United States Patent

Cornelius

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[45] **Aug. 29, 1972**

[54] **REVERSING WATER MOTOR**

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[73] Assignee: **R. M. Wade & Co.,** Portland, Oreg.

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[21] Appl. No.: **96,008**

[52] **U.S. Cl.**.....**239/191,** 239/251

[51] **Int. Cl.**.....**B05b 3/18**

[58] **Field of Search**.....239/191, 192, 251, 258

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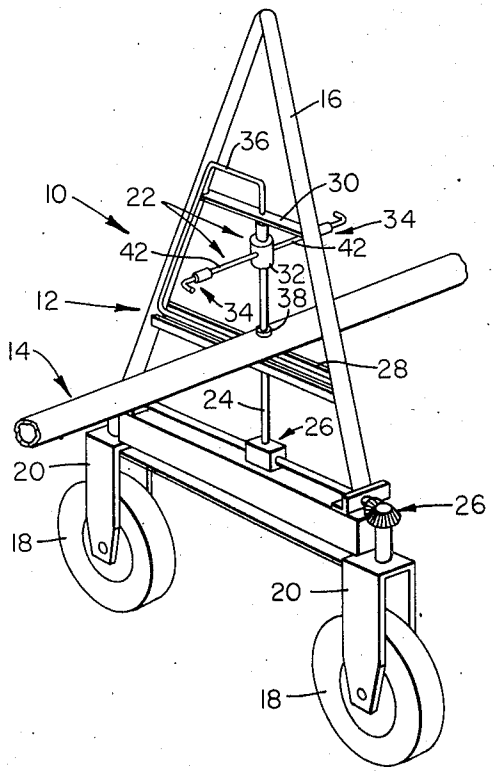
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[57] **ABSTRACT**

An improved water motor adapted for ready reversal of the direction of motor rotation. A simple coupling device is affixed to outer ends of the motor water arms and curved nozzle portions are rotatably held therein, whereby the nozzle portions are easily rotated 180° to reverse the motor direction of rotation. In another embodiment, the motor water arms are interlocked or continuous, whereby rotation of one arm to the reversing position automatically rotates the diametric arm to its reversing position.

7 Claims, 11 Drawing Figures



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2 Sheets-Sheet 1

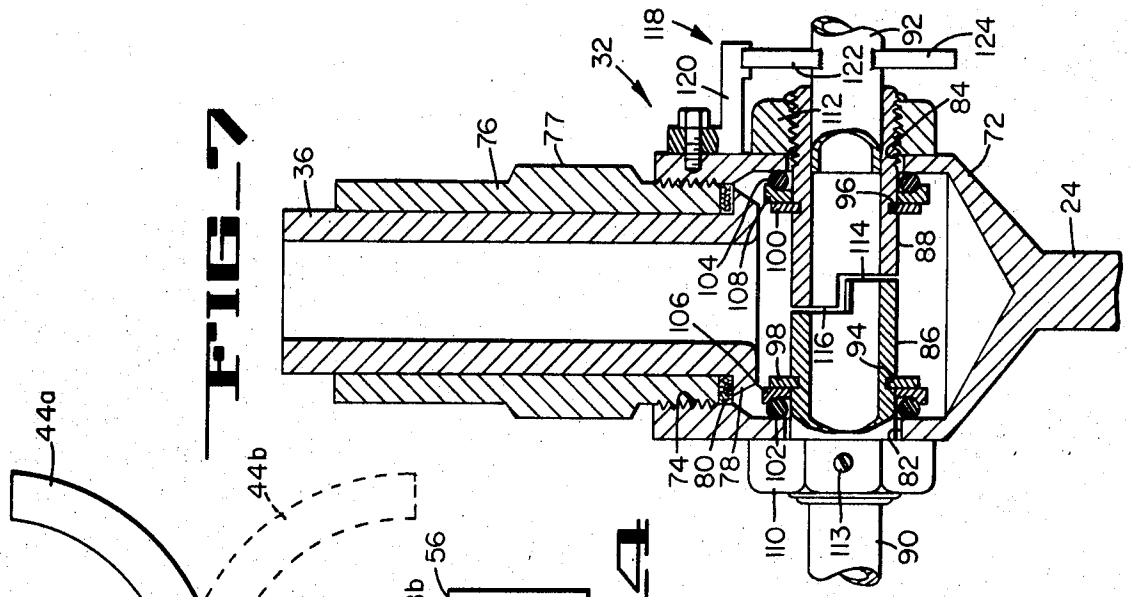


FIG. 7

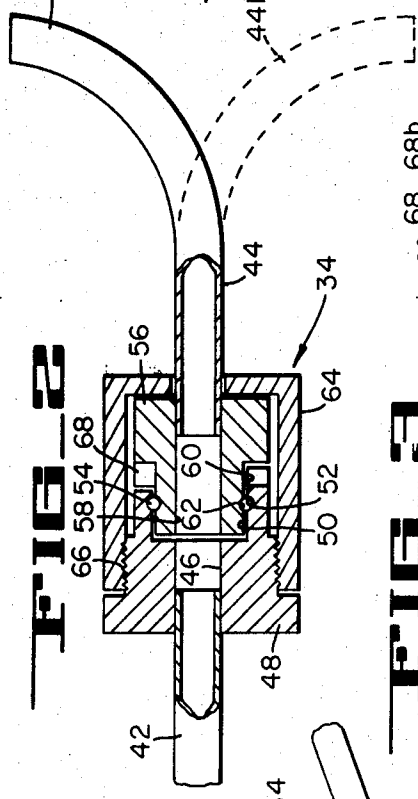


FIG. 2

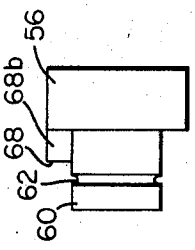


FIG. 4

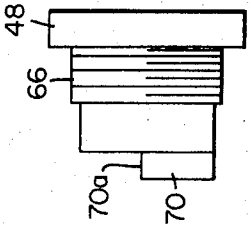


FIG. 6

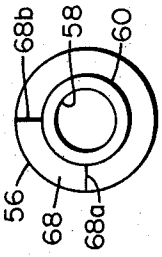


FIG. 3

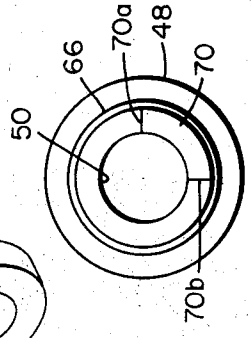


FIG. 5

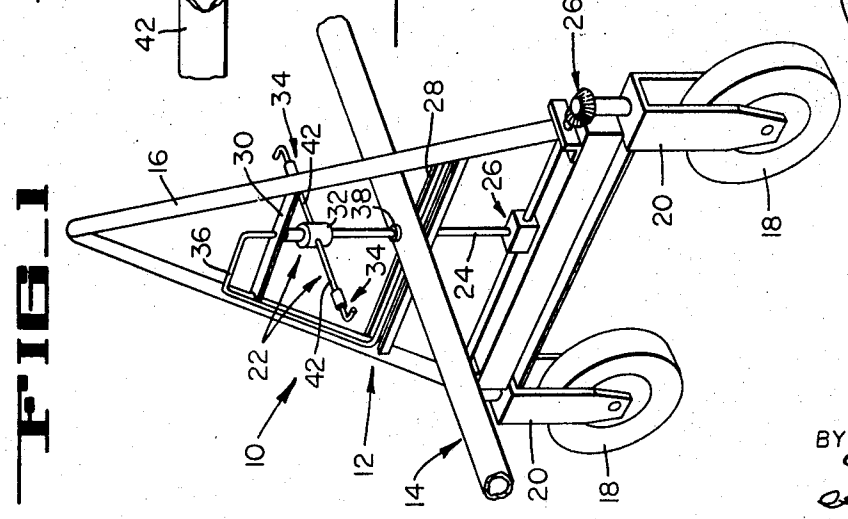


FIG. 1

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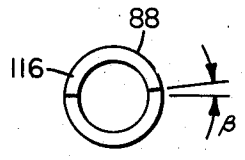


FIG_8

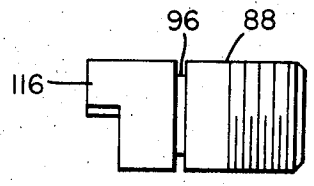


FIG_9

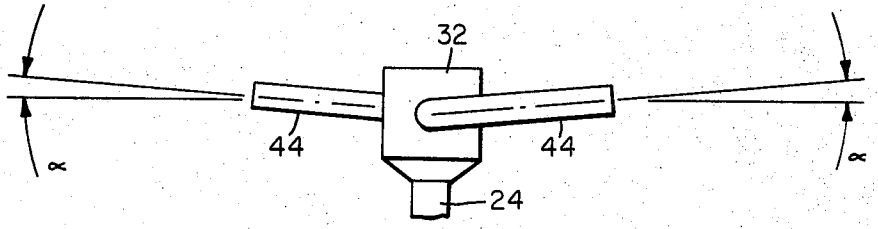


FIG_10

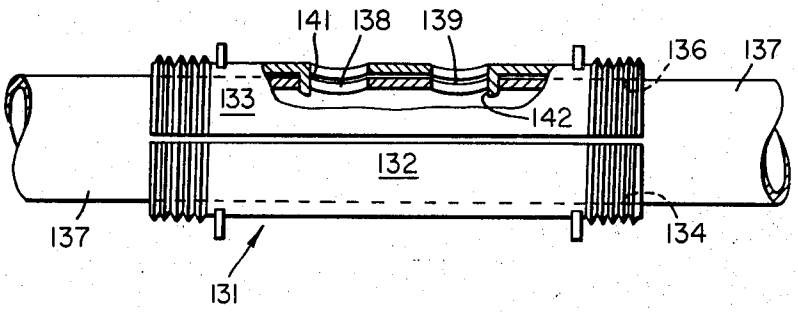


FIG_11

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REVERSING WATER MOTOR

BACKGROUND OF THE INVENTION

1. Field

The invention relates to automatic sprinkler systems, and particularly to an improved water motor for propelling the sprinkler system across a field.

2. Prior Art

In the operation of an automatic, self-propelled sprinkling apparatus it is often necessary to reverse the direction of the movement of the line of pipe, which is accomplished by reversing the direction of rotation of the respective water motors. On systems wherein each pipe supporting water tower is driven by such rotary water powered motors, this has been accomplished in the prior art by loosening locknuts at the connection of the respective water arms to the water spinner, swiveling the arms 180°, and retightening the locknut. This method has not proven satisfactory for it is difficult for the operator to consistently align the arms in a level, opposing position. The misalignment causes both a loss of power, and the generation of a poor irrigation pattern by the water motor.

SUMMARY OF THE INVENTION

The invention provides a simple reversing construction which overcomes the above noted shortcomings of the prior art. The water motor reversing means contemplates a complementary pair of hollow, cylindrical connectors which are disposed at a selectable position or positions along the water arms, and which allow 180°, or less, sealed rotation of the extended water nozzles of the respective water arms. In one embodiment a pair of the rotatable connectors are disposed towards the ends of respective water arms, and include integrally formed stops which provide for present, substantially horizontal, positioning of the water nozzles. A second embodiment includes a single pair of connectors, having extended engaging end portions, and disposed within the spinner, with the end portions providing mechanical coupling therebetween. Rotation of one water arm/nozzle imparts equal rotation to the opposite arm/nozzle. Stop means provides the preset, substantially horizontal positioning of the water nozzles.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective of one support tower of the usual plurality of water towers in an automatic sprinkling system, showing a section of the sprinkler pipeline and a respective improved water motor of the invention.

FIG. 2 is a cross section of one embodiment of the motor reversing apparatus of the invention.

FIGS. 3, 4, 5 and 6 are end and plan views respectively of elements of the motor reversing apparatus shown in FIGS. 1 and 2.

FIG. 7 is a cross section of an alternative embodiment of the motor reversal apparatus shown in FIG. 2.

FIGS. 8 and 9 are end and plan views of elements of the apparatus of FIG. 7.

FIG. 10 is an end view of the apparatus of, for example, FIGS. 1, 2 and 7 depicting an alternative orientation of the sprinkler arms and associated nozzles.

FIG. 11 is an elevation of a longitudinally split connector for use with a single double ended water arm.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIG. 1, there is shown by way of example, a support tower **12** and a corresponding section of a pipeline **14** of an automatic sprinkling apparatus **10**, such as described for example in my copending U.S. applications Ser. No. 805,664 filed March 10, 1969 and Ser. No. 27,226 filed Apr. 10, 1970, said applications being assigned to the same assignee as this application.

The support tower **12** includes an A frame **16**, supported upon a pair of wheels **18** each having its own pivotable, wheel-supporting, fork **20**. As depicted, each support tower **12** is propelled by a respective water motor **22**, the output of which is coupled to the wheels **18** via an output drive shaft **24** and gear train means **26**, such as those described in the above mentioned copending U.S. applications. The A frame **16** includes a horizontal, pipe supporting, cross member **28** and a horizontal, water motor supporting, cross member **30**, for supporting the pipeline **14** and the water motor **22**, respectively.

In accordance with the invention, the water motor **22** includes a water spinner **32** and a water motor direction reversing means **34** integrally disposed therewith, as further described in different embodiments below. The spinner **32** is rotatably supported by the water motor supporting cross member **30**, and is coupled at the upper end thereof to a source of pressurized water introduced to the motor **22** via a conduit **36** which extends from the pipeline **14** along portions of the A frame **16**, to the pipeline **14**.

The water motor **22** is coupled at the lower end of the spinner **32** to the output shaft **24**, which extends downwardly through the pipeline **14** via a shaft supporting means **38**.

Referring now to FIGS. **2–6**, there is illustrated by way of example only, an embodiment of the water motor direction reversing means **34** of FIG. **1**. The means **34** in this particular configuration is integrally associated with a respective arm **42** of the water motor, and in particular, is rigidly secured to the ends of the arms **42**. Water nozzles **44** are rotatably secured to the reversing means **34**, and extend opposite the water arms **42** as further described below. The water nozzles are adapted for 180° rotation from a first substantially horizontal position **44*a***, to a second substantially horizontal position **44*b*** disposed 180° or less from the first position.

The water arm **42** is secured to the water spinner **32** (FIG. **1**), extends generally horizontally therefrom, and is sealably secured as by welding or threading to a bore **46** coaxially extending through a cylindrical female connector **48**. The latter connector **48** has an annular seal surface **50** of a diameter larger than that of the bore **46**, and is adapted with a groove **52** for receiving an O ring seal **54**. A male connector **56** having an internal bore **58**, has an annular, overlapping, seal surface **60** of slightly smaller diameter than that of the seal surface **50**. A groove **62** is formed in the outer surface **60**, and is in register with the groover **52** of the female connector **48**. The O ring seal **54** is confined within the confronting grooves **52, 62** upon assembly of the male and female connectors **48, 56** and provides a rotatable seal means. The water nozzle **44** is integrally secured within the bore **58** of the male connector **56** as by weld-

ing or threading. A lock collar **64** and a shoulder of the connector **48**, are internally and externally threaded respectively as at **66**, to demountable secure the male and female connectors **56**, **48** together in sealed, rotatable relation.

It will be apparent that female connector **48** and male connector **56** may also be sealed by means other than O ring seal **54**. For instance a simple washer type seal could be placed between the transversely abutting surfaces just to the left annular seal surfaces **50** and **60**, respectively, of the female and male connectors. (FIG. **1**).

Referring in addition to FIGS. **3**,**4** and **5**,**6**, the connectors **56** and **48** include axially extending, arcuate, stops **68**,**70** respectively. The stops extend a selected arcuate length which, in this particular example, is one quadrant of 90°. As previously noted, water arms **42** are rigidly fixed to the water spinner **32**, and the female connector **48** is fixed in turn to the end of the water arm **42**. Thus if the female connector is oriented with the stop **70** in the lower-right quadrant (when facing the stop end of the connector, FIG. **5**) then the water nozzle **44** may be secured to the male connector **48** with the latter oriented as in FIG. **3** (facing the stop end of connector **48**), i.e., the stop **68** is in the upper-left quadrant. Assuming a downward view in FIG. **2**, the water nozzle is in the position **44***a*. The confronting surfaces **68***a*, **70***a* of the stops **68**, **70** maintain the horizontal water nozzle position **44***a*.

In accordance with the invention, the direction of rotation of the water motor is reversed, as is the direction of travel of the sprinkling apparatus **10** (FIG. **1**), by rotating the nozzle **44** through 180° to the horizontal position **44***b*. This position is maintained by the confronting surfaces **68***b*, **70***b* of the stops **68**, **70** respectively. Thus the water nozzles **44** are readily and consistently placed in the desired horizontal position by an operator when reversing the motor direction.

It is sometimes desirable to orient the nozzles **44** at a slight upward angle relative to the horizontal, to provide better dispersion of the water from the water motor **22**. Accordingly, as shown in FIG. **10**, a slight angle (of for example 2°, 3°, etc.) may be set on nozzles **44** by changing the arcuate length of the stops **68** and/or **70**. For example, stop **70** is made longer with surface **70***b* disposed a few degrees beyond the vertical, and surface **70***a* a few degrees above the horizontal (FIG. **5**).

An alternative embodiment of the water motor direction reversing means **34**, is depicted in FIGS. **7–9**. In this embodiment the means for reversing the direction of motor rotation is integral with the water arms, but is further located within the water spinner **32** itself. A further feature of this embodiment is that the action of turning one of the water nozzles through 180° to an opposite horizontal position, automatically turns the opposite water nozzle through 180° to its new position.

Accordingly, the water spinner **32** includes a housing **72** adapted at its lower end to demountable receive the coaxially extending drive shaft **24**. The upper, open end of the housing **72** is internally threaded as at **74** to threadably receive an externally threaded end of annular collar **76**. A hexagonal portion **77** is provided to allow tightening the collar **76** against a flange **78** on the corresponding end of the conduit **36**. Coupling seal means **80** is provided between the confronting surfaces of the collar **76** and flange **78**.

Diametrically opposed holes **82**, **84** are drilled through the walls of the housing **72** to receive a pair of complementary annular connectors **86**, **88** respectively. The connectors **86**, **88** are affixed as by welding or threading, to water arms **90**, **92** which terminate in respective water nozzles (not shown). The connectors **86**, **88** are provided with grooves **94**, **96** which receive retainer rings **98**, **100** respectively. A pair of O ring seal **102**, **104** and seal retainers **106**, **108** are confined between respective retainer rings **98**, **100** and the confronting walls of the spinner housing **72**. The connectors are externally threaded at the at the ends thereof connected to the water arms **90**, **92** and receive locknuts **110**, **112** respectively. Tightening the locknuts **110**, **112** against the housing **72** a slight degree compresses slightly the O ring seals **102**, **104** to provide a rotatable water seal between the connectors and the housing **72**. A set screw **113** is provided in each locknut **110**, **112**, and is of the type having a soft lead pellet disposed between the end of the set screw and the threaded portion of the connectors to thus prevent deforming the threads. It may be seen that rotating the water arms **90**, **92** likewise rotates the connectors **86**, **88** as well as the locknuts **110**, **112** relative to the housing **72**.

As further illustrated in FIGS. **8**, **9** the connectors **86**, **88** are provided with abutting, extended end portions **114**, **116** respectively, whereby one connector is rotatably coupled in mechanical relation to the other. As particularly illustrated by connector **88** in FIGS. **8**, **9**, the confronting surfaces on the extended end portions may be formed at a slight angle B to an axially bisecting plane, such that a slight amount of slack or tolerance exists between the connectors **86**, **88**. This allows the water nozzles (not shown) integral with the water arms **90**, **92** to assume a slight angle upward as portrayed by FIG. **10**, when the pressurized water is introduced to the water motor.

A stop device **118** includes a fixed stop **120** secured to the housing **72**, which extends outwardly to bear against a pair of rotatable stops **122**, **124** secured as by welding to the water arm **92** in 180° opposing relation. As shown, the stop **122** is secured in such relation that arm **92** (i.e., nozzle) is held in a horizontal or slightly upwardly oriented position as desired, wherein 180° rotation of the arm positions the rotatable stop **124** against the other side of the fixed stop **120** with the nozzle of arm **92** oriented horizontal or slightly upward. The opposite arm **90** and integral nozzle (not shown) is moved to, and maintained in, position opposite that of the arm **92** via the abutting extended end portions **114**, **116**.

It is to be understood that the stop device **118** configuration shown in FIG. **7** is by way of example only. There are several configurations which may replace that shown as would be obvious to those skilled in the art. For example, the rotatable stop **122** may be replaced by a rotatable stop fixed to water arm **90** and a confronting fixed stop disposed at the opposite side of the spinner housing **72**. Or the rotatable stops **122**, **124** may be replaced by a single arcuate stop formed of an arcuate half disc which extends 180° or less, and which is welded at its center to the water arm **92**.

In accordance with the invention, rotation of the water arm **92** (and integral nozzle) and thus the connector **88**, through and angle of 180°, automatically causes the connector **86** and the water arm **90** to also rotate through a similar 180°, since the two connectors are mechanically coupled together via the abutting extended end portions **114, 116**.

In one further embodiment of the invention, the connectors **86** and **88** may be combined into a single continuous part without any abutting surfaces like those at **114** and **116**. This single connector is shown in FIG. **11** wherein the connector **131** comprises two identical halves **132, 133**, which when placed together form a connector identical in external configuration with connectors **86, 88** if they were combined. The inner arcuate surfaces **134, 136** of the two halves **132, 133**, respectively, are dimensioned to receive and clamp tightly therebetween a single double ended water arm **137** that extends radially away in two directions from water spinner **32**.

Holes **138, 139** are drilled through the connector **131** and arm **137** to admit water from the interior of water spinner **32** into the interior of arm **137**, while lips **141, 142** at the edge of holes **138, 139** extend inwardly towards the interior of arm **137** to hold the connector **131** in fixed relationship to arm **137** to maintain the holes in alignment whereby the interior of arm **137** is in constant communication with the interior open portion of water spinner **32**.

Utilizing all of the clamping parts shown in FIG. **7**, it will be apparent that water arm **137** can be clamped tightly between split connector **131** within water spinner **32**.

When it is desired to reverse the direction of the water motor, locknuts **110, 112** are loosened, and water arm **137** is rotated 180° within housing **72**. The locknuts are then retightened to securely reclamp arm **137** between connector **131** within housing **72**.

By way of explanation of how the invention mechanism is employed, the sequence of pipeline movement when irrigating large, adjacent fields with a water supply in the middle, consists of running the sprinkler line up one field to the end. The line is then disconnected from the tractor unit, is pulled into the adjacent field, and is reconnected to the tractor unit and water supply at its other end. The water motor direction of rotation is reversed in accordance with the invention, which automatically reverses the water sprinkling pattern direction, and the line is run down the second field in the opposite direction. The sequence is repeatable, as required.

What is claimed is:

1. A reversible water motor useful for propelling sprinkling apparatuses comprising: a motor body, a source of pressurized water connected to said body, a rotatable spinner comprising a portion of said motor body, output drive means coupled to the spinner, at least one water arm extending radially from the spinner and affixed thereto, a water nozzle secured to the extended end of said water arm, rotatable connector means securing the water nozzle to the water arm integral with said arm and nozzle and adapted for rotating said nozzle from one predetermined substantially horizontal position to an opposing predetermined substantially horizontal position, the rotatable connector means including a first hollow connector portion coupled to the respective water arm, a second hollow connector portion coupled to the respective nozzle, said first and second Connectors coupled to each other, seal means preventing escape of water from said connector means, stop means in the vicinity of said connection between the water arm and nozzle and adapted to engage upon rotation of the nozzle with respect to its connected arm to define the predetermined substantially horizontal positions, and means for securing said connector means in one of the two aforesaid positions.

2. The reversible water motor of claim **1**, wherein the first and second connector portions further include annular cylindrical members defining concentrically overlapping portions, and said stop means includes extended arcuate stops angularly disposed to bear against confronting surfaces thereof to define the predetermined positions.

3. A reversible water motor comprising: a motor body, a source of pressurized water connected to said body, a rotatable spinner forming a portion of said body, output drive means coupled to the spinner, a pair of integrally formed water arms and water nozzles secured to connector means, said connector means including first and second hollow connectors coupled to respective water arms, the connectors being disposed in rotatable sealed relation through the spinner with the pair of water arms and integral nozzles extending oppositely therefrom, extended portions integral with each first and second connector and adapted to abut and thus mechanically couple the pair of opposing water arms together, and stop means cooperating with at least one of said arms and water spinner for selectively determining a first substantially horizontal position and a second opposed substantially horizontal position of said nozzles.

4. The reversing water motor of claim **3** wherein the extended portions of said first and second connectors comprise interlocking approximately half-circle sections.

5. A reversible water motor comprising: a motor body, a spinner comprising a portion of said body, a source of pressurized water connected to said body and spinner, output drive means connected to said spinner, a single continuous water arm passing through said spinner, means to rotatably retain said water arm through said spinner, at least one water nozzle integral with an end of said water arm and remote from said body, means hydraulically sealing the water arm through said spinner, said water arm further defining at least one hole communicating the interior of the water arm with the interior of the spinner, and stop means associated with said spinner and said arm to define a first horizontal position of the water nozzle on said arm and a second opposed horizontal position of said water nozzle.

6. The reversible water motor of claim **5** wherein said means rotatably retaining said water arm through said spinner comprises a connector split into two parts longitudinally along said water arm and said parts clamp the water arm therebetween.

7. The reversing water motor of claim **5** wherein locking means maintain the connector and water arm in fixed relationship.

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