United States Patent

[11] 3,585,940

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[54] **WATER SKI TOW SYSTEM OR THE LIKE**
8 Claims, 14 Drawing Figs.

[52] **U.S. Cl.** **104/173**
[51] **Int. Cl.** **B61b 11/00**
[50] **Field of Search** 104/173

[56] **References Cited**

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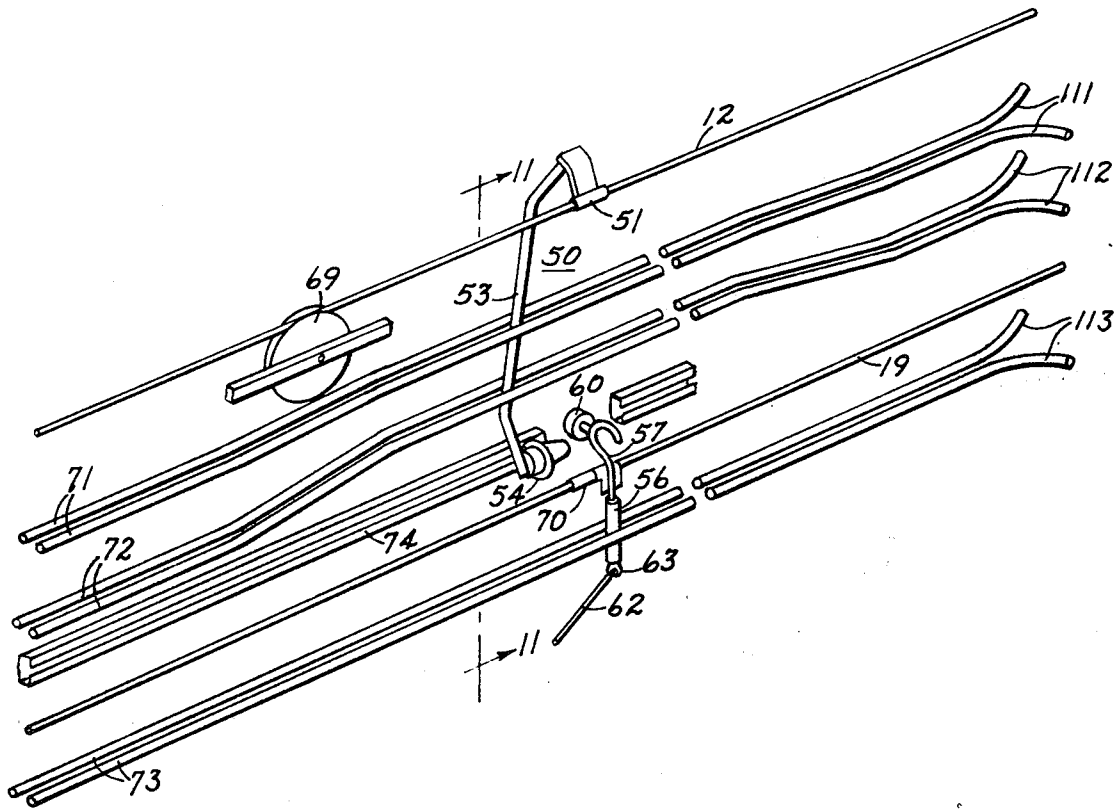
ABSTRACT: A tow system for pulling water skiers around a course comprises a main driving cable extending about the course and driven at the desired speed and an accelerating cable for picking up a skier and bringing him to a speed approaching that of the main cable. A rigid driving bar member is suspended from the main cable and a rigid pickup hook fitting is attached to the skier's towline. At the loading station the driving bar enters guide members which prevent its lateral displacement, and the pickup fitting driven by the accelerating cable enters guide member which hold it in the path of the driving bar. A lateral guide chute and a wheel on the pickup fitting determine the path of the pickup hook and the driving bar pulls the hook away from the accelerating cable when the wheel is released from the chute. At the unloading end of the course a similar guide system and chute are employed to maintain alignment of the bar and hook and the chute is sloped upwardly and away from the point of engagement and lifts the hook from the main cable bar.



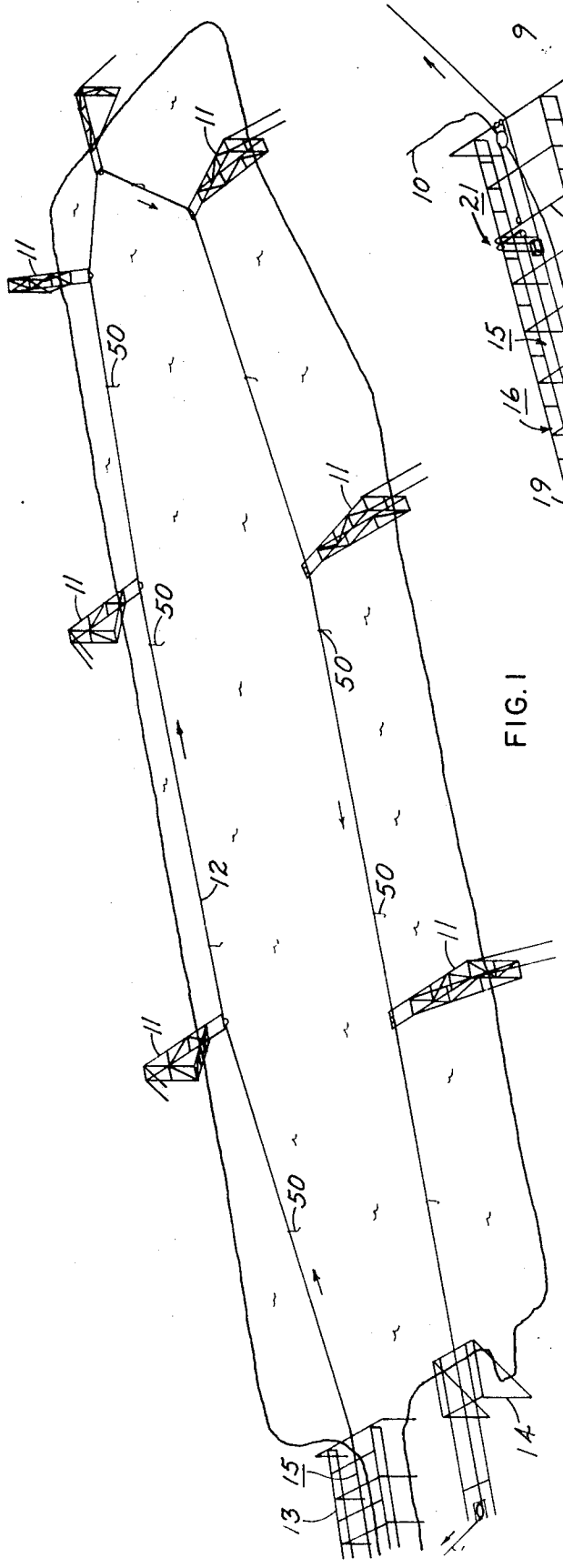


FIG. 1

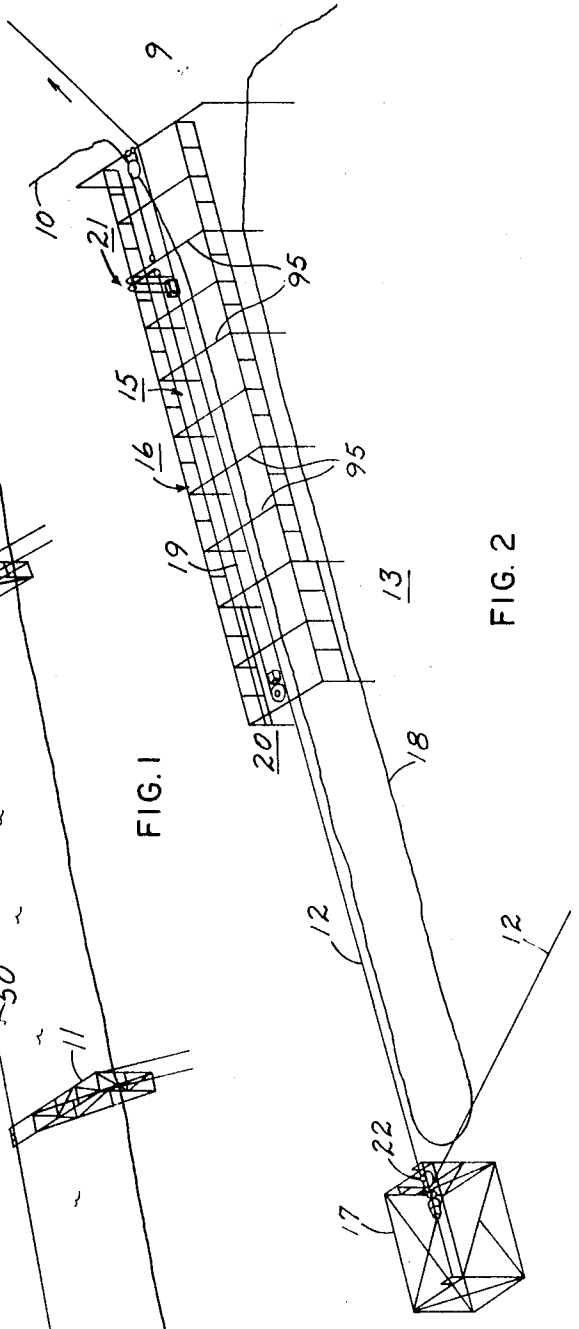


FIG. 2

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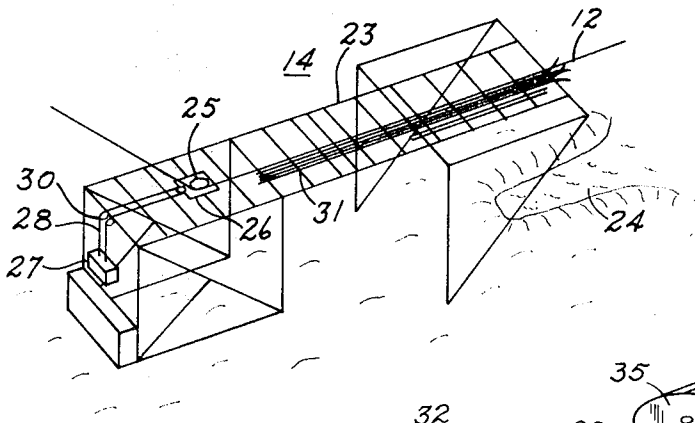

FIG. 3

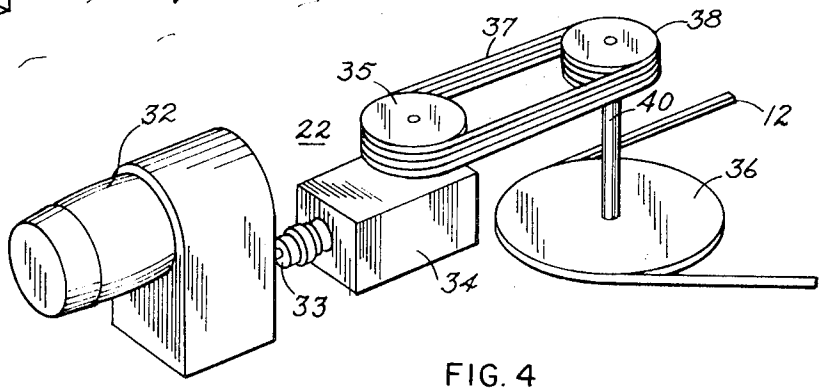

FIG. 4

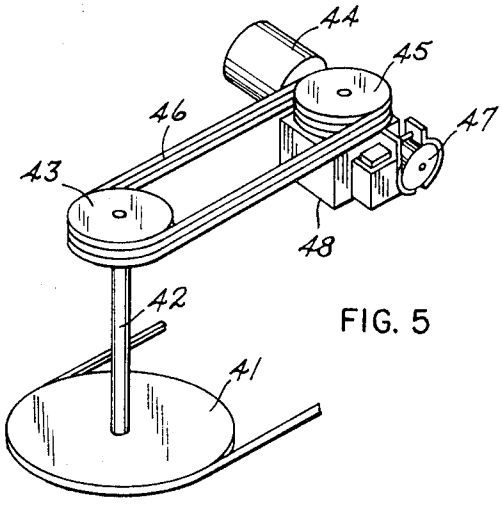

FIG. 5

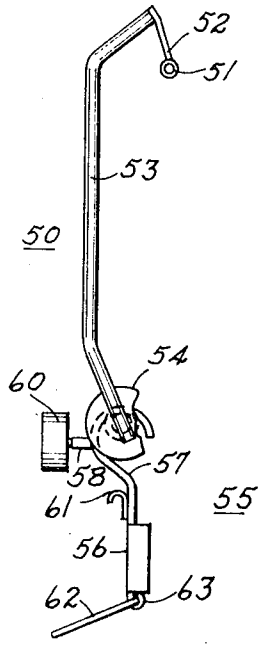

FIG. 6

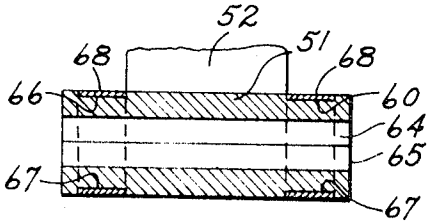

FIG. 6a

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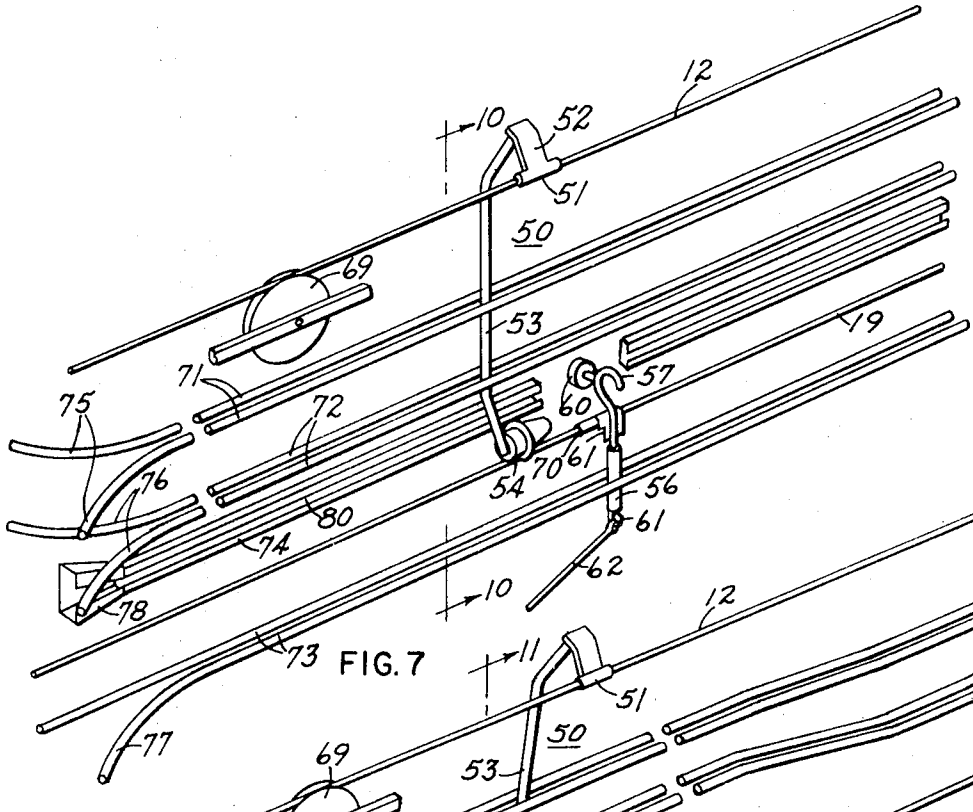

FIG. 7

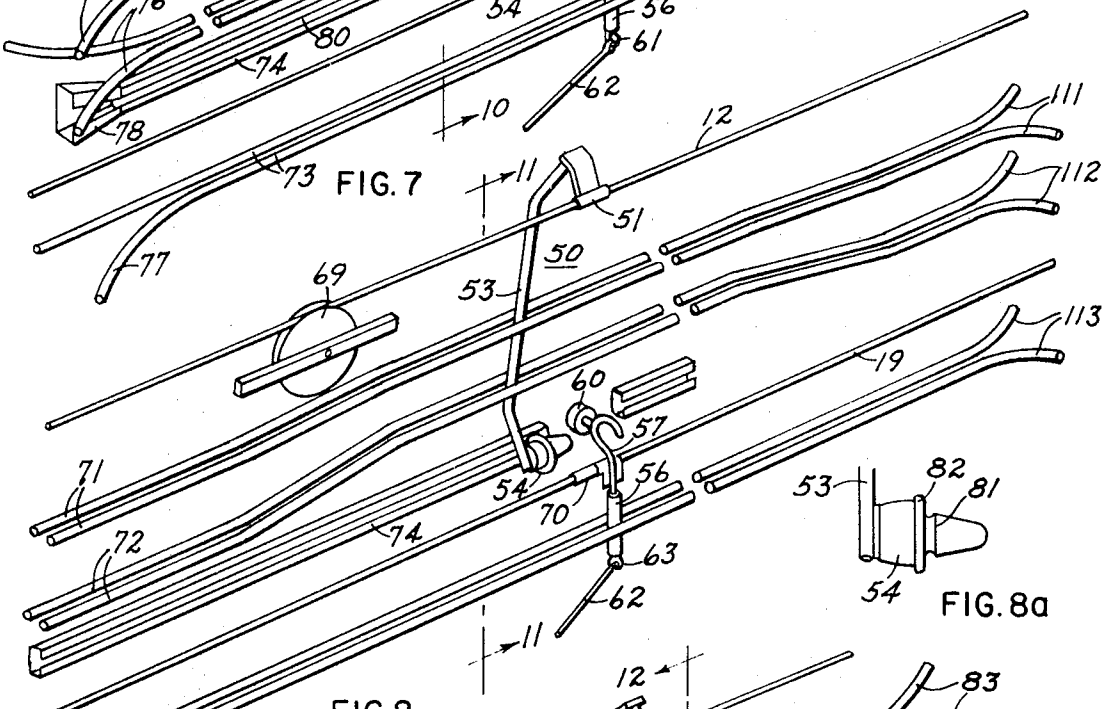

FIG. 8

FIG. 8a

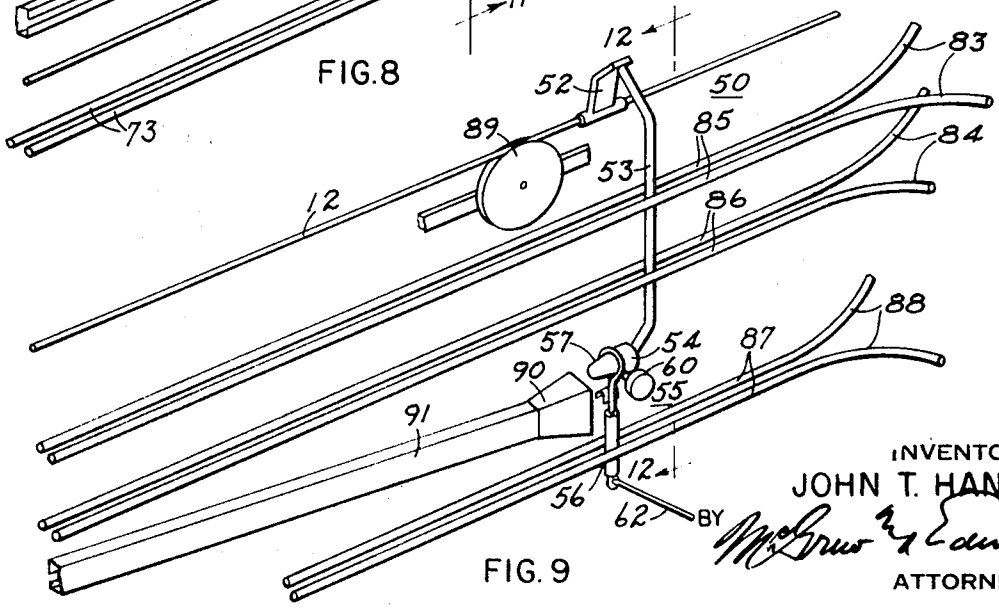

FIG. 9

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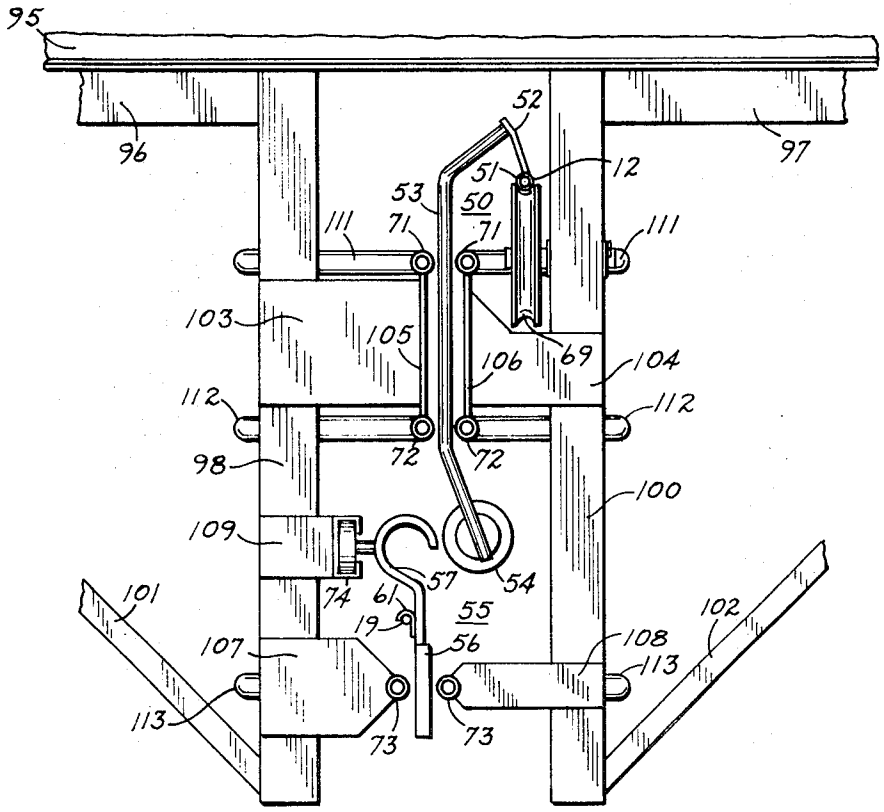

FIG. 10

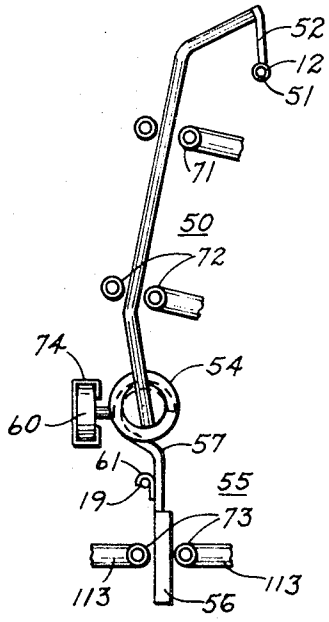

FIG. 11

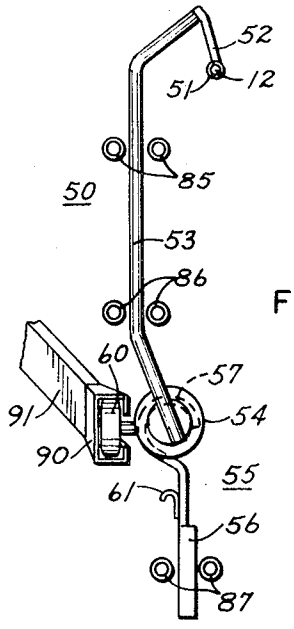

FIG. 12

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WATER SKI TOW SYSTEM OR THE LIKE

This invention relates to towing systems for pulling water skiers or the like about a predetermined course and particularly to an improved loading and unloading apparatus for such system. The present invention is an improvement on the towing system disclosed in my U.S. Letters Pat. No. 3,376,819 issued on Apr. 9, 1968.

The towing system disclosed in my aforesaid patent includes an arrangement for accelerating the skier to bring his speed near that of the main towing cable before he is picked up by that cable. It is desirable that the pickup and unloading operations be smooth and positive in operation and that the equipment shall require minimum servicing or adjustment. Accordingly, it is an object of my present invention to provide a ski tow system having a main tow cable and an accelerating cable and including an improved arrangement for effecting the pickup and drop-off of the skier's towline.

It is another object of this invention to provide in a ski tow system an improved and positive guide and attaching equipment for transferring a skier's towline from an accelerating system to a main tow system.

It is another object of this invention to provide in a ski tow system an improved and positive equipment for disconnecting a skier's towline from the main driving system at the end of the course.

Briefly, in carrying out the objects of this invention in one embodiment thereof, a ski tow system is provided in which the main tow cable has a straight portion running parallel to and above a straight portion of the accelerating cable. A fixture for attaching the skier's towline to the towing cable is constructed to include a hook at its top and a shank for connection to the skier's line. A rotatable guide wheel is mounted on a rigid shaft secured to the fixture adjacent the hook on the closed side thereof and an open channel hook is provided on the shank to rest on the accelerating cable and to be driven by a stop thereon. Pickup bars are attached to and depend from the main cable at spaced intervals, the lower end of the bar having a cone element for engagement with the hook of the ski line fixture. Guide tracks are provided in the loading and unloading zones of the system; these tracks have converging entrance portions to guide the main cable bars and the line fixtures into the pickup and drop-off positions. The guides include channels for confining the guide wheel of the fixture to the respective courses for the loading and unloading operations.

The features of novelty which characterize this invention are pointed out with particularity in the claims annexed to and forming a part of this specification. The invention itself, however, both as to its organization and its manner of operation, together with further objects and advantages thereof, will best be understood upon reference to the following description taken in connection with the accompanying drawings in which:

FIG. 1 is a perspective view of a ski tow system embodying the invention;

FIG. 2 is an enlarged perspective view of the skier acceleration and pickup apparatus of the system;

FIG. 3 is an enlarged perspective view of the skier release apparatus installed at the end of the course of the system;

FIG. 4 is an enlarged perspective view of the main power drive of the system;

FIG. 5 is an enlarged perspective view of the acceleration power drive of the system;

FIG. 6 is an enlarged elevation view of a main cable tow bar and a towline fixture in their position of engagement;

FIG. 6*a* is an enlarged longitudinal sectional view of the clamp for the bar of FIG. 6;

FIG. 7 is an enlarged perspective view of the skier pickup apparatus of the system shown near the beginning of the acceleration course;

FIG. 8 is a view similar to FIG. 7 at the pickup portion of the acceleration course;

FIG. 8*a* is an enlarged side elevation view of the hook attaching cone of FIG. 6;

FIG. 9 is a perspective view similar to FIGS. 7 and 8 showing the release apparatus at the end of the course;

FIG. 10 is a sectional elevation view taken along the line 10–10 of FIG. 7;

FIG. 11 is a sectional elevation view taken along the line 11–11 of FIG. 8; and

FIG. 12 is a sectional elevation view taken along the line 12–12 of FIG. 9.

Referring now to the drawings, FIG. 1 illustrates a water skier towing system embodying the invention and which is arranged to tow a skier around a course within an elongated lake 10 having a plurality of structural steel towers 11 mounted on the shore of the lake and having cantilever arms extending a substantial distance over the lake. These towers support a continuous cable 12 which runs on pulleys provided in the towers and extends continuously along the towers from a loading structure 13 around the lake to an unloading structure 14 from which the cable returns to the tower 13. The cable 12 is moved around the lake at a speed determined by the desired speed for the skiers. The skiers are accelerated to a speed sufficient for their connection to the towline 12 by an accelerating tow system 15 mounted within the loading structure 13, each skier has a towline which may be connected to the cable 12 and is thereby drawn around the lake by holding the towline and allowing the cable to pull him along. At the end of the course, the towline enters the unloading structure 14 and the skier releases the towline, the line connector being detached at this point and then returned in any suitable manner to the loading structure 13.

The general arrangement of the loading structure 13 as shown in FIG. 2 comprises a main overhead steel structure 16 in which is mounted the acceleration cable and driving system 15 and at the rear of which is a second steel structure 17 which contains the motor and driving system for the main cable 12. A water channel 18 is provided from the lake 10 so that the skier may be picked up as he passes under the acceleration structure and may then continue around the lake on the cable 12.

The acceleration system 15 comprises an acceleration cable 19 driven by a motor assembly 20 comprising an accelerating motor and a brake together with a takeup or tension holding mechanism 21 which maintains the required tension on the acceleration cable. The drive system for the cable 12 comprises a motor and main drive pulley assembly 22 mounted in the steel structure 17.

The unloading structure 14 comprises a steel frame structure 23 having its foundation on the land adjacent a short landing channel 24 arranged in alignment with the cable 12. Cable passes over a pulley 25 in the structure 23 and the tension of the main cable is maintained by a tension system including a sliding head 26 a weight 27 and connecting cables 28 passing over pulleys 30 mounted on a horizontal shaft at the corner of the steel structure. The mechanism for releasing the skiers' towline is supported from the upper portion of the steel structure 23 as indicated at 31 and is arranged to remove the skiers' towline from the main cable as the connecting fixture of each line passes through the device 31.

The main driving assembly as illustrated in FIG. 4 comprises a main electric motor and speed reducer assembly 32 connected through a shaft 33 to a gear reducer 34 which drives a pulley 35 on an axis at right angles to the shaft 33. The drive pulley for the cable 12 as indicated at 36 is driven by the pulley 35 through V-belts 37 and a driven pulley 38 connected by a shaft 40 to the pulley 36. This equipment mounted in the steel structure 17 is arranged to maintain the main cable 12 in continuous operation at the preselected speed.

Referring now to FIG. 5, the accelerating cable is driven by a pulley 41 through a shaft 42 connected to a pulley 43 driven by a motor 44 through a pulley 45 and V-belts 46. The motor 44 is the acceleration motor of the system and is stopped in its predetermined start position at the end of each accelerating period by actuation of a solenoid brake 47. Pulley 45 is connected to be driven by the motor 44 through a right angle gear box 48. Attached to the cable 12 are a plurality of towline

connectors or hook bars 50, a number of which are illustrated in FIG. 1 and an enlarged view of one of which is shown in FIG. 6. Each hook 50 comprises a clamp 51 by which it is securely attached to the cable 12, a clamp arm 52 and a bow-shaped hook member 53 having a pickup cone 54 secured to its lower end with its axis parallel to the cable 12. Each of the skier towlines is provided with an attaching hook fixture 55 shown in FIG. 6 and which comprises a body portion 56 and an upwardly extending hook element 57 having its hook opening downwardly and away from the hook bar 53 and of a size and configuration to fit over and drop into an annular recess in the cone 54. Extending from the closed side of the hook 57 is a stub shaft 58 on which is mounted a freely rotatable pulley 60 which, in a manner to be described below, is arranged to travel in guide chutes during the loading and unloading operations of the system. The hook shaft 57 is provided with a downwardly opening hook element 61 which is positioned to engage the acceleration cable at the start of the ride when the skier is being brought up to speed for connection to the main cable 12. A skier towline 62 is attached to an eye 63 at the bottom of the body 56.

As illustrated in FIG. 6*a* the clamp 51 is of cylindrical configuration and comprises two half cylinders 64 and 65 providing complementary halves of a bore of dimensions to fit tightly about the cable 12. The halves have recesses 66 and 67, respectively, near their ends providing two shallow annular grooves about the cylinder in which high tensile strength steel bands 68 are located and bonded together to securely hold the clamp on the cable. The clamp arm 52 is an integral portion of the half 68 of the clamp 51. The steel bands 68 may be of the mechanically connected type commonly used for steel strapping equipment employed for packaging and crating. This construction of the clamp provides secure attachment of the hanger bars 53 to the cable 12 while, at the same time, affording ready removal and relocation or servicing of the bars.

During the operation of the system, when a skier is ready to start his ride, he stands in the shallow water to the left of the steel structure 16 in FIG. 2 while the hook fixture of his towline is placed on the accelerating cable by the operator stationed in the upper portion of the structure, who places the hook 61 of the skier's towline fixture on the accelerator cable 19 immediately in front of a stop 70. The stop 70 is constructed in essentially the same manner as the clamp illustrated in FIG. 6*a* except that it has no projection such as the arm 52 of the hook bars 50. The accelerator cable 19 is stopped in the same position after each skier acceleration operation, the solenoid brake 47 being actuated automatically for this purpose. Automatic controls (not shown) and not necessary to an understanding of the present invention are employed for synchronizing the starting of the acceleration system so that the skier is brought up to the desired predetermined speed at the time that one of the hook bars 50 is passing a point in the course of the acceleration cable where the bar picks up the hook fixture on the skier's towline. As soon as the acceleration system is started in this manner, the skier begins his movement forward and is accelerated as he moves down through the channel 18. FIG. 7 illustrates the hook bar 50 and the ski towline fixture 55 before engagement as the two parts are moving toward the right, the bar attached to the cable 12 and the fitting 55 hooked on the cable 19. In this position, the bar 50 and fitting 55 are held in predetermined horizontal and vertical relationship by positioning pulleys 69 for the cable 12, one of which is shown, pairs of guide bars 71 and 72 for the hook bar 50, a pair of guide bars 73 for the body 56 of the fixture 55 and a channel guide 74 for the wheel 60 of the hook 57. As shown in this figure, the guides 71 and 72 are flared outwardly at the left end where the bar 50 enters the guides, the flares being indicated at 75 for the guide 71 and at 76 for the guides 72. In a similar manner, the guides 73 are provided with entering portions comprising a flared portion 77 on the near guide track, the rear track being straight, this being the position where the operator places the fixture 55 to start the skier's run. The operator at the same time inserts the wheel 60 into the guide 74 through a flared or funnellike opening end portion 78. The guide 74 throughout its length as a central longitudinal opening 80 which affords passage of the shaft 58 of the wheel 60. In the position of FIG. 7, the hook bar 50 and the fixture 55 are moving along predetermined paths with the pickup cone 54 of the bar 53 out of alignment with the hook 57 and moving in a path to the right of the hook as viewed in FIG. 7. Toward the central portion of the guideway, the guide tracks 71 and 72 are displaced rearwardly or to the left as shown in FIG. 8 and this brings the cone 54 into alignment with the hook 57 so that the bar 53 traveling at a greater speed than the accelerator fitting 55 engages the hook 57 of the fitting which seats in an annular groove 81 immediately in front of a raised guard ring 82 formed on the cone 54. These features of the cone construction are illustrated in FIG. 8*a*. The cone 54 and hook 57 are now in engagement and the skier is brought to the full speed of the cable 12. Immediately after the hooking position has been passed, the wheel 60 passes out of the end of the guide channel 74 and then the guide tracks 71 and 72 bend to their original position of alignment so that the hook 61 is disengaged from the cable 19 and when the bar 53 and fitting 55 reach the ends of the guide tracks 71, 72 and 73, the members are in the position essentially as shown in FIG. 6.

The skier is then towed around the entire course shown in FIG. 1 until he reaches the end of the course when the towline fixture 55 and hook 50 enter the takeoff or unloading structure 14 and the bar 53 enters flared openings or gates 83 and 84 of upper and lower spaced guide tracks 85 and 86 shown in FIG. 9 and which are rigidly supported in the structure 14. At the same time, the body 56 of the towline fixture 55 enters spaced guide tracks 87 through flared portions 88 thereof. The cable 12 is positioned vertically by spaced pulleys 89, one of which is shown in FIG. 9. After the bar 53 and the body 56 are held in alignment by the tracks 85, 86 and 87, the wheel 60 of the fixture 55 enters a flared funnel or entranceway 90 of a channel guide 91 which is of similar construction to the guide 80 of FIGS. 7 and 8. The guide 91 is positioned to extend upwardly and away from the guide tracks 85 and 86 so that the wheel 60 is moved upwardly and away from the tracks and this movement withdraws the hook 57 from the groove 81 in the cone 54 and disengages the fixture 55 from the cone. The skier has now reached the end of his run and releases the towline 62. The fixture 55 is retrieved from the guide 91, either manually or automatically, and is then returned to the starting position for use by another skier.

The supporting arrangements for the guide tracks and the hook positions as illustrated in FIGS. 7, 8 and 9 are shown in FIGS. 10, 11 and 12, respectively, which show the relationships of the elements of these structures in each of the three positions illustrated. The alignment guide assemblies illustrated in FIGS. 7 and 8 are securely attached to the cross-beams of the overhead steel structure 16 of the loading structure 13 one of which horizontal beams is illustrated at 95 in FIG. 10, the track or alignment assembly is thus supported at intervals along the loading structure. At each support, there is provided a bracket comprising horizontal channels 96 and 97 which are rigidly secured to the beam 95 and vertical channels 98 and 100 attached to the beam and the channels 96 and 97, respectively, and braced laterally by angle braces 101 and 102 extending from the bottom ends of the uprights 98 and 100 to the outer ends of the channels 96 and 97, these are the portions having been broken away as they are not necessary for purposes of illustration. The upper guide tracks 71 and the lower tracks 72 for the assembly 50 are mounted on brackets 103 and 104 extending laterally from the channels 98 and 100, respectively, the brackets 103 and 104 have end straps 105 and 106, respectively, which are welded or otherwise rigidly attached to the brackets and provide the bases on which the tracks 71 and 72 are supported. In a similar manner the lower alignment track 73 are secured to the channels 98 and 100 by brackets 107 and 108, respectively, and the guide channel 74 for the wheel 60 is supported on lateral brackets 109 secured to the channel 98.

As shown in FIG. 10, the cable 12 rides on the pulley or idler 69 and the pickup cone 54 moves below the guide track 72 to the right of the path of the hook assembly 55 the wheel 60 which rides in the channel 74. The view in FIG. 10 is somewhat diagrammatic in that the flared exit ends of the guides 71 and 72 which are horizontal portions 111 and 112, respectively, are illustrated but not the laterally bent portions of the guides 71 and 72 as appearing in FIG. 8, these having been omitted to avoid complication of the illustration.

In FIG. 10, the pickup cone 54 is moving in a path to the right and parallel to the path of the hook 57 of the assembly 55. When the hook assembly passes into the laterally offset portions of the guides shown in FIG. 8, the assembly 50 and hook assembly 55 move into the position illustrated in FIG. 11 and it is in this zone that the hook assembly 50 is controlled to overtake and pick up the hook 57. And immediately thereafter the channel guide 74 terminates and the guides 71 and 72 bend back toward their original position as shown in FIG. 10 which results in rotation of the hook assembly 50 about the cable 12 as a center whereupon the assembly 55 is lifted slightly and moved to the right whereupon the cable 19 snaps out from under the hook 61 and frees the skier from the acceleration cable. The skier now proceeds at the speed of the main cable, the hook assembly passing out beyond the flared portions of the guide tracks, the body 56 of the hook assembly 55 also passing out through corresponding flared guide portion 113 at the outer end of the guide 73. The skier now proceeds around the course and as he approaches the unloading tower 14 the hook bar assembly 50 and hook assembly 55 enter into the guides 85, 86, 87 and 91 as shown in FIG. 12, the wheel 60 being shown as it enters the funnel portion 90 of the guide 91. As the assembly is drawn along the wheel 60 proceeds outwardly away from the line of the cone 54 and upwardly and the hook 57 is released from the recess 81 in the cone assembly 54. The skier may drop off at any time during this unloading period and the hook assembly 55 on his towline is then collected by the channel guide 91 and is returned to the loading structure 13. The guides 85, 86, 87 and 91 shown in FIGS. 8 and 12 are supported from the unloading structure in essentially the same manner as the loading guide is supported on the structure 13 as illustrated in FIG. 10.

The guiding structures as described provide an arrangement for supporting the hook assemblies and guiding them in a positive manner so that the skier may be accelerated to a speed near that of the main cable and be picked up by the main cable and securely held in the towing position until the skier has covered the entire course and has reached the unloading zone where he may drop his towline and the hook assembly attached to this towline is effectively detached from the hook bar assembly of the main cable to be ready for its next use.

I claim:

1. In a system for towing water skiers and the like over the surface of a body of water and comprising a main towing cable arranged about a predetermined ski course and an accelerating cable having a straight portion parallel to a straight portion of the main cable and means for driving said cables whereby the accelerating cable may be operated to approach the speed of the main cable, a loading system comprising a rigid bar attached to and suspended from said main cable, a hook engaging element secured near the lower end of said bar, a towline hook, a towline secured to said hook, a guide member extending laterally from said hook, a hanger on said hook for engaging the accelerating cable, a stop on said accelerating cable for engaging said hanger, a first stationary guide means adjacent said straight portion of said main cable for holding said bar in a fixed course parallel to said accelerating cable, and a second stationary guide means adjacent said straight portion of said accelerating cable for holding said guide member in a fixed course with said hook adjacent the course of said bar, and means for moving said hook and said hook engaging element in the same path whereby said element overtakes and engages said hook and said towline is picked up by said main cable, said guides being of lengths for releasing said bar and said guide member after engagement of said element and said hook.

2. In a system for towing water skiers and the like a loading system as set forth in claim 1 wherein said means for moving said hook and hook engaging element in the same path includes laterally offset portions of said first stationary guide means for moving said bar to position said hook engaging element in the path of said hook.

3. In a system for towing water skiers and the like a loading system as set forth in claim 2 wherein said first stationary guide means is shaped to return to its original guide path for releasing said hanger from said accelerating cable and thereby releasing said hook therefrom.

4. In a system for towing water skiers and the like a loading system as set forth in claim 1 wherein said guide member on said hook comprises a rigid shaft secured to the towline hook and a freely rotatable wheel mounted on the end of said shaft for rotation about the axis of said shaft, and wherein said second stationary guide means comprises a chute having a longitudinal opening extending toward said hook and positioned to receive and guide said wheel with said shaft extending through said longitudinal opening.

5. In a system for towing water skiers and the like a loading system as set forth in claim 1 including unloading means positioned adjacent the end of the course of said main cable for releasing said hook from said hook engaging element.

6. In a system for towing water skiers and the like a loading and unloading system as set forth in claim 5 wherein said guide member on said hook comprises a rigid shaft secured to the towline hook and a freely rotatable wheel mounted on the end of said shaft for rotation about the axis of said shaft, wherein said second stationary guide means comprises a chute having a longitudinal opening extending toward said hook and positioned to receive and guide said wheel with said shaft extending through said longitudinal opening and wherein said hook opens on the side opposite said wheel and wherein said releasing means adjacent the end of the course comprises a second chute having an opening on its side toward said hook and extending upwardly and horizontally away from the line of travel of said cable whereby said hook is moved out of engagement with said hook engaging element.

7. In a system for towing water skiers and the like a loading and unloading system as set forth in claim 5 including longitudinal guide members adjacent the ends of the course for holding the hook and bar in predetermined positions and wherein said guide members are flared away from the course at their inlet ends of the guide members to provide funnellike openings for receiving the moving hook and bar.

8. In a system for towing water skiers and the like a loading and unloading system as set forth in claim 7 wherein said guide members comprise pairs of spaced tracks the tracks of each pair flaring away from one another near their ends to provide said funnellike openings.