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HYDRAULIC SHOCK ABSORBER TOW BAR STRUCTURE

Filed March 17, 1961

FIG. 1

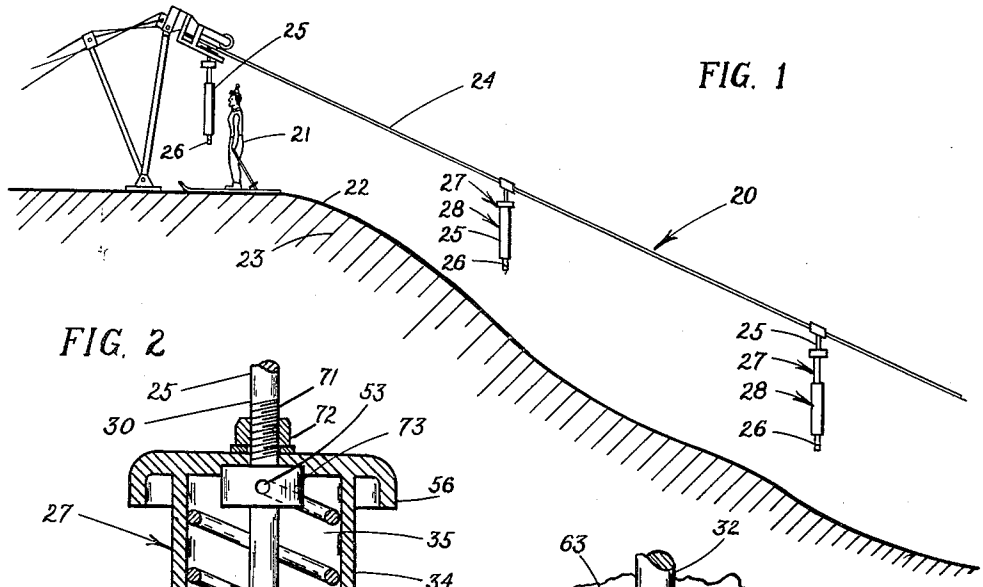


FIG. 2

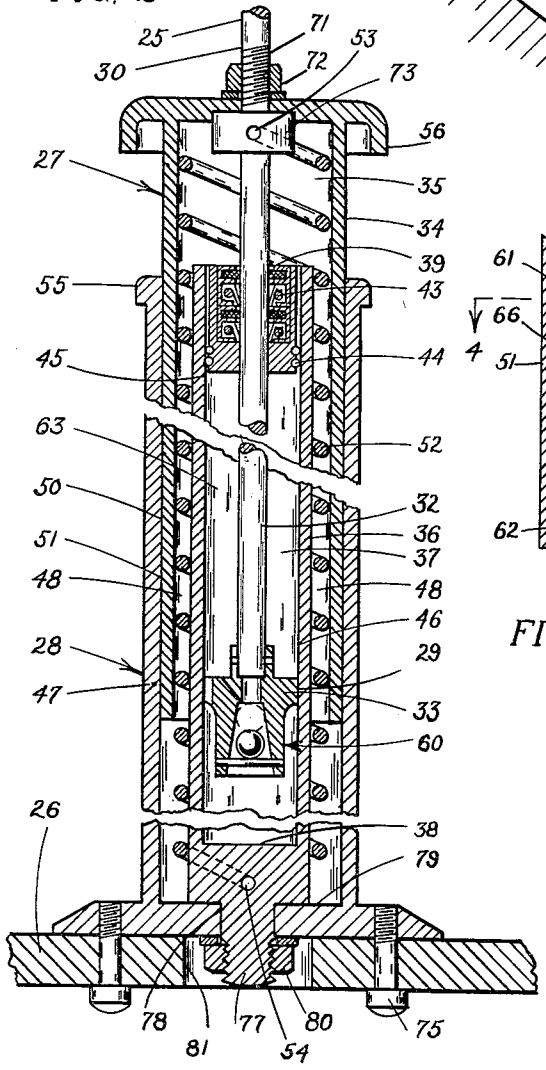


FIG 3

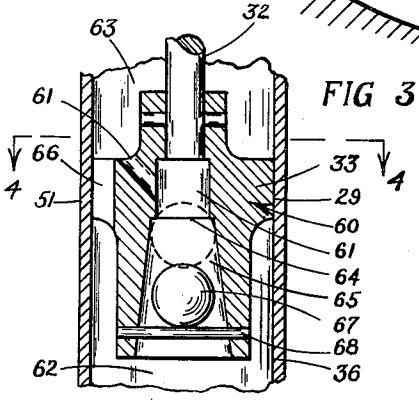
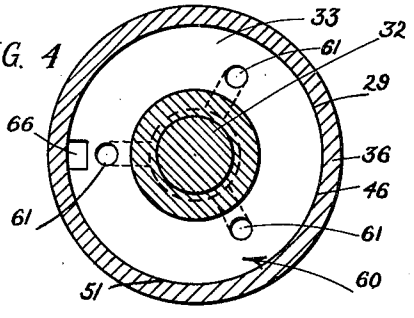


FIG. 4



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HYDRAULIC SHOCK ABSORBER TOW BAR STRUCTURE

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This invention relates to ski lifts of the tow type in which the bars may be of T, J or other shape.

In the conventional ski tow, the tow bars depend from the tow and are telescopable in order that the occupant may remain in contact with the ground despite changes in contour thereof. The telescopable tow bars have included a tension coil spring for normally contracting the bar and creating a spring load to permit the bar to expand as necessary to support the skier on the ground while towed up an incline.

A disadvantage of the conventional ski tow and tow bar has been the fact that many skiers, when arriving at the top of the incline, have released their weight from the bar in such manner as to cause undue rapidity of spring contraction. The succession of contraction impacts, wherein the lower portion of the bar has snapped upwardly into contact with the upper portion has tended to fatigue the metal of the bar to the point of breakage. This tendency to fatigue and fracture is aggravated by the brittleness of the metal in the cold areas where ski tows are located and by the rust deterioration caused by the outdoor location of ski tows in mountainous areas having considerable precipitation.

The object of this invention is to provide a ski tow with telescopable, spring loaded tow bars, each having a single acting, fluid shock absorber for absorbing the impact of contraction and each constructed to withstand the moisture, cold and treatment typical of ski areas.

Another object of the invention is to incorporate a simple, rugged, springless, ball valve mechanism into a telescopable tow bar for creating a dash-pot absorber, whereby no parts subject to fatigue or likely to deteriorate in cold weather are added to the bar to form a shock absorber.

A further object of the invention is to provide a pair of concentric plunger members upon which a pair of concentric, cylinder members are slidable, the opposite inside members forming a shock absorber and the opposite outside members serving the dual purpose of a sliding seal and a sliding guide for preventing breakage of the bar.

Other objects and advantages of the invention will be apparent from the claims, the description of the drawing and from the drawing in which:

FIG. 1 is a side elevation of a ski tow with tow bars constructed in accordance with the invention.

FIG. 2 is an enlarged, sectional, side elevation of the plunger and cylinder portion of one of the tow bars shown in FIG. 1.

FIG. 3 is a fragmentary, further enlarged, sectional view of the valve mechanism and piston head shown in FIG. 2, and

FIG. 4 is a plan view on line 4—4 of FIG. 3.

As shown in FIG. 1, the ski tow 20 is designed to tow, rather than carry, a number of individual skiers 21 successively up the inclined face 22 of a hill or mountain 23. The contour of the face 22 is usually irregular, with depressions and mounds and the tow 24 is usually of metal cable, substantially in parallelism with the incline. The tow bars 25 are, therefore, telescopable and normally spring loaded into contracted position. The weight of a skier occupant on a tow bar 25 causes the bar to expand in length and during travel up the inclined face 22, the

bar will continually expand and contract in length to conform to the contour while the skier 21 is towed up the incline riding on his skis. As indicated at the left of FIG. 1, when the skier 21 arrives at the top of the incline and releases his weight from the support 26 of his tow bar 25, the bar 25, in conventional structures, has tended to snap into contracted position under the urging of the coil spring thereby eventually tending to break the bar or the spring.

In this invention, as best shown in FIG. 2, the terminal end 30 of each tow bar 25, depending from the tow 24, includes a unitary, dash-pot plunger member 27 upon which a unitary, dash-pot cylinder member 28 is slidably telescopable, the member 28 having a suitable support 26 for a skier occupant. The tow bar 25 may be of the well known T shape or J shape or any other desirable configuration suitable for towing a skier along a surface.

The unitary, dash-pot plunger member 27 includes an elongated central piston rod 32, terminating in an enlarged piston head 33, and a first guide tube 34 concentrically spaced from the rod 32 to form an annular space, or chamber 35, therearound.

The unitary, dash-pot cylinder member 28 includes an elongated, central, piston cylinder 36, having a piston chamber 37 slidably receiving the piston head 33, the chamber 37 being closed at each opposite end 38 and 39. The upper end 39 of piston cylinder 36 includes packing 43 and O rings 44 for sealing the hydraulic fluid medium in the chamber while permitting the piston rod 32 to reciprocate in the bore 45. The outer face 29 of the piston head 33 is in sliding engagement with the inner face 46 of the piston cylinder 36. The cylinder member 28 also includes a second guide tube 47 concentrically spaced from piston cylinder 36 to form an annular space 48 therearound which space is substantially coextensive in area and length with the annular space 35. The interior face 50 of the second guide tube 47 is in close sliding engagement with the exterior face 51 of the first guide tube 34 to serve the dual purpose of sealing the interior against the admission of moisture while reinforcing the structure against breakage, especially when in expanded, or nearly expanded position.

A tension coil spring 52 encircles the piston cylinder 36, occupying the overlapping annual spaces 35 and 48 and within the confines of the first and second telescopably slidable guide tubes 34 and 47. One end 53 of spring 52 is fixed to the plunger member 27 and the other end 54 is fixed to the cylinder member 28 whereby the member 28 is normally spring loaded into contracted, telescoped position relative to the plunger member 27.

In addition to the atmospheric seal of the cooperating, reciprocable, dash-pot members 27 and 28, formed by the opposite outer guide tubes 34 and 47, the second guide tube 47 is provided with an enlarged upper rim 55 which seats within an enlarged upper cap 56 on the first guide tube 34. Thus each tow bar which is not in use, and all tow bars, when the ski tow is idle, are protected from the atmospheric elements by the coverage and seal afforded by cap 56 and the outside guide tube 47. This of course protects the opposite inner elements, piston rod 32 and piston cylinder 36, from rust and lengthens the useful life of the entire tow bar structure.

Single acting hydraulic shock absorbed mechanism 60 is provided in piston head 33 for cushioning the impact of contraction of each bar 25 without constituting an additional element subject to breakage and deterioration. Mechanism 60 includes a conduit 61 in the head 33 leading from one side 62 of chamber 37 to the other side 63 thereof, the conduit 61 terminating in a ball seat 64 and a ball cage 65 in the chamber 62. Mechanism 60 also

includes at least one groove **66** in the exterior face **51** of piston head **33** leading from one side **62** of chamber **37** to the other side **63** thereof. The ball **67** is normally in the downward position in cage **65**, resting on the cross bar **68** as the cooperating dash-pot members **27** and **28** reciprocate relative to each other to conform to ground contours. However, when the bar **25** is relieved of the weight of a skier **21**, the sudden onrush of hydraulic medium from the side **62** of chamber **37** through conduit **61** into the side **63** causes the ball **67** to seat firmly in ball seat **64** and close conduit **61**. The conduit **61**, remains closed during the remainder of the spring contraction and the hydraulic medium flows only through the groove **66** at a predetermined relatively slow rate to reduce the contraction impact.

Upon complete contraction of the tow bar **25**, the flow of hydraulic medium ceases and the gravity actuated ball **67** again drops downwardly to rest on the cross bar **68**.

For convenience of assembly the terminal end **30** of tow bar **25** may be threaded at **71** for a threaded nut **72** and a threaded collar **73** with the end **53** of the coil spring **52** inserted in a suitable hole in collar **73**. Similarly, the other end **54** of the spring **32** may be inserted in a suitable hole in the end **38** of cylinder **36**. The closed lower end **38** of piston cylinder **36** includes an integral stud **77**, received in a suitable hole **78** in the closed end **79** of the guide tube **47**, a nut **80** being threaded on the stud for clamping the parts into a unitary assembly. Support **26** is suitably countersunk at **81** to accommodate the nut **80**.

In FIGURE 1, the tow bar **25**, at the right of the figure, is shown in expanded condition as though just released by a skier not shown.

We claim:

1. In a ski lift of the tow type, the combination of a plurality of tow bars spaced along said tow; a unitary, dash-pot plunger member fixed to the terminal end of each said tow bar, each said plunger member including a central piston rod terminating in an enlarged piston head and a first guide tube concentrically spaced from said rod to form an annual space therearound; a cooperating, unitary, dash-pot cylinder member, reciprocable on said plunger member, said cylinder member including a central piston cylinder having a chamber slidably receiving said piston head and a second guide tube concentrically spaced from said piston cylinder to form an annual space therearound, the interior face of said second guide tube slidably engaging the exterior face of said first guide tube; a tension coil spring encircling said piston cylinder, in the annular space therearound for spring loading said cylinder member into normally contracted telescoped position relative to said plunger member and a single acting hydraulic shock absorber mechanism in said piston head and limiting the flow of hydraulic medium from one end of said chamber to the other for absorbing the impact of contraction induced by said coil spring.

2. A combination as specified in claim 1 wherein said single acting hydraulic shock absorber mechanism comprises a central conduit through said piston head terminating in a ball seat and ball cage; a gravity actuated ball in said cage normally spaced from said seat but movable upwardly thereinto by excessive flow of fluid into said conduit and at least one exterior groove in said piston head for passing fluid relatively slowly thereby when said ball is seated and closing said central conduit.

3. A combination as specified in claim 1 wherein said second guide tube on said cylinder member includes an enlarged upper rim and said unitary plunger member includes a cap at the upper end thereof, slidably receiving and encircling said rim, for sealing said second guide tube against admission of moisture in telescopably contracted position.

4. In a ski lift of the tow type, the combination of a plurality of spaced, spring loaded, tow bars depending from said tow, telescopable guide means on each said tow bar including a unitary, dash-pot, plunger member, comprising a central piston rod concentrically encircled by a first guide tube; a unitary, dash-pot cylinder member, comprising a central piston cylinder concentrically encircled by a second guide tube; said central piston rod having a piston head slidable within said central piston cylinder and said first guide tube closely fitting within said second guide tube to constitute a sliding seal, and single acting hydraulic, shock absorber mechanism associated with the said opposite piston head of each said spring loaded tow bar for reducing the impact of contraction thereof when released by an occupant.

5. In a sk lift of the tow type, the combination of a plurality of spaced spring-loaded, telescopable tow bars, each depending from said tow and terminating in a support for an occupant; spring load means on each said tow bar for urging the same into normally contracted position but permitting expansion by the weight of an occupant to conform to ground contours and single acting, hydraulic shock absorber mechanism, mounted on each said tow bar for reducing contraction impact upon release of the weight of an occupant, said mechanism including a central piston and cylinder enclosed within outer, concentric, reciprocable, guide tubes for slidably sealing said mechanism from the atmosphere.

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