July 10, 1962 L. R. NELSON 3,043,520

PROPELLED SPRINKLING DEVICE

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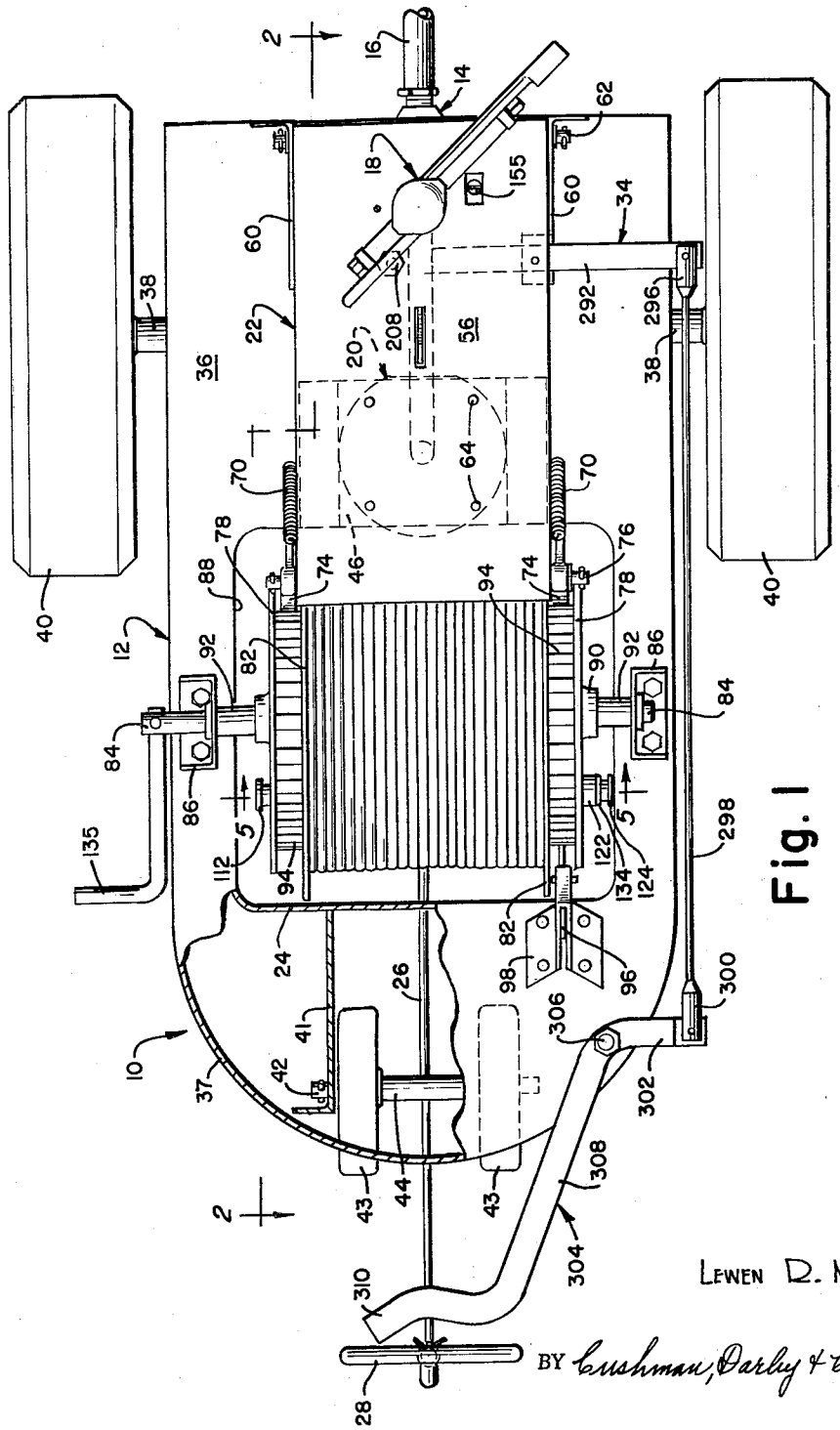


Fig. 1

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July 10, 1962 L. R. NELSON 3,043,520

PROPELLED SPRINKLING DEVICE

Filed July 21, 1960 5 Sheets-Sheet 2

Fig. 5

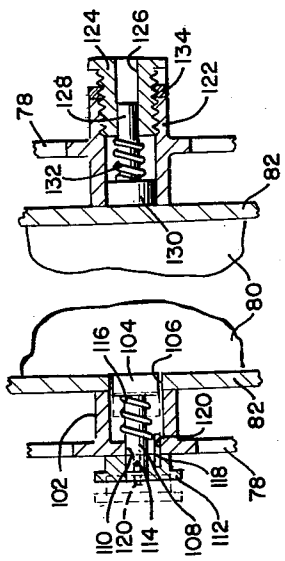


Fig. 2

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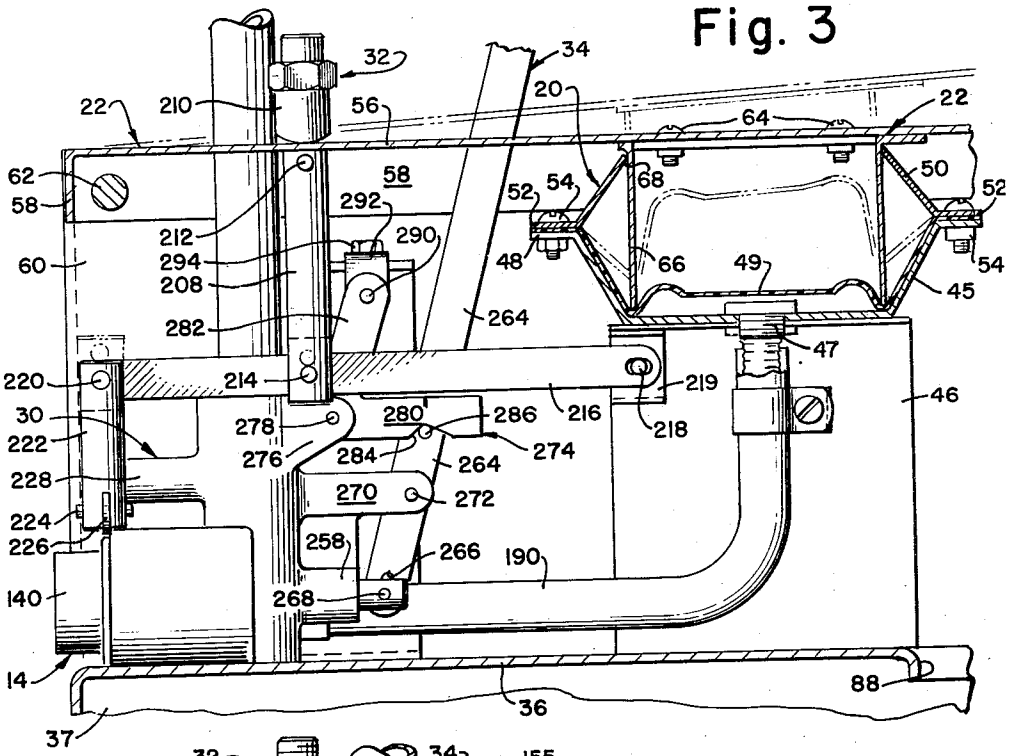
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July 10, 1962 L. R. NELSON 3,043,520

PROPELLED SPRINKLING DEVICE

Filed July 21, 1960 5 Sheets-Sheet 3

Fig. 3



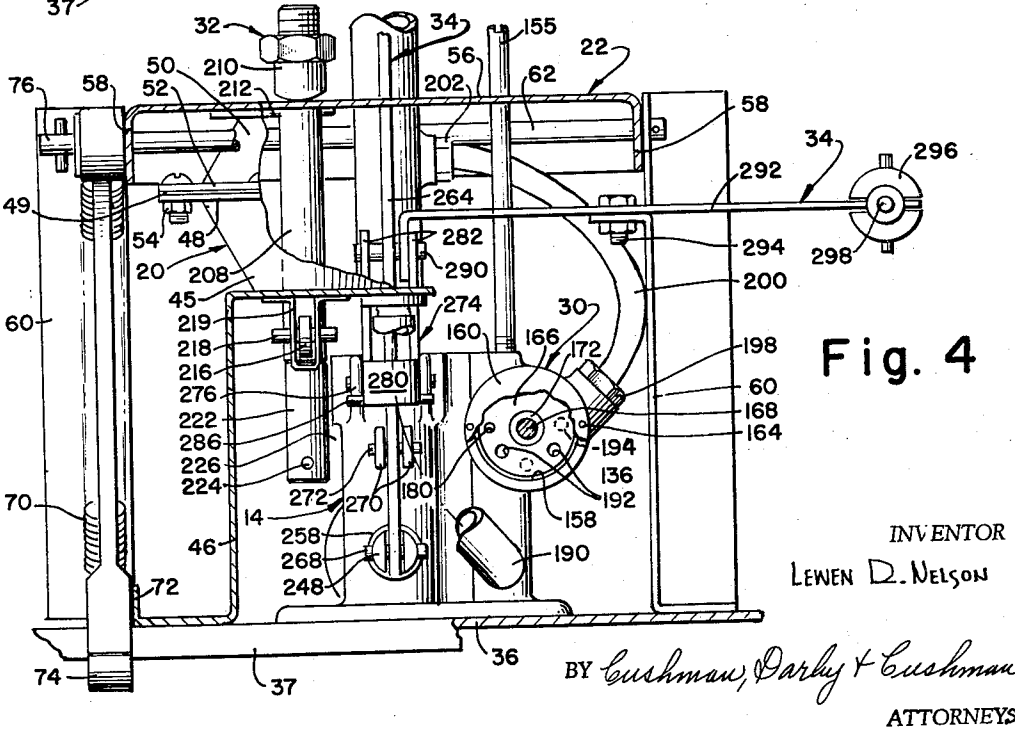


Fig. 4

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PROPELLED SPRINKLING DEVICE

Filed July 21, 1960 5 Sheets-Sheet 4

Fig. 6

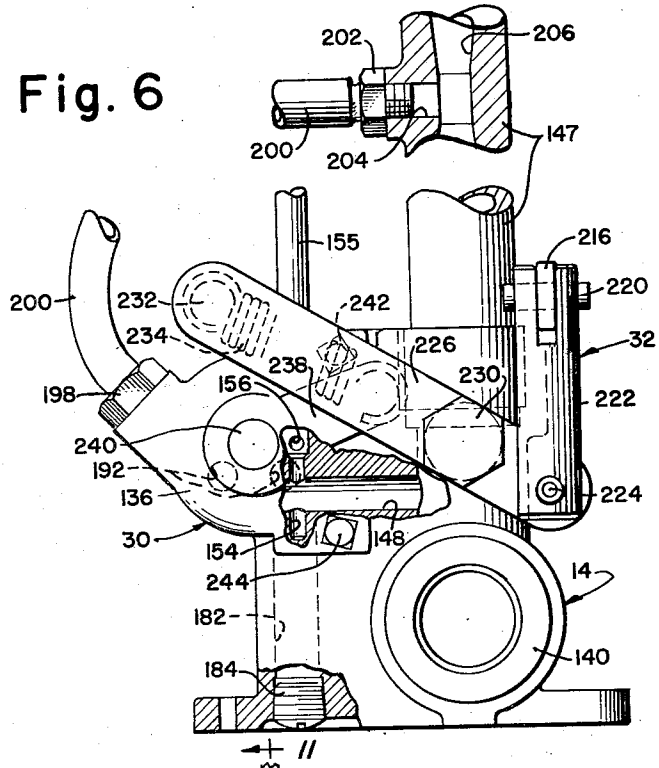


Fig. 8

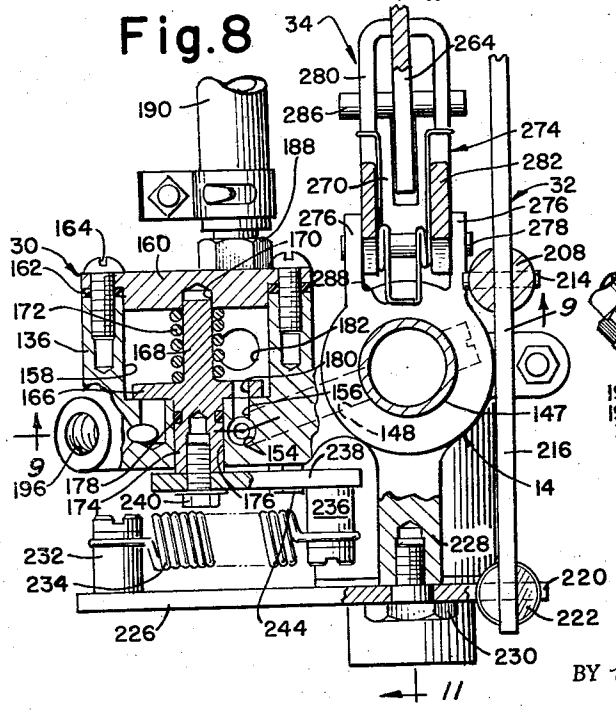
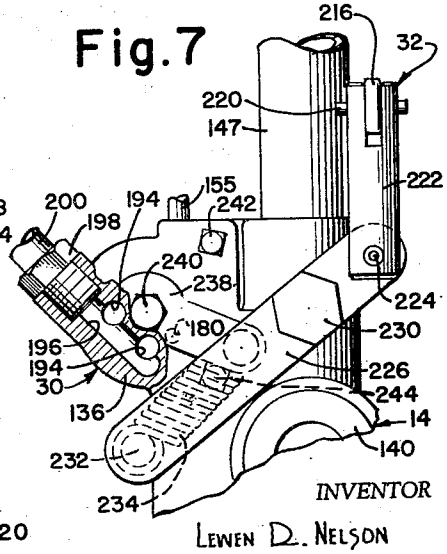


Fig. 7



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July 10, 1962 L. R. NELSON 3,043,520

PROPELLED SPRINKLING DEVICE

Filed July 21, 1960 5 Sheets-Sheet 5

Fig. 11

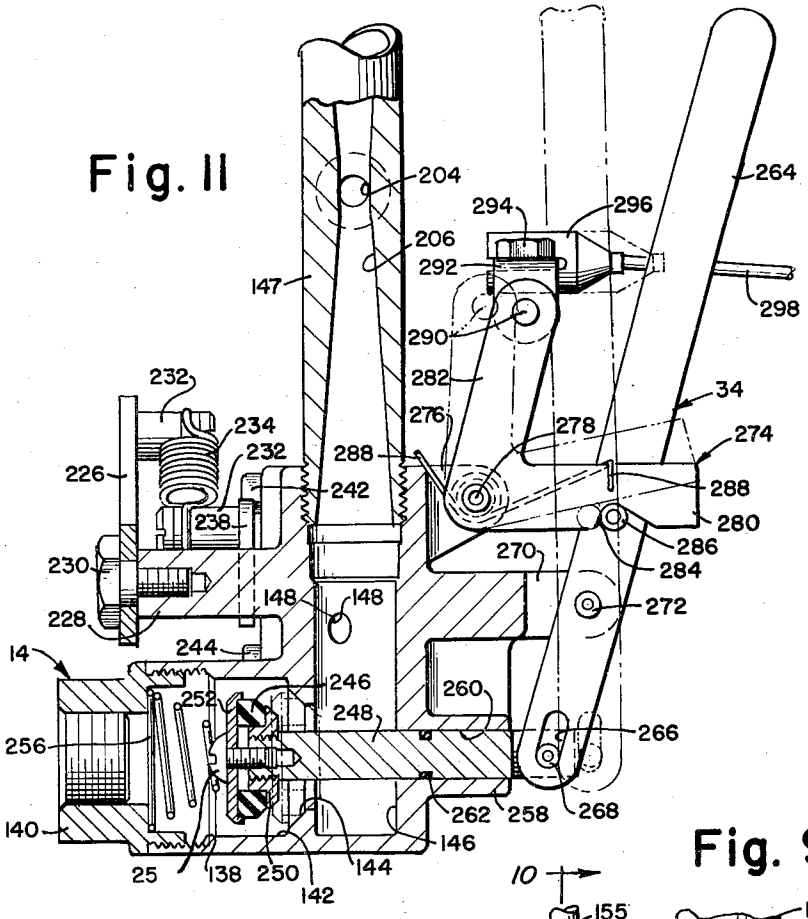


Fig. 10

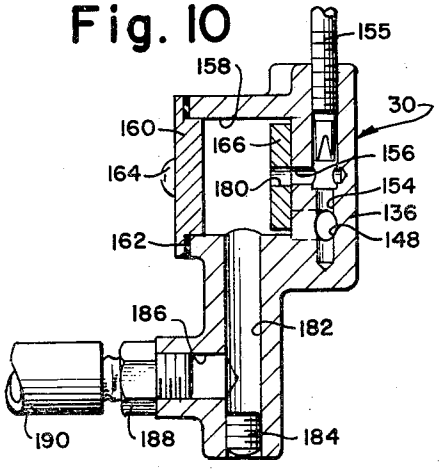
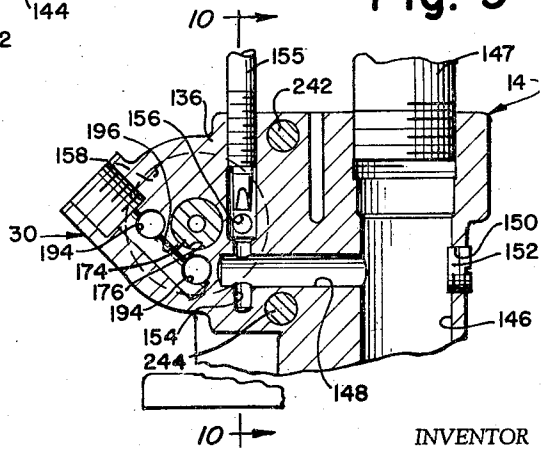


Fig. 9



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3,043,520

PROPELLED SPRINKLING DEVICE

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Filed July 21, 1960, Ser. No. 44,481
16 Claims. (Cl. 239—189)

This invention relates to sprinkling devices and more particularly to sprinkling devices of the type adapted to be propelled in response to the flow of water under pressure therethrough.

Traveling sprinkler devices are well-known and they usually embody a rotary sprinkler head which turns in response to the flow of water therethrough. Usually, the turning action of the sprinkling head is utilized to propel the device along the ground such as by a gear arrangement connected with the wheels of the device. This type of traveling sprinkler device has not proven entirely satisfactory in large installations such as athletic fields, golf courses and agricultural fields because the distribution of water of a continuously rotating sprinkler head is not as desirable as is the distribution pattern of other types of sprinkler heads such as step-by-step rotary sprinkler heads.

An object of the present invention is to provide a sprinkling device having a step-by-step rotary sprinkler head which is communicated with a source of water under pressure independent of the means operable in response to the flow of liquid under pressure for propelling the device.

Another object of the present invention is the provision of a traveling sprinkler device of the type described having improved water pressure responsive expansible and contractable means in the form of a diaphragm assembly operable to expand and contract in response to the flow of water through the device.

Still another object of the present invention is the provision of a traveling sprinkler device having a diaphragm assembly which is expandable and contractable in response to the flow of water under pressure through the device and improved means for discharging the water from the diaphragm assembly during the contraction of the latter.

Still another object of the present invention is the provision of a traveling sprinkler device of the type described having improved means for controlling the flow of water under pressure through the device including a stopping lever operable to shut off the flow when the device reaches the end of its travel.

Another object of the present invention is the provision of a traveling sprinkler device of the type described having a rotatable drum assembly operable during the flow of water under pressure through the device to wind up a cable thereabout having an end extending from the drum assembly and anchored to the ground to thereby effect movement of the device toward the anchored end of the cable.

A still further object of the present invention is the provision of a traveling sprinkler device of the type described having improved means for driving the drum assembly in response to the flow of water under pressure to the device and means for disconnecting the driving means to the drum assembly so that the cable can be payed out to begin operation in a controlled manner.

Still another object of the present invention is the provision of a traveling sprinkler device of the type described having a diaphragm assembly, valve mechanism for controlling the flow of water under pressure to the diaphragm assembly and permitting exhaust of water therefrom and improved means for actuating the valve mechanism in response to the expansion and contraction of the diaphragm assembly to continuously cycle the latter.

These and other objects of the present invention will become more apparent during the course of the following detailed description and appended claims.

The invention may best be understood with reference to the accompanying drawings wherein an illustrative embodiment is shown.

In the drawings:

FIGURE 1 is a top plan view of a sprinkling device embodying the principles of the present invention which certain parts broken away for purposes of clearer illustration;

FIGURE 2 is a cross-sectional view, with parts broken away, taken along the line **2—2** of FIGURE 1;

FIGURE 3 is an enlarged fragmentary view similar to FIGURE 2 showing the rear portion of the device;

FIGURE 4 is a fragmentary front end view, partly broken away, of the structure shown in FIGURE 3;

FIGURE 5 is an enlarged fragmentary cross-sectional view taken along the line **5—5** of FIGURE 1;

FIGURE 6 is an enlarged rear end view, partly broken away, of the flow housing of the present device, the valve mechanism being shown in one limiting position permitting water under pressure to enter the diaphragm assembly;

FIGURE 7 is a view similar to FIGURE 6 on a reduced scale showing the valve mechanism in another limiting position permitting exhaust of water from the diaphragm assembly;

FIGURE 8 is a top plan view, with parts broken away, of the structure shown in FIGURE 6;

FIGURE 9 is a fragmentary cross-sectional view taken along line **9—9** of FIGURE 8;

FIGURE 10 is a fragmentary cross-sectional view taken along the line **10—10** of FIGURE 9; and

FIGURE 11 is a cross-sectional view taken along the line **11—11** of FIGURE 8, the flow control mechanism being shown in full lines in a position permitting flow and in phantom lines in a position shutting off flow.

General Construction and Operation

Referring now more particularly to the drawings, there is shown in FIGURES 1 and 2 thereof a sprinkling device, generally indicated at **10**, which embodies the principles of the present invention. The sprinkling device comprises a wheeled frame, generally indicated at **12**, having a flow housing, generally indicated at **14**, mounted on the rear end thereof, the housing being adapted to be connected with a hose or the like, indicated at **16**, having a source of water under pressure communicating therewith. The flow housing **14** is arranged to convey the water from the hose **16** to an upwardly extending sprinkler head, generally indicated at **18**.

An expansible and contractable diaphragm assembly **20** is fixedly mounted on the frame **12** in a position forward of the housing **14** and has a motion transmitting mechanism, generally indicated at **22**, connected therewith for rotating a drum assembly, generally indicated at **24**, in response to the expansion and contraction of the diaphragm assembly. The drum assembly **24** is mounted on the frame **12** at a position forwardly of the diaphragm assembly **20** for rotation about a horizontal axis in response to the expansion and contraction of the diaphragm assembly through the operation of the motion transmitting mechanism **22** and is operable to propel the sprinkling device by winding up a cable **26** thereon having its free end anchored to the ground to be sprinkled, by any suitable means, such as an anchoring stake or rod **28**, as shown in FIGURE 1.

In order to effect expansion and contraction of the diaphragm assembly, there is provided in the flow housing **14** a valve mechanism, generally indicated at **30**, which is operable in one limiting position to permit a portion of the water within the housing passing to the sprinkler head **18**, to flow into the diaphragm assembly **20** to expand the latter. In another limiting position, the valve mechanism **30** is operable to permit water to

exhaust from the diaphragm assembly **20** to permit the latter to contract.

The valve mechanism **30** is moved between its limiting positions in response to the expansion and contraction of the diaphragm assembly **20** by a valve actuating mechanism, generally indicated at **32**. The valve actuating mechanism **32** is preferably connected with the motion transmitting mechanism **22** and is arranged to move the valve mechanism **30** into its exhausting position when the diaphragm assembly **20** has expanded a predetermined amount and to move the valve mechanism **30** into its flow position when the diaphragm assembly has contracted a predetermined amount. In this way, the diaphragm assembly is continuously expanded and contracted through the operation of the valve mechanism **30** and valve actuating mechanism **32** so long as the housing **14** is connected to a source of water under pressure, as by the hose **16**. This continuous expansion and contraction of the diaphragm assembly **20** during the flow of water into the housing **14** and thence from the sprinkler head **18**, as stated above, effects a rotation of the drum assembly **24** whereby the entire sprinkling device is propelled in a direction toward the anchoring stake **28** through the cable **26** attached thereto.

The sprinkling device of the present invention also has embodied therein a flow control mechanism, generally indicated at **34**, which is operable to commence the flow of water through the housing **14** to the sprinkler head **18** and diaphragm assembly **20** and to automatically shut off the flow of water under pressure when the device has been propelled to a point adjacent the anchoring stake **28**.

Details of Construction

The frame **12** includes a generally horizontal extending main frame plate **36** which is of generally rectangular configuration in plan having its forward end rounded off, the plate **36** having a flange **37** extending downwardly from the outer edges thereof throughout its periphery.

Fixedly mounted beneath the rearward portion of the frame plate **36**, as by welding or the like, is a transversely extending horizontal tubular member **38**, having its ends interiorly threaded to fixedly receive a pair of stub shafts **39**. Journalled on the stub shafts **39** is a pair of rear ground engaging wheels **40** disposed on opposite sides of the frame plate **36**.

A pair of transversely spaced brackets **41** is rigidly secured, as by welding or the like, to the underside of the frame plate **36** and extends downwardly therefrom. The lower ends of the brackets **41** carry a transversely extending horizontal shaft **42** which has rotatably mounted thereon a pair of forward ground engaging wheels **43**. The forward wheels **43** are mounted in transversely spaced relation by means of a spacer collar **44** mounted in surrounding relation to the shaft **42** and having its ends in engagement with the wheels.

Referring now more particularly to FIGURES 2 and 3, the diaphragm assembly **20** preferably comprises an upwardly facing lower dish-shaped housing member **45** which is fixedly mounted on the frame plate **36** adjacent the central rearward portion thereof by means of an inverted U-shaped bracket or plate **46**. The U-shaped bracket has the ends of its legs welded or otherwise suitably fixed to the upper surface of the frame plate **36** and its bight portion fixed to the central portion of the diaphragm housing member **45**, by means of a bolted flow coupling or fitting **47**.

The lower diaphragm housing member **45** includes an outwardly extending peripheral flange **48** which has mounted in abutting relation therewith the outer marginal edge portion of a diaphragm **49**. Any suitable means is provided for securing the marginal edge portion of the diaphragm to the flange **48**, and, as shown, such means comprises an upper frusto-conical diaphragm housing member **50** having a lower outwardly extending peripheral flange **52** disposed in overlying relation to the flange **48** and sealingly engaging the marginal edge of the diaphragm **49** therebetween as by a series of circumferentially spaced bolt assemblies **54**.

The motion transmitting mechanism **22** comprises a lever or pivoted member **56** which is preferably in the form of a rectangular plate having a flange **58** extending downwardly from the edges thereof throughout its periphery. The rearward end of the member **56** is pivotally mounted on the frame plate **36** adjacent the rearward end thereof by any suitable means, such as a pair of transversely spaced upstanding brackets **60** suitably fixed at their lower ends to the frame plate **36** and apertured at their upper ends to receive a horizontal transversely extending shaft **62** which also extends through the adjacent portion of the flanges of the member **56**.

Fixedly secured to the underside of the member **56** in a position adjacent the diaphragm assembly **20**, as by bolts **64**, is a tubular member **66** which loosely extends through an opening **68** formed in the upper diaphragm housing member **50** and into engagement with diaphragm **49** as shown in FIGURE 3. It can be seen that the member **56** will be pivoted from the full line position shown in FIGURE 3 to the broken line position shown therein in response to the expansion of the diaphragm **49**. In order to provide a force for effecting the contraction of the diaphragm **49**, there is provided a pair of helical tension springs **70** connnected at their upper ends to the side flanges **58** of the member **56** adjacent their forward ends and at their lower ends to appropriate flanges **72** formed on the legs of the bracket **46**. The motion transmitting mechanism **22** also includes a pair of hook shaped pawl members **74** pivoted to the forward end of the member **56**, as by a horizontal transversely extending shaft **76**, which cooperate with ratchet wheels **78** formed on the drum assembly **24**.

As best shown in FIGURES 1, 2 and 5, the drum assembly **24** includes a cylindrical drum member **80** having circular end disks **82** fixed to opposite ends thereof. The end disks **82** are centrally apertured to fixedly receive a shaft **84** having its ends journalled in bearings or brackets **86** fixed to the upper surface of the frame plate **36** on opposite sides of a central rectangular shaped drum receiving opening **88** formed in the frame plate **36**. The ratchet wheels **78** are disposed adjacent the outer sides of the end disks **82** and include hub portions **90** journalled on the shaft **84** and retained in proper position between the bearings or brackets **86** by spacer collars **92**. Each ratchet wheel **78** includes an annular portion disposed inwardly of the outer periphery thereof providing a series of circumferentially-spaced ratchet teeth **94** for engagement by the hook-shaped end of the paw members **74**. An additional stop pawl element **96** is arranged to engage the teeth **94** of each ratchet wheel **78** to prevent rotation of the latter in a counter-clockwise direction as viewed in FIGURE 2. As shown, each stop pawl element **96** is pivoted on the frame by means of an inverted U-shaped flanged bracket **98**. It will be noted that each stop pawl element **96** includes a counter-weight portion **100** which serves to gravitationally bias the tooth-engaging end of the pawl element **96** into engagement with the associated teeth **94**.

The ratchet wheels **78** are arranged to be selectively disconnected from the end disks **82** so as to permit the drum to rotate freely of the ratchet wheels or connected therewith so as to rotate the drum in response to their rotational movement. To this end, one of the ratchet wheels **78** is provided with an inwardly extending socket portion **102** as shown in FIGURE 5. Slidably mounted within the socket portion is a locking element **104** arranged to engage within an opening **106** formed in the adjacent end disk **82**. The locking element **104** has a stem **108** extending outwardly therefrom through an aperture **110** formed in the surface of the ratchet wheel **78**. A flanged knob **112** is fixed to the outer end of the stem **108**, as by

a pin **114**, the flanged knob providing a means for shifting the locking element transversely within the socket portion **102** into and out of the end disk opening **106**. The locking element **104** is maintained within the opening **106** by means of a coil spring **116** which is disposed in surrounding relation to the stem **108** and has its ends in engagement with the portion of the ratchet wheel surrounding the opening **110** and the inner surface of the locking element **104**.

In order to maintain the locking element **104** in a position out of engagement with the opening **106** against the action of the spring **116**, a pin **118** is fixed to the flanged knob **112** in a position spaced from the axis thereof and extends through a registering opening **120** formed in the adjacent wall of the ratchet wheel. It can thus be seen that when the flanged knob is moved to the left as viewed in FIGURE 5, from the full line position to the dotted line position as shown, and then partially rotated, the free end of the pin **118** will engage the outer surface of the ratchet wheel **78** and thus maintain the locking element **104** out of engagement with the opening **106**.

The opposite ratchet wheel **78** has a tubular portion **122** formed therein, the outer end of which is interiorly threaded to receive a plug member **124**. Plug member **124** has a central opening **126** formed therein for receiving the outer end of a stem **128** having a drum disk engaging member **130** formed on the inner end thereof. The member **130** is resiliently biased into engagement with the adjacent surface of the associated end disk **82** by means of a coil spring **132** surrounding the stem **128** and having its ends engaged between the members **124** and **130**. It will be seen that by turning the plug member **124** within the tubular portion **22** the tension applied by the spring **132** to the disk engaging member **130** can be varied. In order to lock the plug member in any desired position of adjustment, a nut **134** is threaded on the stem member for engagement with the end of the tubular portion **122**.

As shown in FIGURE 1, a crank handle **135** is detachably connected to one end of the drum assembly shaft **84**, which may be used to wind up the cable thereon where necessary or to unwind the cable when the locking element **104** is out of engagement with the opening **106**.

The valve mechanism **30** for effecting expansion and permitting contraction of the diaphragm assembly **20** includes a valve body **136** which, as shown, forms an integral part of the housing **14**. As best shown in FIGURES 6–11, the housing **14** includes an inlet socket portion **138** having an inlet coupling member **140** threadedly engaged therein, such coupling being adapted to receive the end of the hose **16**. A horizontally extending inlet passage **142** communicates at its rearward end with the inlet socket portion **138** and has formed in the forward end thereof an annular valve seat **144** which leads to and communicates with the lower end of a main vertical passage **146**, as can best be seen in FIGURE 11.

The upper end of the main vertical passage **146** is interiorly threaded to fixedly receive in communication therewith the lower end of a vertically extending tubular flow member **147**, the upper end of which extends through a suitable opening in the member **56** and has the sprinkler **18** mounted thereon. It will be understood that the sprinkler **18** may be of any suitable construction, and, as shown, a step-by-step rotary sprinkler of the type disclosed in Englehard Patent 1,997,101 is used.

It will be noted that because the present device is propelled by the diaphragm assembly **20**, motion transmitting mechanism **22**, and drum assembly **24**, independent of the action of the sprinkler **18**, it is therefore possible to utilize step-by-step rotary sprinklers as well as sprinklers of the full rotary type which have heretofore been required in order to provide the motive power to propel known traveling sprinkling devices.

As best shown in FIGURE 9, the valve body **136** has formed therein a horizontal passage **148** which extends angularly into communication with the central portion of the vertical passage **146**. As shown in FIGURE 9, the passage **148** is preferably formed by a drilling operation, and, to this end, the exterior wall of the housing **14** is also bored, as indicated at **150**, simultaneously with the formation of the passage **148**. The opening **150** is closed by any suitable means, such as a plug member **152**. The inner extremity of the passage **148** within the valve body **136** communicates with the lower end of a vertical passage **154**, the upper end of which is interiorly threaded to receive the lower end of an elongated flow regulating stem **155**, the upper end of which extends through a suitable opening formed in the member **56**.

An inlet opening or passage **156** communicates with passage **154** intermediate the ends thereof and extends horizontally into communication with a cylindrical valve chamber or cavity **158**, as is best shown in FIGURES 8 and 10. The valve chamber or cavity **158** of the body **136** is open at the end thereof opposite from the passage **156** and is closed by an end closure disk **160** secured to the body in fluid tight engagement, as by annular sealing ring **162** and bolts **164**.

Mounted for limited rotary movement within the valve chamber **158** is a disk valve member **166** having one surface thereof disposed in engagement with the inner end surface of the valve chamber. Extending from the opposite surface of the valve disk **166** is a stem **168**, the outer extremity of which is journalled within an opening **170** formed in the central portion of the end closure member **160**, as shown in FIGURE 8. Preferably, a coil spring **172** is disposed in surrounding relation to the stem **168** and has its ends in engagement with the closure member **160** and adjacent disk surface so as to resiliently urge the opposite face of the disk into engagement with the end surface of the valve chamber.

The surface of the valve disk **166** in engagement with the end surface of the valve chamber has a tubular portion **174** extending therefrom which is journalled within a registering opening **176** formed in the valve body. Preferably, suitable sealing means is provided between the exterior surface of the tubular portion **174** and the opening **176** as, for example, an O-ring seal **178**.

The valve disk member **166** is adapted to be moved between two limiting positions and in one limiting position, as shown in FIGURES 6, 8 and 10, is adapted to permit flow of water under pressure from the housing **14** through the passages **148**, **154** and **156** into the valve chamber **158**. To this end, the disk valve member **166** has an aperture **180** formed therein which registers with the passage **156** when the disk valve member is disposed in the flow position.

Water under pressure entering the valve chamber **158** is directed to the diaphragm assembly **20** through a vertically extending passage **182** formed in the valve body **136**, having its upper end in communication with the valve chamber **158** and its lower end closed, as by a plug **184**. Communicating with the vertical passage **182** above the plug **184** is a lateral branch outlet **186** having a hose fitting **188** connected therewith. One end of a hose **190** is connected with the fitting **188** and the opposite end of the hose is connected with the fitting **47** previously described in connection with the description of the diaphragm assembly **20**. It can thus be seen that when the disk valve member is in the position shown in FIGURES 6, 8 and 10 wherein the aperture **180** registers with the passage **156**, water under pressure within the housing **14** will flow into the diaphragm assembly to expand the latter.

In its opposite limiting position, as shown in FIGURE 7, the valve disk member **166** is operable to interrupt the flow of water under pressure from the housing to the valve chamber **158** and to permit the water in the valve chamber to exhaust therefrom so that the water

within the diaphragm assembly in communication with the valve chamber can flow outwardly therefrom to permit the diaphragm assembly to contract under the action of springs 70. To this end, the disk valve member is provided with a pair of outlet apertures 192 which are disposed in circumferentially spaced relation with respect to each other and the aperture 180. The apertures 192 are adapted to register with a pair of correspondingly spaced openings or passages 194 formed in the valve body 136 when the disk valve member is disposed in its exhaust position. The passages 194 communicate with an upwardly and outwardly extending outlet passage 196 having its outer extremity enlarged and threaded to receive a hose fitting 198. A hose 200 has one end mounted on the fitting 198 and its opposite end connected with a fitting 202 engaged within a lateral passage 204 formed in the flow member 147. As best shown in FIGURES 6 and 11, the flow member 147 has an interior passage 206 of venturi construction, the lateral passage 204 communicating with the venturi passage at its throat so that the flow of liquid under pressure through the member 147 has the tendency to induce a flow through the hose 200 from the valve chamber 158.

It will be understood that the spacing of the outlet apertures 192 and inlet aperture 180 in the valve disk member 166 and the spacing of the outlet openings 194 and inlet opening 156 in the valve body 136 are so related that when the aperture 180 in the valve disk member registers with the opening 156, openings 194 and apertures 192 will be out of registry, thus preventing flow from the valve chamber 158 to outlet passage 196 while permitting flow from the passage 156 into the chamber. Conversely, when the apertures 192 are disposed in registry with the openings 194, inlet aperture 180 will be disposed out of registry with inlet passage 156, thus preventing flow of water under pressure into the valve chamber 158 and permitting flow outwardly therefrom to the outlet passage 196. As best shown in FIGURE 4, the apertures 192 are spaced an arcuate distance of 90° from each other and the aperture 192 adjacent the aperture 180 is spaced from the latter an arcuate distance of 45°. The openings 194 are likewise spaced apart an arcuate distance of 90°, while the opening 194 adjacent the opening 156 is spaced from the latter an arcuate distance of 90°. With this arrangement the disk valve member 166 moves an arcuate distance of 45° between its limiting positions.

The valve actuating mechanism 32 for moving the valve mechanism 30 into its limiting positions in response to the expansion and contraction of the diaphragm assembly 20 includes a vertical rod member 208, the upper end of which extends through a suitable aperture in the member 56 and has an adjustable element 210 secured thereto, the element 210 providing a downwardly facing arcuate surface for engaging the upper surface of the plate member 56. The lower surface of the plate member is engaged by a pin 212 which is selectively mounted within one of a plurality of vertically spaced apertures in the rod member 208. The lower end of the rod member 208 is pivotally connected, as at 214, intermediate the ends of a lever 216. The forward end of the lever is slidably pivoted as indicated at 218, to a pivot pin carrying depending bracket 219 fixed to the under side of the inverted U-shaped bracket 42 and the rearward end thereof is pivoted, as at 220, to the upper end of a vertically extending connecting link 222, as is best shown in FIGURES 2, 3 and 4.

Referring now more particularly to FIGURES 6, 7 and 8, the lower end of the link 222 is pivoted, as at 224, to the outer end of one arm of a straight lever 226. The lever 226 is pivoted intermediate its ends to a boss portion 228 formed in the housing 14, as by a pivot bolt 230. The outer end of the opposite arm of the lever 226 has a stud 232 extending therefrom to which one end of a helical tension spring 234 is connected. The opposite end of the spring 234 is connected with a stud 236 fixed to the outer end of an arm 238 having its inner end fixed to the tubular portion 174 of the disk valve member 166, as by a bolt 240.

As clearly indicated in FIGURES 6 and 7, the pivotal axis of the arm 238 is disposed in the same horiozntal plane as the pivotal axis of the lever 226, the arm 238 being secured to the disk valve member 166 by the bolt 240 in a position so that when the latter is disposed in its limiting positions, the arm will extend at an angle of 22½° on opposite sides of the above-mentioned common horizontal plane. Upper and lower bolts 242 and 244 are threadedly engaged within the valve body 136 so that their heads are disposed in spaced positions to engage the arm 238 and prevent movement of the latter beyond the above-mentioned limiting positions.

The flow control mechanism 34 for commencing the flow of water under pressure from the hose through the housing 14 and for shutting off the flow when the device has reached the end of its travel includes an annular valve member 246 carried by the rearward end of a valve stem 248, as shown in FIGURE 11. Preferably, the valve member 246 is mounted on the valve stem by suitable means providing for its removal so that it may be readily replaced when worn. As shown, such means includes a flanged valve receiving member 250 threadedly engaged on the rearward end of the stem 248 and a disk element 252 engaging the rearward surface of the valve member 246 and removably secured to the end of the valve stem, as by a bolt 254. The valve member 246 is resiliently urged into engagement with the valve seat 144, previously described, by any suitable means, such as a spiral compression spring 256 having one end in engagement with the disk element 252 and its opposite end in engagement with the inlet coupling member 140.

The forward end of the valve stem 248 extends outwardly of the housing 14 through a boss portion 258 formed integrally in the housing 14 with an opening 260 therein receiving the valve stem. Any suitable means may be provided for effecting a fluid-tight seal between the stem and the opening 260, as, for example, an O-ring seal 262 mounted in an appropriate peripheral groove in the stem and extending outwardly thereof into engagement with the periphery of the opening 260.

The outer extremity of the valve stem 248 is bifurcated to receive the lower end of a starting lever 264, the latter having a longitudinally elongated slot 266 formed therein which receives a pin 268 mounted in the bifurcated end of the valve stem. The starting lever 264 is pivotally mounted intermediate its ends on the housing 14, as by a pair of spaced lugs 270 formed thereon, carrying a pivot pin 272 which extends through the starting lever. The upper end of the starting lever extends upwardly through a suitable opening formed in the plate member 56.

It will be seen that when the starting lever is disposed in the phantom line position shown in FIGURE 11, the valve member 246 will be in engagement with the valve seat 144 under the action of spring 256 as well as the pressure of the water in the inlet opening 142 acting on the resultant rearwardly facing surface of the disk element 252. The valve member 246 is moved into its open position as shown in solid lines in FIGURE 11 by forward movement of the upper end of the starting lever 264. The valve is maintained in its open position against the action of spring 256 by means of a bell crank lever, generally indicated at 274, which constitutes a latch mechanism. The bell crank lever 274 is preferably made of two spaced intermediate pieces and is pivotally mounted on the housing 14, as by a pair of spaced lugs 276 formed integrally with the housing and having a pivot pin 278 extending therebetween and through the bell crank lever 274.

The bell crank lever 274 includes a first generally

horizontally disposed arm 280 and a second generally vertically disposed arm 282, the arm 280 having a notch 284 formed in the lower end thereof for receiving a pin 286 mounted on the starting lever 264 in a position spaced above the pivot pin 272. It will be seen that the rear wall defining the notch will engage the pin when disposed therein and maintain the upper end of the starting lever in its forward solid line position, as shown in FIGURE 11. Movement of the pin 286 out of notch 284 is yieldingly resisted by means of a U-shaped spring 288 having a pair of coil portions surrounding the pivot pin 278, a bight portion engaging the housing between the lugs 278, and legs with the free ends thereof bent over the upper surfaces of spaced pieces of the arm 280.

The bell crank lever or latch mechanism 274 is operable to maintain the valve member 246 in its open position when the starting lever 264 is moved from the phantom line position shown in FIGURE 11 to the full line position shown therein and is operable to be tripped at the end of the travel of the sprinkling device so as to permit the starting lever to move from the solid line position shown in FIGURE 11 to the phantom line position to thus shut off the flow of water under pressure past the valve seat 144 by the valve member 246. To this end, the upper end of the arm 282 of the bell crank lever 274 is pivotally connected, as at 290, to the downturned end of a horizontally extending lever 292 pivotally mounted intermediate its ends to an inturned portion of the bracket 60, as by a vertical pivot bolt 294. The outwardly extending end of the lever 292 has a cable fitting 296 pivotally connected therewith to which the rear end of a cable 298 is attached. The forward end of the cable 298 has a fitting 300 connected therewith which, in turn, is pivotally connected with the upturned outer end of an arm 302 forming a part of a stopping bell crank lever, generally indicated at 304. The arm 302 extends laterally inwardly and the bell crank lever 304 is pivotally mounted on the forward end of the frame plate 36 adjacent the inner end of the arm 302 as by a vertically extending pivot pin 306. The stopping lever 304 also includes a forwardly extending horizontal arm 308, the outer end of which is bent to extend transversely, as indicated at 310, so as to be in a position to engage the anchor stake 28.

Details of Operation

The present device is particularly applicable in sprinkling relatively large areas such as athletic fields, golf courses and agricultural fields. In preparing the present device for operation in such areas, the cable anchoring stake 28 is sunk into the ground at an appropriate position defining one limit of the area to be sprinkled. The sprinkling device 10 is initially disposed at the opposite end of the area to be sprinkled, the length of such area being determined by the length of the cable 26. Of course, the cable must be unwound from the drum assembly 22 between the starting position of the device and the anchoring stake with the free end of the cable secured to the anchoring stake. This condition can either be achieved by first anchoring the cable end to the stake 28 with the device adjacent the stake and then moving the device to its starting position so as to pay out the cable during its movement, or the device can be initially disposed at its starting position with the cable wound up on the drum assembly and then the free end of the cable is moved to the stake to pay out the cable from the drum assembly. In either event, when the cable is being unwound from the drum assembly, the flanged knob 112 is moved to the dotted line position shown in FIGURE 5 to disengage the locking element 104 from the drum disk aperture 106, thus permitting relative rotation between the drum 80 and the ratchet wheels 78. It will be noted that because of the resiliently biased frictional engagement of the element 130 with the opposite end disk 82, the drum 80 is rotatable independently of the ratchet wheels 78 in a controlled manner which prevents the occurrence of backlash, as would be the case if the drum were freely rotatable.

After the device is disposed in its starting position with the cable extending therefrom and attached to the anchoring stake, the flanged knob 112 is then moved from the dotted line position shown in FIGURE 5 to the solid line position shown therein to engage the locking element 104 within the end disk aperture 106, thus insuring that the drum will be positively rotated in response to the rotation of the ratchet wheels.

It will be understood that during the positioning of the device preparatory to starting the sprinkling run, the supply of water under pressure to the sprinkling head 18 must be cut off. This can be done either by shutting off the source of water under pressure to the hose 16 or positioning the flow control valve member 246 in engagement with the valve seat 144 by disposing the starting lever in the phantom line unlatched position shown in FIGURE 11. Where the source of water under pressure is controlled prior to entry into the hose 16, starting lever 264 must initially be moved into the solid line latched position shown in FIGURE 11 to open the inlet valve seat 144. In this condition, the operation of the device is commenced by communicating the source of water under pressure with the hose 16. It will also be understood that where the hose is initially communicated with the source of water under pressure, and the control lever is in the phantom line unlatched position shown in FIGURE 11, the operation can be commenced by simply moving the starting lever 264 into its full line latched position. In either event, it will be noted that upon commencement of operation the engagement of the pin 288 within the notch 284 of the spring biased bell crank lever 274 serves to maintain the starting lever 264 in its full line latched position shown in FIGURE 11 wherein the valve member 246 is disposed in open relation with respect to the valve seat 144. With the valve 246 in an open position, water under pressure from the hose 16 flows through the inlet opening 142, past the valve seat 144 and then into the main vertical passage 146 of the housing 14.

The main flow of water in the passage 146 flows upwardly through the member 147 and then is distributed to the area to be watered by the sprinkling head 18. The water under pressure within the passage 146 is also free to flow into the passage 148 in communication therewith. Prior to the commencement of operation, the springs 70 will urge the diaphragm assembly into its fully contracted position and in a like manner the member 56 of the motion transmitting mechanism 22 will be disposed in its lowermost position, as shown in FIGURE 2 and in solid lines in FIGURE 3. With the diaphragm assembly 20 and the motion transmitting mechanism 22 in this position, the valve actuating mechanism 32 will be disposed in the position shown in FIGURE 6 thus maintaining the valve mechanism 30 in its flow position wherein the inlet aperture 180 of the disk valve member 166 is disposed in alignment with the inlet passage 156 and the outlet apertures 192 are closed. Thus, a portion of the water under pressure within the main vertical passage 146 will flow through the horizontal passage 148, vertical passage 154, inlet passage 156, valve aperture 180 and into the valve chamber 158. From the valve chamber the water under pressure flows through the vertical passage 182, branch passage 186, and hose 190 to the chamber of the diaphragm assembly 20, thus causing the diaphragm 49 to expand.

During the expansion of the diaphragm, the motion transmitting mechanism 22 is operable to impart a rotary movement to the drum assembly 24 through the engagement of the hook-shaped pawl elements 74 with the teeth 94 of the ratchet wheels. As shown in FIGURE 2, the rotation of the drum assembly is in a clockwise direction to wind the cable 26 around the drum 80 and thus effect a movement of the entire device 10 toward

the anchoring stake 28. It will be noted that the stop pawl elements 96 serve to engage the successive teeth 94 of the ratchet wheels so as to prevent opposite rotation of the drum assembly when the expansion stroke of the diaphragm assembly is completed.

It will also be noted that during the expansion of the diaphragm assembly 20, lever 226 will be moved from the position shown in FIGURE 6 into the position shown in FIGURE 7 through the operation of rod 208, lever 216, and link 222. During the latter part of this movement, the action of the spring 234, which in the position shown in FIGURE 6, biases the arm 238 in a counterclockwise direction as viewed in FIGURES 6 and 7 against the upper bolts 242 to maintain the valve mechanism in its flow position, will change when the axis of the stud 232 on the lever 226 moves beneath a plane passing through the axis of rotation of the disk valve member 166 and the axis of the stud 236 so as to resiliently urge the lever arm in a clockwise direction as viewed in FIGURES 6 and 7. In this way, the valve actuating mechanism 32 serves to move the valve mechanism from the flow position shown in FIGURE 6 to the exhaust position shown in FIGURE 7 in response to the expansion of the diaphragm assembly 20 to its fully expanded condition or the movement of the motion transmitting mechanism 22 into its uppermost position. Thus, it can be seen that there will be a snap action movement of the valve mechanism 30 in response to the expansion of the diaphragm assembly into its fully expanded condition which has the effect of disposing the valve mechanism in its exhaust position wherein valve aperture 180 is closed and valve apertures 192 register with exhaust openings 194. In this position of the valve mechanism, contraction of the diaphragm assembly can take place under the action of springs 70 by flow of water from the diaphragm chamber back to the valve chamber 158, and from the valve chamber outwardly through the valve apertures 192. During the contraction of the diaphragm assembly, the lever arm 226 will be moved from the position shown in FIGURE 7 to the position shown in FIGURE 6 and again the valve mechanism will be moved into its flow position by a snap action toward the end of this movement, that is when the diaphragm assembly has contracted to a fully contracted condition and the lever member 56 is disposed in its lowermost position. Since the movement of the valve mechanism at the end of the contraction stroke of the diaphragm assembly is into the flow position shown in FIGURE 6, expansion of the diaphragm begins again and the cycle is continuously repeated.

During the compression stroke of the diaphragm assembly 20, the motion transmitting mechanism 22 is operable to move the hook-shaped pawl members so that they will ride over the teeth 94 of the ratchet wheels 78 by a gravitational action. During this movement of the pawl members 74, the stop pawl elements 96 will maintain the drum assembly 24 against rotation by their engagement with the teeth 94 of the ratchet wheels 78. At the end of the contraction stroke of the diaphragm assembly 20, the hook-shaped pawl member 74 will then be in a position to engage the teeth 94 for the next expansion stroke. It can thus be seen that during the contraction stroke of the diaphragm assembly 20, the device 10 will not be propelled toward the anchoring stake 28, such movement occurring only during the expansion stroke of the diaphragm assembly.

From the above it can be seen that so long as water under pressure is communicated with the housing 14, the device will be propelled toward the anchoring stake 28 through the operation of the drum assembly 24 which is rotated during the expansion stroke of the diaphragm assembly 20 by motion transmitting mechanism 22, the diaphragm assembly 20 being continuously cycled through the operation of the valve mechanism 30 and the valve actuating mechanism 32. Since the drum assembly 24 is rotated only during the expansion stroke of the diaphragm assembly 20 wherein water under pressure is passing through the inlet opening 156, the forward movement of the device can be controlled by adjusting the position of the stem 155 with respect to the inlet opening 156.

The device will be propelled toward the stake in the manner indicated above until the transverse end portion 310 of the stopping lever 304 engages the anchoring stake 28. From FIGURE 1 it can be seen that the engagement of the stopping lever 304 with the anchoring stake 28 will serve to move the bell crank lever 274 into its unlatched position shown in phantom lines in FIGURE 11, through the operation of the arm 302, cable 298, and lever 292. With the bell crank lever 274 disposed in its unlatched position, the starting lever 264 will be biased from the solid line position shown in FIGURE 11 to the phantom line position shown therein, through the operation of the spring 256 to thereby close off the flow of water under pressure into the main vertical passage 146 by the engagement of the valve member 246 with the valve seat 144. In this way the flow of water under pressure to the sprinkler head 18 and diaphragm assembly 20 is automatically shut off when the device reaches the end of its travel.

It thus will be seen that the objects of this invention have been fully and effectively accomplished. It will be realized, however, that the foregoing specific embodiment has been shown and described only for the purpose of illustrating the principles of this invention and is subject to extensive change without departure from such principles. Therefore, this invention includes all modifications encompassed within the spirit and scope of the following claims.

I claim:

1. A sprinkling device comprising a wheeled frame, a diaphragm assembly expansible in response to the flow of water under pressure therein, a member pivoted to said frame and operatively connected with said diaphragm assembly for pivotal movement in one direction in response in the expansion of said diaphragm assembly, spring means between said frame and said pivoted member resiliently urging the latter to pivot in the opposite direction and thus contract said diaphragm assembly, a drum assembly rotatably mounted on said frame, a cable wound around said drum assembly and having a free end extending therefrom adapted to be anchored to the ground to be sprinkled, means operatively connected between said pivoted member and said drum assembly for rotating the latter in response to the expansion and contraction of said diaphragm assembly to wind up said cable on said drum assembly to thereby propel said wheel frame to the anchored end of said cable, a water inlet housing carried by said frame adapted to be connected with a hose having a source of water under pressure communicating therewith, a sprinkler head carried by said frame in communication with said inlet housing, means communicating said housing in parallel with said diaphragm assembly, said last-mentioned means including a valve mechanism operable in a first position to permit flow of water under pressure into said diaphragm assembly and in a second position to permit exhaust of water from said diaphragm assembly under the action of said spring means, means operatively connected between said pivoted member and said valve mechanism for moving the latter into said first position in response to a predetermined contraction of said diaphragm assembly and into said second position in response to a predetermined expansion of said diaphragm assembly, said housing having flow control valve means disposed therein movable between an opened position permitting flow of water under pressure to said sprinkler head and to said diaphragm assembly and a biased closed position preventing flow of water under pressure to said sprinkler head and said diaphragm assembly, a starting lever movably mounted on said frame and operatively connected with said flow

control valve means to move the latter from said closed position to said opened position, latch means operatively connected with said starting lever and carried by said frame for movement between a latched position operable to retain said starting lever in a position to maintain said flow control valve means in said opened position and an unlatched position permitting said starting lever to be biased with said flow control valve means into the closed position of the latter, a stopping lever carried by said frame in a position to be moved by engagement with a ground anchored stake in response to the travel of said wheeled frame into a position adjacent said stake, and means operatively connected between said stopping lever and said latch means for moving the latter from said latched position to said unlatched position in response to the movement of said stopping lever.

2. A sprinkling device comprising a wheeled frame, a diaphragm assembly expansible in response to the flow of water under pressure therein, a member pivoted to said frame and operatively connected with said diaphragm assembly for pivotal movement in one direction in response to the expansion of said diaphragm assembly, spring means between said frame and said pivoted member resiliently urging the latter to pivot in the opposite direction and thus contract said diaphragm assembly, a drum assembly rotatably mounted on said frame, a cable wound around said drum assembly and having a free end extending therefrom adapted to be anchored to the ground to be sprinkled, means operatively connected between said pivoted member and said drum assembly for rotating the latter in response to the expansion and contraction of said diaphragm assembly to wind up said cable on said drum assembly to thereby propel said wheel frame to the anchored end of said cable, a water inlet housing carried by said frame adapted to be connected with a hose having a source of water under pressure communicating therewith, a sprinkler head carried by said frame in communication with said inlet housing, means communicating with said housing in parallel with said diaphragm assembly including a venturi flow passage, said last-mentioned means including a valve mechanism operable in a first position to permit flow of water under pressure into said diaphragm assembly and in a second position to permit exhaust of water from said diaphragm assembly under the action of said spring means, and means operatively connected between said pivoted member and said valve mechanism for moving the latter into said first position in response to a predetermined contraction of said diaphragm assembly and into said second position in response to a predetermined expansion of said diaphragm assembly, said valve mechanism including inlet valve means communicating in parallel with said inlet housing downstream of said venturi flow passage operable to control the flow of water under pressure to said diaphragm assembly and outlet valve means communicating with said venturi passage adjacent the throat thereof operable to control the exhaust of water from said diaphragm assembly.

3. A sprinkling device comprising a wheeled frame, a diaphragm assembly expansible in response to the flow of water under pressure therein, a member pivoted to said frame and operatively connected with said diaphragm assembly for pivotal movement in one direction in response to the expansion of said diaphragm assembly, spring means between said frame and said pivoted member resiliently urging the latter to pivot in the opposite direction and thus contract said diaphragm assembly, a drum assembly rotatably mounted on said frame, a cable wound around said drum assembly and having a free end extending therefrom adapted to be anchored to the ground to be sprinkled, means operatively connected between said pivoted member and said drum assembly for rotating the latter in response to the expansion and contraction of said diaphragm assembly to wind up said cable on said drum assembly to thereby propel said wheel frame to the anchored end of said cable, a water inlet housing carried by said frame adapted to be connected with a hose having a source of water under pressure communicating therewith, a sprinkler head carried by said frame in communication with said inlet housing, means communicating said housing in parallel with said diaphragm assembly, said last-mentioned means including a valve mechanism operable in a first position to permit flow of water under pressure into said diaphragm assembly and in a second position to permit exhaust of water from said diaphragm assembly under the action of said spring means, said valve mechanism comprising a valve body having a valve chamber communicating with said diaphragm, an inlet passage extending into said valve chamber, an outlet passage extending from said valve chamber, a disk valve member rotatably mounted within said chamber for movement between first and second positions corresponding to the first and second positions of said valve mechanism, said disk valve member being disposed within said chamber in a position to close the communication between said valve chamber and said inlet and outlet openings and having an inlet aperture therethrough positioned to align with said inlet passage to communicate the latter with said chamber when said disk valve member is disposed in said first position and an outlet aperture therethrough positioned to align with said outlet passage to communicate the latter with said chamber when said disk valve member is disposed in said second position, means operatively connected between said pivoted member and said valve mechanism for moving the latter into said first position in response to a predetermined contraction of said diaphragm assembly and into said second position in response to a predetermined expansion of said diaphragm assembly, said valve mechanism moving means comprising a first arm fixed to said disk valve member for movement therewith between corresponding first and second positions, a lever pivotally carried by said frame having a second arm extending from the pivotal axis thereof, spring means interconnecting the outer ends of said first and second arms, the outer end of said second arm being movable in response to the expansion and contraction of said diaphragm assembly in a limited arcuate path such that said spring means acts to resiliently urge said first arm into said first position when the outer end of said second arm is disposed adjacent one end of its arcuate path and during its movement from said one end to a position adjacent the other end of its path and to resiliently urge said first arm into said second position when the outer end of said second arm is disposed adjacent said other end of its path and during its movement from said other end to a position adjacent said one end.

4. A sprinkling device as defined in claim 3 wherein said valve mechanism moving means further includes a second lever pivotally carried by said frame, a connecting link interconnecting said second lever to said first-mentioned lever and a connecting rod interconnecting said second lever with said pivoted member.

5. In a sprinkling device, the combination comprising a frame having means thereon supporting the same for movement along the ground, water pressure responsive means expansible in response to the flow of water under pressure therein and contractible to exhaust water therefrom, means operable in response to the expansion and contraction of said pressure responsive means for moving said frame along the ground, a water inlet housing carried by said frame adapted to be communicated with a source of water under pressure, a sprinkler head, means communicating said water inlet housing with said sprinkler head including a venturi flow passage, means communicating said inlet housing in parallel with said pressure responsive means including a valve mechanism having inlet valve means communicating in parallel with said water inlet

housing downstream of said venturi flow passage movable between opened and closed positions to control the flow of water under pressure to said pressure responsive means and outlet valve means communicating with said venturi passage adjacent the throat thereof movable between opened and closed positions to control the exhaust of water from said pressure responsive means, and means for moving said inlet valve means into its closed position and said outlet valve means into its opened position in response to a predetermined expansion of said pressure responsive means and for moving said inlet valve means into its opened position and said outlet valve means into its closed position in response to a predetermined contraction of said pressure responsive means.

6. The combination as defined in claim 5 wherein frame moving means comprises a drum assembly, rotatably mounted on said frame, a cable wound around said drum assembly and having a free end extending therefrom adapted to be anchored to the ground to be sprinkled, and means between said pressure responsive means and said drum assembly for rotating the latter in response to the expansion and contraction of said pressure responsive means to wind up said cable on said drum assembly to thereby effect movement of said frame toward the anchored end of said cable.

7. A sprinkling device as defined in claim 6 wherein said drum assembly comprises a drum having a pair of disk members on opposite ends thereof mounted on said frame for rotation about a transverse horizontal axis, and wherein said drum rotating means comprises a ratchet wheel mounted for independent rotation adjacent each of said disk members, one of said ratchet wheels having a spring pressed member extending therefrom into sliding frictional engagement with the adjacent disk member, the other of said ratchet wheels having a locking element movable into and out of an opening formed in the associated disk member to selectively lock said drum for rotation with said ratchet wheels or permit frictionally controlled rotation of said drum independent of said ratchet wheel, and pawl members pivotally connected to said pivoted member and engageable with said ratchet wheels for rotating the latter in response to the expansion of said diaphragm assembly.

8. A sprinkling device comprising a wheeled frame, water pressure responsive means expansible in response to the flow of water under pressure therein and contractible to exhaust water therefrom, a drum assembly rotatably mounted on said frame, said drum assembly comprising a drum having a pair of disk members on opposite ends thereof mounted on said frame for rotation about a transverse horizontal axis, a ratchet wheel mounted for independent rotation adjacent each of said disk members, one of said ratchet wheels having a spring pressed member extending therefrom into sliding frictional engagement with the adjacent disk member, the other of said ratchet wheels having a locking element movable into and out of an opening formed in the associated disk member to selectively lock said drum for rotation with said ratchet wheels or permit frictionally controlled rotation of said drum independent of said ratchet wheels, a cable wound around said drum and having a free end extending therefrom adapted to be anchored to the ground to be sprinkled, means connected between said ratchet wheels and said pressure responsive means operable in response to the expansion and contraction of said pressure responsive means for rotating said ratchet wheels and said drum when said other ratchet wheel is locked thereto to thereby wind up said cable on said drum and hence propel said wheeled frame to the anchored end of said cable, a water inlet housing carried by said frame adapted to be connected with a hose having a source of water under pressure communicating therewith, a sprinkler head carried by said frame in communication with said inlet housing, means connecting said housing in parallel with said pressure responsive means, said last-mentioned means including a valve mechanism operable in a first position to permit flow of water under pressure into said pressure responsive means and in a second position to permit exhaust of water from said pressure responsive means, and means for moving said valve mechanism into said first position in response to a predetermined contraction of said pressure responsive means and into said second position in response to a predetermined expansion of said pressure responsive means.

9. A sprinkling device as defined in claim 8 wherein said housing has flow control valve means disposed therein movable between an opened position permitting flow of water under pressure to said sprinkler head and to said diaphragm assembly and a closed position preventing flow of water under pressure to said sprinkler head and said diaphragm assembly, said flow control valve means being biased into said closed position and wherein a starting lever is movably mounted on said frame and operatively connected with said flow control valve means to move the latter from said closed position to said opened position, latch means operatively connected with said starting lever and carried by said frame for movement between a latched position operable to retain said starting lever in a position to maintain said flow control valve means in said opened position and an unlatched position permitting said starting lever to be biased with said flow control valve means into the closed position of the latter, a stake having a lower portion arranged to be imbedded in the ground and an upper portion arranged to extend above the ground and to have the free end of said cable fixed thereto, a stopping lever carried by said frame in a position to be moved by engagement with said stake in response to the travel of said wheeled frame into a position adjacent said stake, and means operatively connected between said stopping lever and said latch means for moving the latter from said latched position to said unlatched position in response to the movement of said stopping lever.

10. In a sprinkling device, the combination comprising a wheeled frame, a water inlet housing adapted to be connected to a hose communicated with a source of water under pressure, a sprinkler head carried by said frame in communication with said housing, means operable in response to the flow of water under pressure through said housing for propelling said wheeled frame along the ground, a starting lever mounted on said frame for movement between first and second positions, a valve member mounted in said housing and operatively connected with said starting lever for movement between opened and closed positions in response to the movement of said starting lever into said first and second positions respectively, said starting lever and said valve member being biased into their second and closed positions respectively, a latch mechanism operatively connected with said starting lever movable between a latched position operable to retain said starting lever in said first position and an unlatched position permitting said starting lever to be biased into said second position and hence the valve member movable therewith into said closed position, a stopping lever carried by said frame to be moved by engagement with a ground anchored stake in response to the travel of said wheeled frame into a position adjacent said stake, and means operatively connected between said stopping lever and said latch mechanism for moving the latter from said latched position to said unlatched position in response to the movement of said stopping lever.

11. A sprinkling device comprising a wheeled frame, a diaphragm assembly carried by said frame expansible in response to the flow of water under pressure therein, a member pivoted at its rear end to the rear end of said frame and operatively connected with said diaphragm assembly for pivotal movement about a transverse horizontal axis in one direction in response to the expansion of said diaphragm assembly, spring means between said frame and said pivoted member resiliently urging the

latter to pivot in the opposite direction and thus contract said diaphragm assembly, a drum having a pair of disk members on opposite ends thereof mounted on said frame for rotation about a transverse horizontal axis, a cable wound around said drum and having a free end extending therefrom adapted to be anchored to the ground to be sprinkled, a ratchet wheel mounted for independent rotation adjacent each of said disk members, one of said ratchet wheels having a spring pressed member extending therefrom into sliding frictional engagement with the adjacent disk member, the other of said ratchet wheels having a locking element movable into and out of an opening formed in the associated disk member to selectively lock said drum for rotation with said ratchet wheels or permit frictionally controlled rotation of said drum independent of the rotation of said ratchet wheel, pawl members pivotally connected to the forward end of said pivoted member and engageable with said ratchet wheels for rotating the latter in response to the expansion of said diaphragm assembly to thereby rotate said drum when said other ratchet wheel is locked thereto so as to wind up said cable on said drum and hence propel said wheeled frame to the anchored end of said cable, a water inlet housing carried by said frame adapted to be connected to a hose having a source of water under pressure communicated therewith, a sprinkler head carried by said frame, means communicating said water inlet housing with said sprinkler head including a venturi flow passage, means communicating said inlet housing in parallel with said diaphragm assembly including a valve mechanism having inlet valve means communicating in parallel with said water inlet housing downstream of said venturi flow passage movable between opened and closed positions to control the flow of water under pressure to said diaphragm assembly and outlet valve means communicating with said venturi passage adjacent the throat thereof movable between opened and closed positions to control the exhaust of water from said diaphragm assembly, means for moving said inlet valve means into its closed position and said outlet valve means into its opened position in response to a predetermined expansion of said diaphragm assembly and for moving said inlet valve means into its opened position and said outlet valve means into its closed position in response to a predetermined contraction of said pressure responsive means, means between said inlet valve means and said inlet housing for controlling the rate of flow through said inlet valve means to thereby control the rate of expansion of said diaphragm assembly and hence the speed of travel of said wheeled frame, a starting lever mounted on said frame for movement between first and second positions, a flow control valve member mounted in said housing downstream from the parallel communication of said diaphragm assembly and said sprinkler head therewith and operatively connected with said starting lever for movement between opened and closed positions in response to the movement of said starting lever into said first and second positions respectively, said starting lever and said flow control valve member being biased into said second and closed positions respectively, a latch mechanism operatively connected with said starting lever movable between a latched position operable to retain said starting lever in said first position and an unlatched position permitting said starting lever to be biased into said second position and hence the flow control valve member movable therewith into said closed position, a stopping lever carried by said frame in a position to be moved by engagement with a ground anchored stake in response to the travel of said wheeled frame into a position adjacent said stake, means operatively connected between said stopping lever and said latch mechanism for moving the latter from said latched position to said unlatched position in response to the movement of said stopping lever.

12. A sprinkling device as defined in claim 11 wherein said valve mechanism includes a valve body having a valve chamber communicating with said diaphragm assembly, an inlet passage extending into said chamber, an outlet passage extending from said chamber, and wherein said inlet and outlet valve means comprises a disk valve member rotatably mounted within said chamber for movement between first and second positions, said disk valve member being disposed within said chamber in a position to close communication between said valve chamber and said inlet and outlet openings and having an inlet aperture therethrough positioned to align with said inlet passage to communicate the latter with said chamber when said disk valve member is disposed in said first position and an outlet aperture therethrough positioned to align with said outlet passage to communicate the latter with said chamber when said disk valve member is disposed in said second position.

13. A sprinkling device as defined in claim 12 wherein said valve moving means comprises a first arm fixed to said disk valve member for movement therewith between corresponding first and second positions, a lever pivotally carried by said housing having a second arm extending from the pivotal axis thereof, spring means interconnecting the outer ends of said first and second arms, the outer end of said second arm being movable in response to the expansion and contraction of said diaphragm assembly in a limited arcuate path such that said spring means acts to resiliently urge said first arm into said first position when the outer end of said second arm is disposed adjacent one end of its arcuate path and during its movement from said one end to a position adjacent the other end of its path and to resiliently urge said first arm into said second position when the outer end of said second arm is disposed adjacent said other end of its path and during its movement from said other end to a position adjacent said one end.

14. A sprinkling device as defined in claim 13 wherein said valve moving means further includes a second lever pivotally carried by said frame, a connecting link interconnecting said second lever to said first-mentioned lever and a connecting rod interconnecting said second lever with said pivoted member.

15. A sprinkling device comprising a frame having means thereon supporting the same for movement along the ground, water pressure responsive means expansible in response to the flow of water under pressure therein and contractable to exhaust water therefrom, means operable in response to the expansion and contraction of said pressure responsive means for moving said frame along the ground, a water inlet housing carried by said frame adapted to be communicated with a source of water under pressure, a sprinkler head carried by said frame, means communicating said water inlet housing with said sprinkler head, means communicating said water inlet housing in parallel with said pressure responsive means including a valve mechanism, said valve mechanism comprising a valve body having a valve chamber communicating with said pressure responsive means, an inlet passage extending into said valve chamber, an outlet passage extending from said valve chamber, a disk valve member rotatably mounted within said chamber for movement between first and second positions, said disk valve member being disposed within said chamber in a position to close the communication between said valve chamber and said inlet and outlet openings and having an inlet aperture therethrough positioned to align with said inlet passage to communicate the latter with said chamber when said disk valve member is disposed in said first position and an outlet aperture therethrough positioned to align with said outlet passage to communicate the latter with said chamber when said disk valve member is disposed in said second position, and means for moving said disk valve member into its second position in response to a predetermined expansion of said pressure responsive means and for moving said disk valve member into its first position in response to a predetermined contraction of said pressure responsive means.

16. A sprinkling device as defined in claim 15 wherein

said disk valve member moving means comprises a first arm fixed to said disk valve member for movement therewith between corresponding first and second positions, a lever pivotally carried by said frame having a second arm extending from the pivotal axis thereof, spring means interconnecting the outer ends of said first and second arms, the outer end of said second arm being movable in response to the expansion and contraction of said pressure responsive means in a limited arcuate path such that said spring means acts to resiliently urge said first arm into said first position when the outer end of said second arm is disposed adjacent one end of its arcuate path and during its movement from said one end to a position

adjacent the other end of its path and to resiliently urge said first arm into said second position when the outer end of said second arm is disposed adjacent said other end of its path and during its movement from said other end to a position adjacent said one end.

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