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Bancel

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[54] **PULLEY DEVICE ADAPTED FOR USE IN A SKI TOW INSTALLATION**

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[52] **U.S. Cl.** ..... **104/197,** 74/230.3, 74/230.5, 74/230.13, 104/173 ST

[51] **Int. Cl.** **B61b 7/10,** B61b 11/00

[58] **Field of Search** ..... 104/173 ST, 182, 197; 295/9 R; 74/230.3, 230.5, 230.11, 230.13

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[57] **ABSTRACT**

A pulley device adapted for use in a ski tow installation. The device comprises a pulley having a hub supported on an axle adapted to be mounted on a support pole, a web and a grooved rim which receives the cable for pulling the loads through the intermediary of tow bars. An annular flange is provided on at least one side of the groove and is mounted for rotation on the web by means of rollers supported on roller bearings forming a circular rolling path. Each of the rollers has a groove for receiving the rounded inner edge of the annular flange. The periphery of the flange includes teeth forming cut-outs for receiving the bars.

10 Claims, 9 Drawing Figures

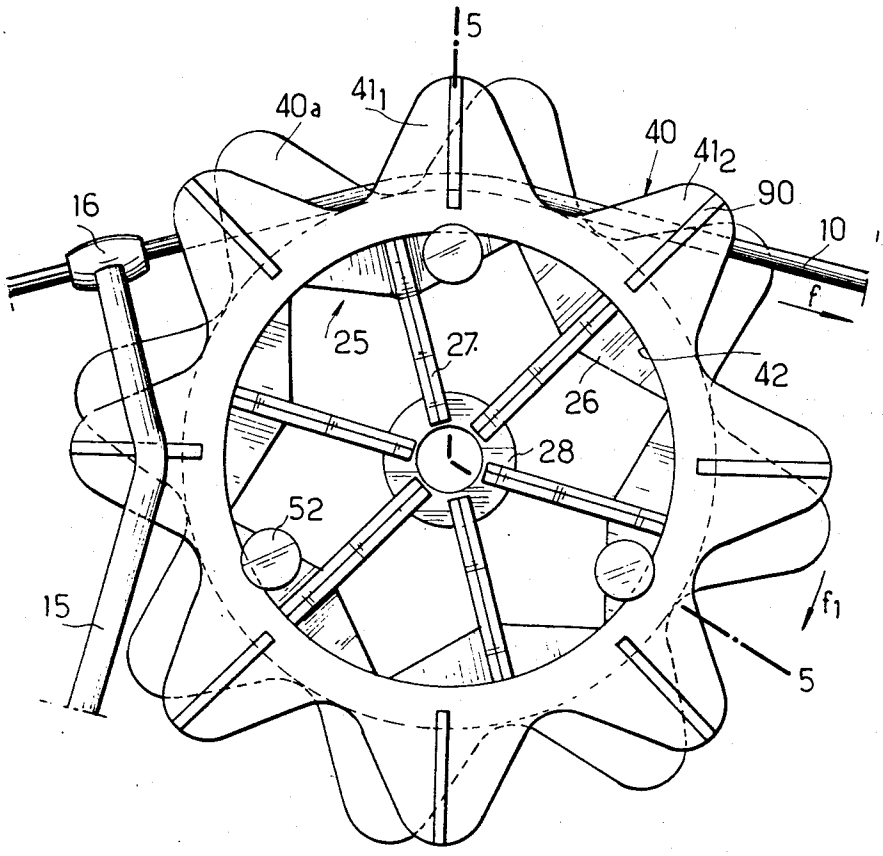


Fig-1

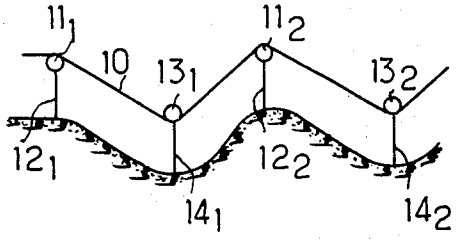


Fig-2

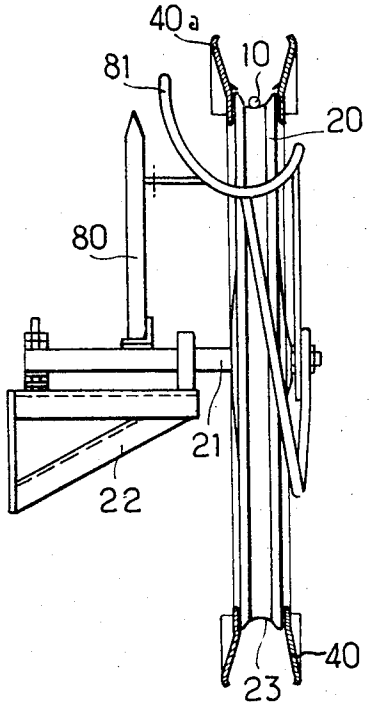


Fig-3

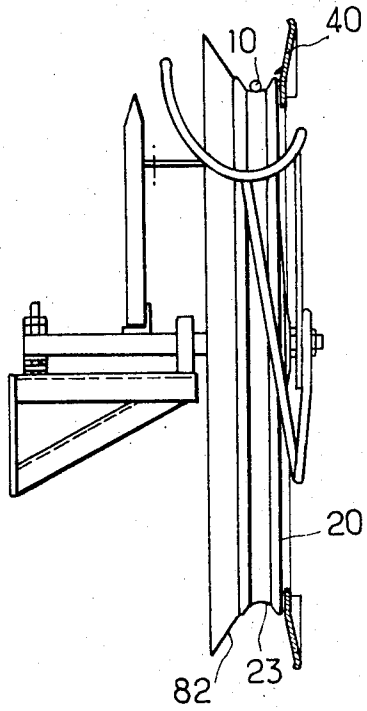


Fig-4

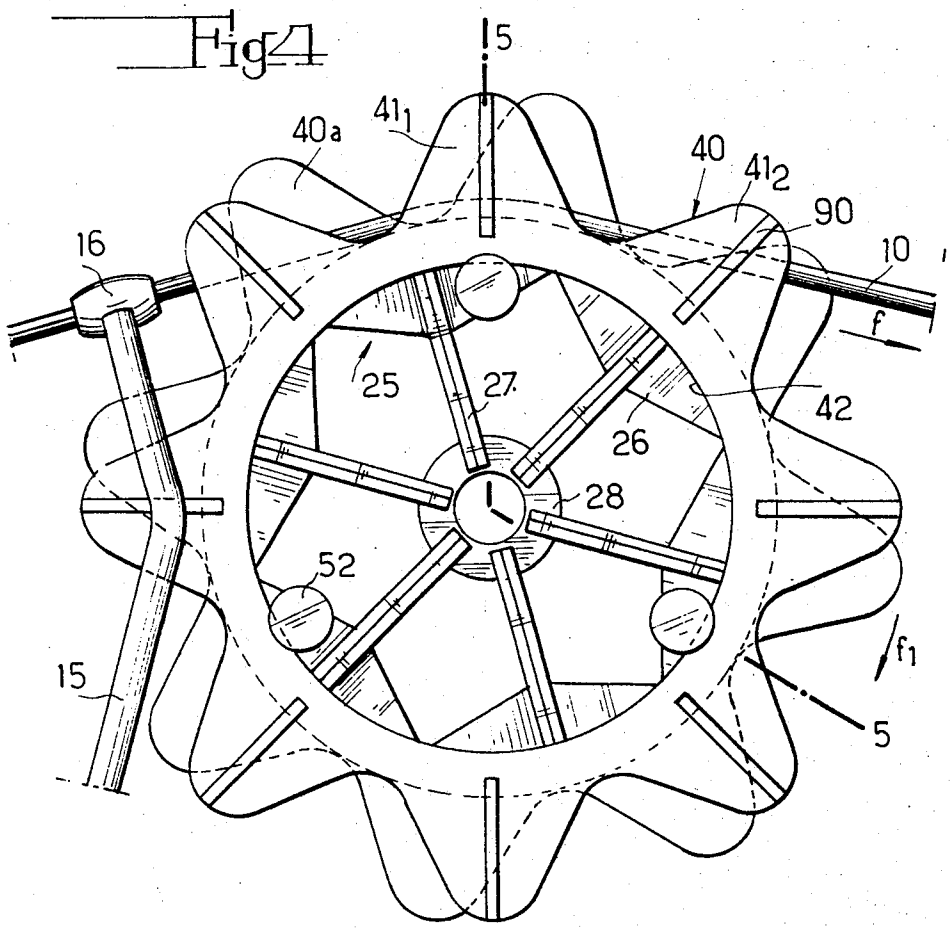


Fig-9

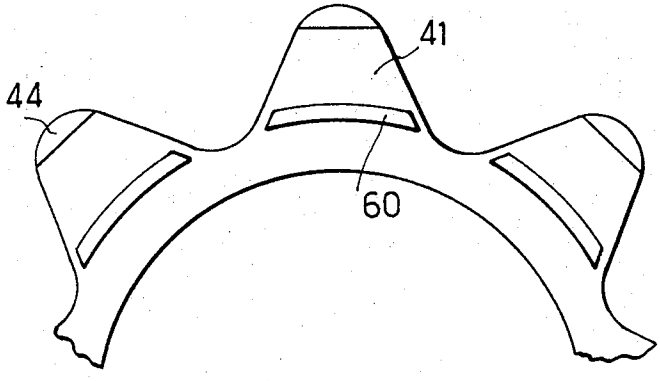
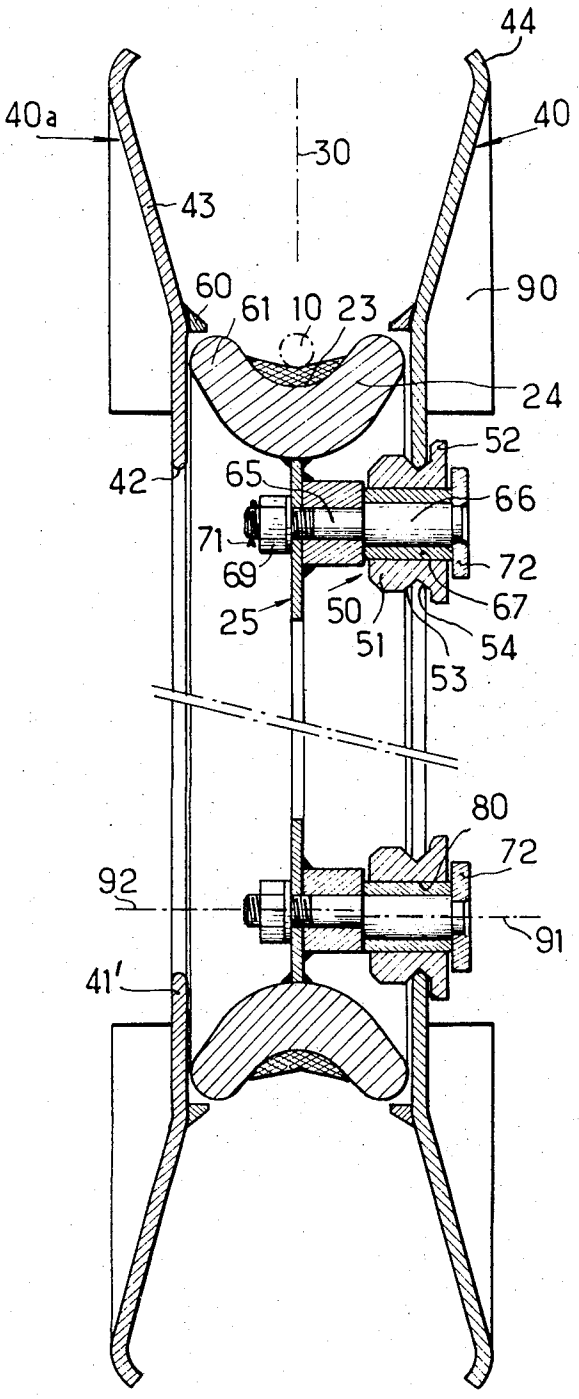


Fig-5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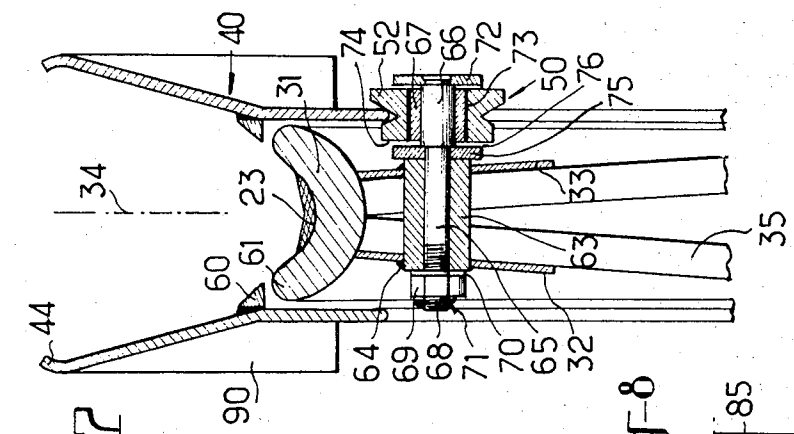

Fig-7

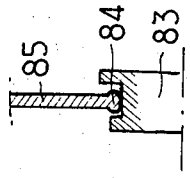

Fig-8

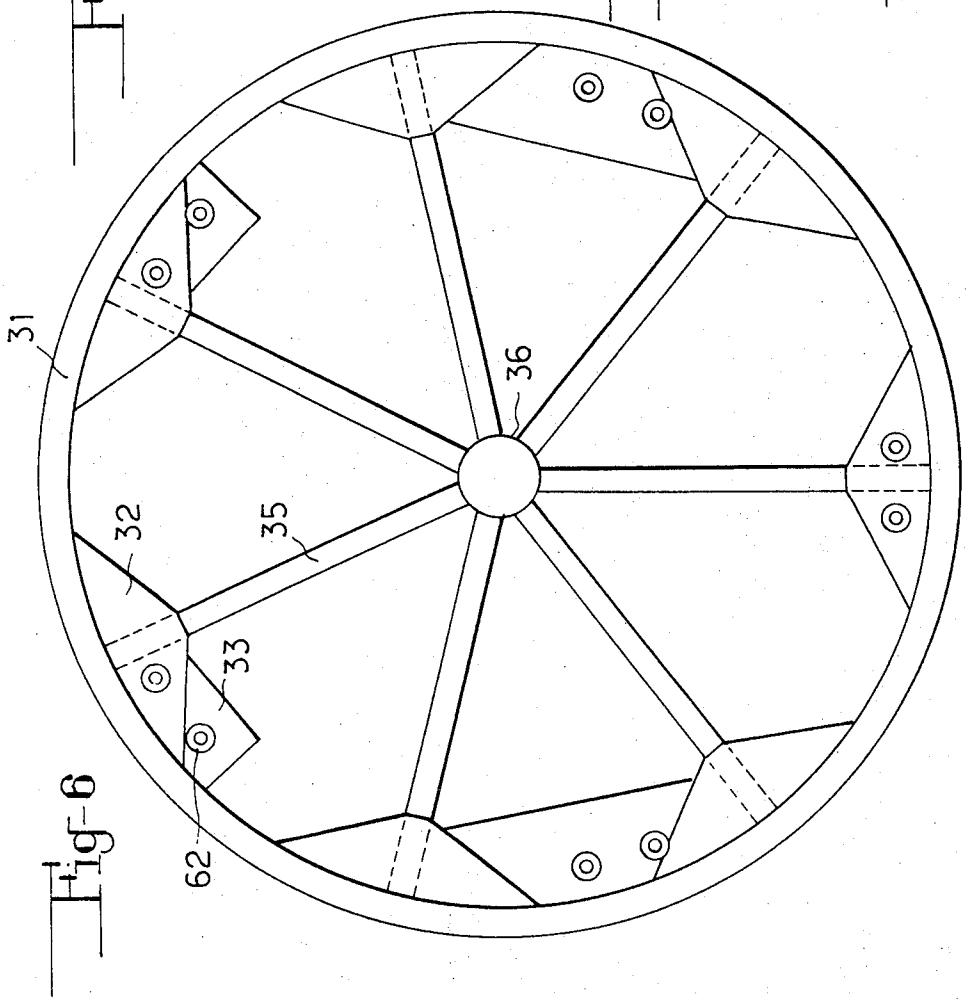

Fig-6

PULLEY DEVICE ADAPTED FOR USE IN A SKI TOW INSTALLATION

The invention relates to a pulley device comprising a pulley mounted for rotation about its hub and having a grooved rim for receiving a cable adapted to pull a load, in particular a ski tow cable, at least one side extending the groove per se and mounted for rotation with respect thereto.

In a load-pulling installation such as a ski tow, a tow cable passes most often at the upper part of a pulley, sometimes at the lower part, according to the grade of the terrain and the height above the ground of the support poles carrying pulleys. It is not unusual for a cable to come off a guiding pulley, owing to changes in the load suspended from the cable, for example in the case of a ski tow, on the sudden departure from a seat during the run, or because of forces exerted on the cable due, for example, to sudden changes in climatic conditions such as gusts of wing or the like.

An object of the invention is to provide an improved pulley device which completely eliminates such occurrences, which is of a simple construction, inexpensive, and capable of being constructed by modifying existing pulleys without it being necessary for the rest of the installation to undergo any transformation, namely the support poles.

It is a further object of the invention to provide an improved pulley which does not require changes in the securing means for the members from which the loads are suspended, in particular the bars bent at their upper ends for the skiers to grab onto in a ski tow installation.

It is also an object of the invention to provide an improved pulley in which there is no slipping between the cable and the grooved rim and therefore does not bring about wear of the cable or pulley.

A still further object of the invention is to provide such an improved pulley device which is free of risk and which is therefore not a new source of accidents.

The pulley device according to the present invention comprises means angularly distributed about the drum of the pulley for forming a circular path of travel in the rim of generally annular shape having an outer periphery with a cut out adapted to receive an arm or the like by means of which the cable exerts its driving action on the load.

The invention will become more fully understood by the description which follows by way of example with reference to the accompanying drawings in which :

FIG. 1 is a diagrammatic showing of the general organization of a cable guiding device for pulling loads ;

FIG. 2 is a side elevation view of a pulley device according to the invention in a first embodiment ;

FIG. 3 is a view similar to that of FIG. 2 for another embodiment ;

FIG. 4 is a front elevation view of a pulley device according to the invention ;

FIG. 5 is a view in section taken along line 5—5 of FIG. 4 on a larger scale ;

FIG. 6 is a front elevation view of a pulley adapted to be provided with means according to the invention ;

FIG. 7 is a partial view in section of a pulley according to FIG. 6 provided with means according to the invention ;

FIG. 8 is schematic detail of another embodiment of the improved pulley according to the invention ; and

FIG. 9 is a partial view of the periphery of a rim for a pulley device according to the invention.

Referring to FIG. 1 of the drawing, therein is seen a cable **10** of a cable guiding device adapted to pull loads, for example ski tows, the cable **10** passage in a known way over pulleys 11_1, 11_2, etc., placed at the top of support poles 12_1, 12_2, etc., erected at intermediary or high points of the terrain and possibly on pulleys 13_1, 13_2, etc., carried by support poles 14_1, 14_2, etc., erected at low points ; the bars or cross members **15** by which skiers are pulled are fixed to the cable **10** driven by a motor (not shown) usually in a releasable manner by sleeves **16.**

A pulley shown is FIGS. 2 and 3 at **20** is mounted for rotation about an axle **21** carried by a bracket **22** on a support pole **12** or **14,** and the pulley has a groove **23** for receiving the cable and comprises, for example, a torus-shaped member **24** (FIG. 5) welded to a central web **25,** which is preferably cut out, the web **25** constituting gusset plates **26** which are connected by arms or spokes **27** to the hub **28.**

In the embodiment of FIGS. **4** and **5,** there are six gusset plates **26** and six spokes **27** (this number is of course in no way and) the gusset plates are placed in the plane of symmetry **30** of the pulley perpendicular to the axis of rotation.

In the embodiment of FIGS. **6** and **7,** a torus-shaped member **31** forms the grooved rim of the pulley and is advantageously secured by welding to the gusset plates **32** and **33** placed on each side of the plane of symmetry **34** of the pulley and connected by arms **35** to the hub **36.**

At least one flange **40** of generally annular shape is mounted for rotation relative to the pulley **20** its inner edge **42** cooperating with guiding and centering devices fixed for rotation with the central web and advantageously comprising rollers mounted on roller bearings.

The flange **40** comprises a planar annular portion **41'** with a rounded inner edge followed by a portion **43** extending radially outward and inclined relative to the portion **41'** and on which are provided teeth 41_1, 41_2, etc., defining spaces therebetween for receiving the bent ends of the bars **15.** The pitch of the teeth is chosen to ensure a height such as to avoid sudden disengagement of the cable, even where the cable is subject to forces with a large lateral component. In addition, each one of the teeth **41** has an outer edge with an inwardly curved portion **44** (FIGS. **5** and **9**). At the base of the flange **40** facing the pulley is a fillet **60** extending substantially along the entire base of the tooth and in the vicinity of the junction of the portions **41'** and **43** of the flange such that the fillet is disposed above the ends **61** of the groove **23** of the pulley when the flange is mounted thereon.

Reinforcing ribs **90** (FIGS. **4, 5** and **7**) are secured on the outer surface of the flange for resisting deformation of the flange.

The embodiment of FIGS. **4–7** provides as centering and guiding devices in rotation with respect to the pulley per se, rollers **50** rotatably mounted on roller bearings **67.** Each roller comprises a sleeve **51** with a flange **52** at one end and in which is formed a groove, preferably V-shaped with walls **53** and **54,** in which the inner edge **42** of the flange **40** is received. The rounded inner edge **42** of the flange and the V-shaped groove assure a contact of the cooperating surfaces of the flange and

the roller along a line which favors reliable operation even with unfinished molded or cast flanges.

The assembling of a flange according to the invention on the pulley is effected as follows :

After boring circular holes **62** (FIG. 6) in the gusset plates **32** and **33** of the pulley, a sleeve **63** is inserted in each of the two gusset plates and fixed therein, for example by welding thereto at **64** ; or the sleeves **63** are fixed to the gusset plates such as **26** (FIGS. **4** and **5**) without extending into the same. Each one of the sleeves then receives a roller bearing device comprising a pin **65** having a head **72** at its end **66** for supporting a roller **67** surrounded by a metal ribbon **73** and a threaded end **68** adapted to cooperate with a nut **69** with the interpositioning of a washer **70.** A keeper pin **71** prevents the unloosening of the nut **69.** Between the front end surface of the sleeve **63** facing the roller **50** and the front surface **74** of the roller is interposed a washer **75** which forms a slight gap **76** with the roller **50.**

When at least two roller devices with their associated bearings are fixed on the web of the pulley, a flange **40** is mounted on the rollers with its inner edge **42** received in the V-shaped groove therein. In the case of the rolling path of the flange with respect to the pulley being defined by three points, as shown in FIG. **4,** a roller **50,** not mounted on a bearing, is positioned facing the third point and on the inside of the flange until the axis of the roller is substantially aligned with the axis of the hole in the gusset plate **26.** A roller bearing device is then inserted which is different from the two devices previously put into place in that the pin **91** of the fixed support **66** for the rollers **67** is eccentric relative to the axis **92** of the rod **65** introduced into the sleeve **63** previously fixed to the web of the pulley per se. By rotating the head **72,** a displacement of the roller **50** is brought about until line contact of the rounded edge **42** of the flange with the sides of the grooves **53** and **54** of the V-shaped groove in the roller is established.

In the case of a rolling path of the flange on the pulley comprising more than three points, for example five as shown in FIG. **6,** the process is the same as above except that three support members are used for the eccentric roller relative to the pin extending through the sleeves fixed to the gusset plates **32, 33.**

The gap **76** formed between the washer **75** and the opposing surface of the sleeve **51** enables a slight displacement of the roller **50** relative to the sleeve **63** associated therewith, allowing a certain amount of pivoting of the flange with respect to the pulley without disturbing the operating conditions.

FIG. **2** shows an improved device according to the invention comprising a flange **40** and an identical flange **40***a* on the respective sides of the groove **23,** the bracket **22** carrying a conventional cable guide **81** by means of an upright **80.**

In the embodiment illustrated in FIG. **3,** only the flange **40** is mounted on the web of the pulley 20 per se. The groove **23** of the pulley extends onto the opposite surface supporting the flange **40** by a truncated conical flange having a periphery **82** withough cut outs.

The operation of an improved pulley according to the invention is as follows:

When a bar **15** pulled by the advancing cable **10** in the direction indicated by the arrow f is about to jump off the pulley, the bar **15** comes into cooperation with one of the teeth **41** of the flange **40** which it turns in the direction of the arrow f_1. During such movement, the cable **10** is surrounded at its point of contact with the pulley on both sides, either by the flanges **40** and **40***a* in the embodiment of FIG. **2,** or by the flanges **40** and **82** in the embodiment according to FIG. **3,** which prevents it from escaping from the flanges and jumping off the pulley regardless of the circumstances.

In the course of such an occurrence, the cable **10** may tend to be displaced with an upward movement on the inner surface of the teeth **41** relative to the pulley. If the displacement of the cable is sufficiently great for it to reach the vicinity of the inward curved portions **44** its shape as shown in FIG. **9** causes the cable to return to the groove **23.** The ribs **60** adjacent the outer edges of the groove ensure that the cable, even when subjected to relatively great lateral forces, does not pass between the flange and the pulley. The reinforcing gusset plates **90** resist any deformation of the flange.

In the embodiment of FIG. **8,** the rolling path of the flange, instead of being constituted by rollers having a V-shaped grooves comprises rollers **83** having rectangular-shaped grooves which receive an enlarged edge **84** of flange **85.** The shape of the edge of the flange and the groove of the rollers provides linear contact along the cooperating surfaces permitting a slight displacement of the flange relative to the rollers favorable to reliable operation of the device.

The means according to the invention comprising the rolling path ensures that even in the case of accidential loosening of one of the nuts of the securing means for the roller bearings on the web, the flange will remain fixed to the pulley.

What I claim is:

1. A pulley device comprising a pulley including a hub, an annular rim provided with a groove adapted to receive a cable for pulling loads by means of bars, gusset plates secured to said rim and extending inwardly therefrom towards the hub, means secured to the gusset plates for defining a circular rolling and guiding path, at least one annular flange having cut-outs in the periphery thereof, said flange having one lateral face extending adjacent said rim in confronting relation to said groove and extending in continuity thereof, said flange being rotatably mounted on said circular guiding and rolling path, whereby said cut-outs allow the passage of said bars, and means connecting said plates to said hub.

2. A pulley device according to claim **1,** wherein the means defining the circular rolling and guiding path comprises roller bearings secured to said gusset plates, rollers rotatably mounted on said roller bearings, each of said rollers having a groove receiving the inner edge of said flange.

3. A pulley device as claimed in claim **2** comprising sleeves fixed to said gusset plates and receiving said roller bearings.

4. A pulley device according to claim **2,** wherein the inner edge of the annular flange is rounded.

5. A pulley device according to claim **4,** comprising sleeves fixed to said gusset plates and receiving said roller bearings, a washer mounted on the roller bearing between the roller and the sleeve, a slight play being provided between the washer and the surface of the roller facing the washer.

6. A pulley device according to claim **2,** comprising eccentric means supporting at least one of said rollers in adjustable position from said gusset plates.

7. A pulley device according to claim **2**, wherein the groove in each roller is bounded by opposed surfaces, the surface most distant from the gusset plates having an outer edge of a diameter larger than that of the opposite surface so that removal of the flange is prevented after the flange is mounted onto the pulley.

8. A pulley device according to claim **1**, wherein said flange defines teeth between the cut-outs, said teeth including inwardly curved portions at the outer edges thereof, and ribs extending substantially the entire length of the teeth at the base thereof, said ribs being

located on the inner face of the flange facing said rim, said rib being adjacent the outer edge of the groove of the pulley.

9. A pulley device according to claim **1**, further comprising guiding means for said bars in the vicinity of the pulley.

10. A pulley device according to claim **1**, wherein two of said annular flanges are provided disposed respectively on opposite sides of said rim.

* * * * *