pulley means **38**. That is, motor **28**, which will be understood to be reversible in its direction of rotation, when operated in reverse direction of rotation **40**, is effective in transmitting this direction of rotation via the pulley means **38** to the shaft **16** and thus causes wind-up of the door **10** about the shaft **16**.

The foregoing opening and closing mode of operation of the means **12** is facilitated by the power-transmitting mechanism **14** hereof. Specifically, the power input pulley or chain sprocket **42** of the power transmission means **30** and the power distribution pulleys or sprockets, in this case preferably sprockets **44** and **46** respectively of the power transmission means **32** and **38**, are all operatively disposed on a single power shaft **48**. As will be described in greater detail subsequently, during driving rotation **34** of sprocket **44** which, as already indicated, results in opening movement **18** of door **10**, the other sprocket **46** is freewheeling on the power shaft **48**. On the other hand, when sprocket **46** is

powered in rotation in the direction 40 and thus results in opening movement 36 of the door 10, sprocket 44 is freewheeling on the power shaft 48. This tandem driving and freewheeling operation of the sprockets 44 and 46 is achieved by the power-transmitting mechanism 14, all as will be described subsequently.

At this point, however, it is helpful to note that proper operation of the door 10 requires that when one sprocket is driving, the other sprocket be freewheeling. In this regard, it should be readily appreciated that, when the door 10 is in its fully wound condition on the shaft 16, the unwinding thereof in the direction 18 is occasioned by greater lengths of the door 10 being unwound from the shaft 16 during initial, as distinguished from terminal, closing movement 18. This is because the outer helical turns of the door 10 are of a greater circumferential length, due to their larger diameter, than the inner wraps of the door. Thus, each turn of the shaft 16 is not corrolated to any uniform length of door 10. Thus, when the door 10 is being urged through closing movement 18 as a result of rotation of the cable drum 26 in the direction 34, each turn of said drum 26 may require initially only a portion of a full turn of shaft 16 and, at the end of the closing movement 18, may require a rotatable traverse which exceeds one turn. It is for this reason that it is necessary that when sprocket 44 and its cooperating sprocket 45 are driving the drum 26, the other sprocket 46 (and its cooperating sprocket 47) be freewheeling in order to allow for the different rotational traverses of the drum 26 and shaft 16. By the same token, during wind-up or opening movement 36 of the door 10, there is the same disparity between the rotational traverses of the shaft 16 and of the drum 26, the cables 20 and 22 being unwound from the drum 26 at this time. This discrepency is fully provided for since, when sprocket 46 is in driving rotation 40, the sprocket 44 is in freewheeling operation about the power shaft 48.

Reference is now made to FIGS. 2–5 for details of the construction and mode of operation of the power-transmitting mechanism 14 which provides the just described operation of the opening and closing means 12. Mechanism 14 includes the previously noted single power shaft 48 appropriately vertically supported and journalled for rotation in a support structure 50. Disposed in freewheeling rotation on the power shaft 48 are the previously noted sprockets 44 and 46. Although not shown, it will be understood that an endless chain is appropriately entrained about each of these sprockets and about the sprockets which cooperate therewith, to thereby respectively define the previously noted power transmission means 32 and 38. The freewheeling operation of the sprockets 44 and 46 may be achieved in any appropriate way, as for example by the use of a sleeve bearing 52 shown interposed between the sprocket 44 and the power shaft 48.

Formed integral with each of the sprockets 44, 46 and, more particularly on the sides thereof in facing relation to each other, are a pair of driving rachets 52 and 54. Interposed between the rachets and actually connected to the power shaft 48, as by a drive pin 56, is a U-shaped actuating member, generally 52 and 54, and 58. Due to its U-shape, member 58 has bifulcated actuating arms 60 and 62.

As may best be understood from FIG. 4 in conjunction with FIG. 2, interposed between the arms 60 and 62 is a pivotally mounted rachet-driving means, consisting of a pivotally mounted member 64 connected via an activating pin or shaft 66 to opposite pawl-like members 68 and 70. Thus, in response to rotation of shaft 66, pawl 68 is pivotally movable between a clearance position, as illustrated in FIG. 2, with respect to rachet 52 and an intermeshing driving relation therewith. Similarly, pawl 70 alternates between the intermeshing driving relation with rachet 54 as illustrated in FIG. 2, and a clearance position disengaged therefrom. It should be readily appreciated that through proper angular orientation of the pawl 68 and 70 on the shaft 66, it can be arranged that when pawl 70 is engaging rachet 54, pawl 68 is disengaged from rachet 62, and vice versa. To shift the pawls 68 and 70 between the operative engaged and disengaged positions thereof, it is necessary merely to pivot the member 64 in an appropriate direction about the axis of the shaft 66. This, in turn, is achieved by selective abutment of either the arm 60 or 62 with the member 64, depending upon the direction of rotation of the power shaft 48, all as will now be described in the summary of the operation of the mechanism 14 which follows.

However, before summarizing such operation, it should be noted that completing the construction of the mechanism 14 are support plates 74 and 76 which loosely accommodate the power shaft 48 therethrough and are located on opposite sides of the actuating member 58. Specifically, shaft 66 is projected through ends of the plates 74, 76 so as to permit the advantageous location of the pawls 68 and 70 in relation to the rachets 52, 54 and so that these pawls can be pivoted between clearance and engaging positions with respect to these rachets.

A typical interval of operation of the mechanism 14 can perhaps best be understood in reference to FIG. 4. Assume that power shaft 48 is powered in rotation in the direction 34 which, as previously noted, contemplates driving rotation of sprocket 44 while the other sprocket 46 is freewheeling, the door 10 at this time being urged through closing movement 18. Rotation 34 of the power shaft 48 is transmitted via the drive pin 56 to the actuating member 58 and, more particularly, results in arm 62 thereof being moved in the direction 34 into physical abutment against member 64. This results in corresponding movement 34 in the member 64 and thus rotation of shaft 66 in the direction 34, or in a clockwise direction as seen in the plan view of FIG. 4. Responsive to this rotational traverse of the shaft 66, pawl 68 is rotated into driving relation with the rachet 52 while the other pawl 70 is rotated into a clearance position with respect to its cooperating rachet 54. Consequently, continued rotation of the power shaft 48 in the direction 34, after the establishment of the driving connection between the pawl 68 and rachet 52, results in sprocket 44 being powered in rotation in the direction 34. Thus, drum 26 is powered in the direction 34 and results in the exertion of a pulling force by the cables 20 and 22 which unwinds door 10 from the shaft 16 and urges it through closing movement 18. Any disparity in the rotational traverses of the shaft 16 with respect to the drum 26 does not adversely effect the

operation of the opening and closing means **12** since, as already indicated, sprocket **46** is freewheeling with respect to the power shaft **48**.

Naturally, when the power shaft **48** is rotated in the reverse direction **40**, arm **60** is pivoted into contact with the member **64** and, in turn, causes a pivotal traverse therein which is transmitted via the shaft **66** to the pawls **68** and **70**. Specifically, as illustrated in FIG. **2**, this direction of rotation of shaft **66** has caused pawl **68** to move into its clearance position, as depicted in FIG. **2**, with respect to the rachet **52**, while the pawl **70** is caused to engage the rachet **54**. As a consequence, continued rotation of the power shaft **48** in the direction **40**, after the establishment of driving engagement of pawl **70** and rachet **54** results in rotation of the sprocket **46** in the direction **40**. This, in turn, causes wind-up operation of the door shaft **16** and thus opening movement **36** of the door **10**.

Illustrated in FIG. **5** is an acceptible manner of applying drag to each of the sprockets **46** and **44**, with sprocket **44** being used as the illustration in FIG. **5**. That is, it has been found in practice that it is desirable that the sprockets not be totally and completely freewheeling about the power shaft **48**, but that some drag or resistance to rotation be applied against these sprockets. Accordingly, a member having an appropriate friction surface **68** is pressed against sprocket **44** under an adjustable pressure, applied for example by a threadable member **70**. Member **70** may be appropriately supported in a support arm **72**. Naturally, other appropriate structures for applying drag to the sprockets may be utilized.

A latitude of modification, change and substitution is intended in the foregoing disclosure, and in some instances some features of the invention will be employed without a corresponding use of other features. Accordingly, it is appropriate that the appended claims be construed broadly and in a manner consistent with the spirit and scope of the invention herein.

What is claimed is:

1. The combination with a side-coiling door of an improved power-transmitting mechanism for urging said door through opening and closing movements, said mechanism comprising a power shaft adapted to be selectively powered in opposite directions of rotation respectively corresponding to said door opening and closing movements, a pair of spaced apart door-opening and door-closing sprockets disposed in freewheeling relation on said power shaft and each operatively connected to said door to respectively produce said opening and closing movements thereof, a driving rachet on each said door-opening and door-closing sprockets disposed in facing relation to each other, an actuating member fixedly connected to said power shaft in an interposed position between said facing driving rachets, and a pivotally mounted rachet-driving member having first and second operative ends operatively arranged to be pivoted by said actuating member in one direction so that said first end thereof is moved into driving relation with one said driving rachet and said second end is moved into a clearance position with respect to said other driving rachet, and when pivoted in a reverse direction said first end is disengaged from driving relation and said second end is moved from said clearance position into driving relation, whereby during an interval of operation only one said door-opening or door-closing sprocket is powered in rotation with said power shaft while the other is freewheeling thereon.

2. An improved power-transmitting mechanism as claimed in claim **1** wherein said actuating member is U-shaped and has bifulcated arms advantageously located on opposite sides of said rachet-driving member, one of said arms selectively engaging said rachet-driving member depending upon the direction of rotation of said power shaft.

3. An improved power-transmitting mechanism as claimed in claim **2** wherein said first and second operative ends of said rachet-driving member are formed as teeth-engaging pawls.

* * * * *