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Ross

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[54] **DEFLECTOR FOR CABLE TRANSPORT**

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[73] Assignee: **Willi Habegger,** Thun, Switzerland

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[52] **U.S. Cl.** **254/190**

[51] **Int. Cl.** **B66d 1/36**

[58] **Field of Search** 254/190; 187/95; 74/229; 198/159, 182; 226/196, 190

[56] **References Cited**

UNITED STATES PATENTS

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Attorney, Agent, or Firm—Karl F. Ross; Herbert Dubno

[57] **ABSTRACT**

A deflector for a cable transport system, wherein the cable is provided with a plurality of members each supporting a load, has a wheel rotatable about an upright axis and provided around its periphery with a plurality of angularly equispaced guides. Each such guide is carried on one end of a short arm pivoted itself on the periphery of the wheel so that the guides can be pushed to the side by the load-carrying members as they pass. The guides are small synthetic-resin sheaves which are rotatable about respective axes on their respective arms. The arms normally project radially inwardly of the wheel. In the case of a system wherein the arc of the deflection is flatter than the wheel curvature a cam is provided to array those guides in contact with the cable along the desired arc.

10 Claims, 10 Drawing Figures

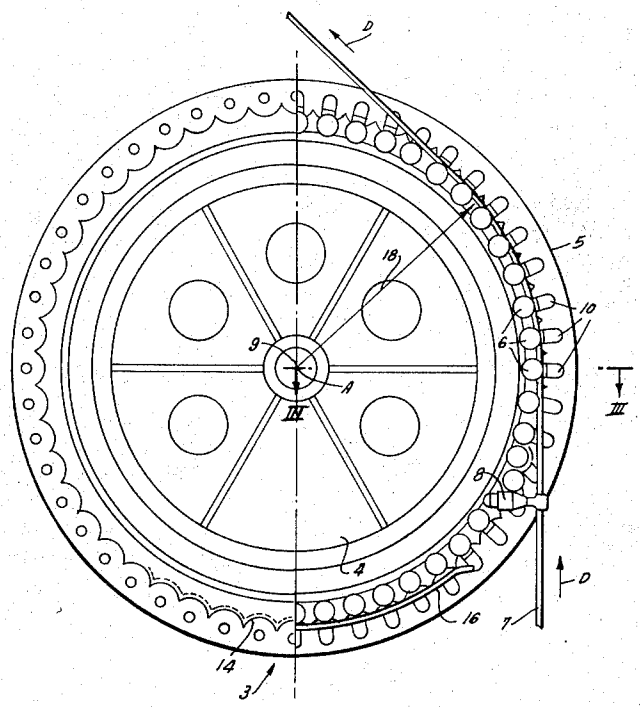
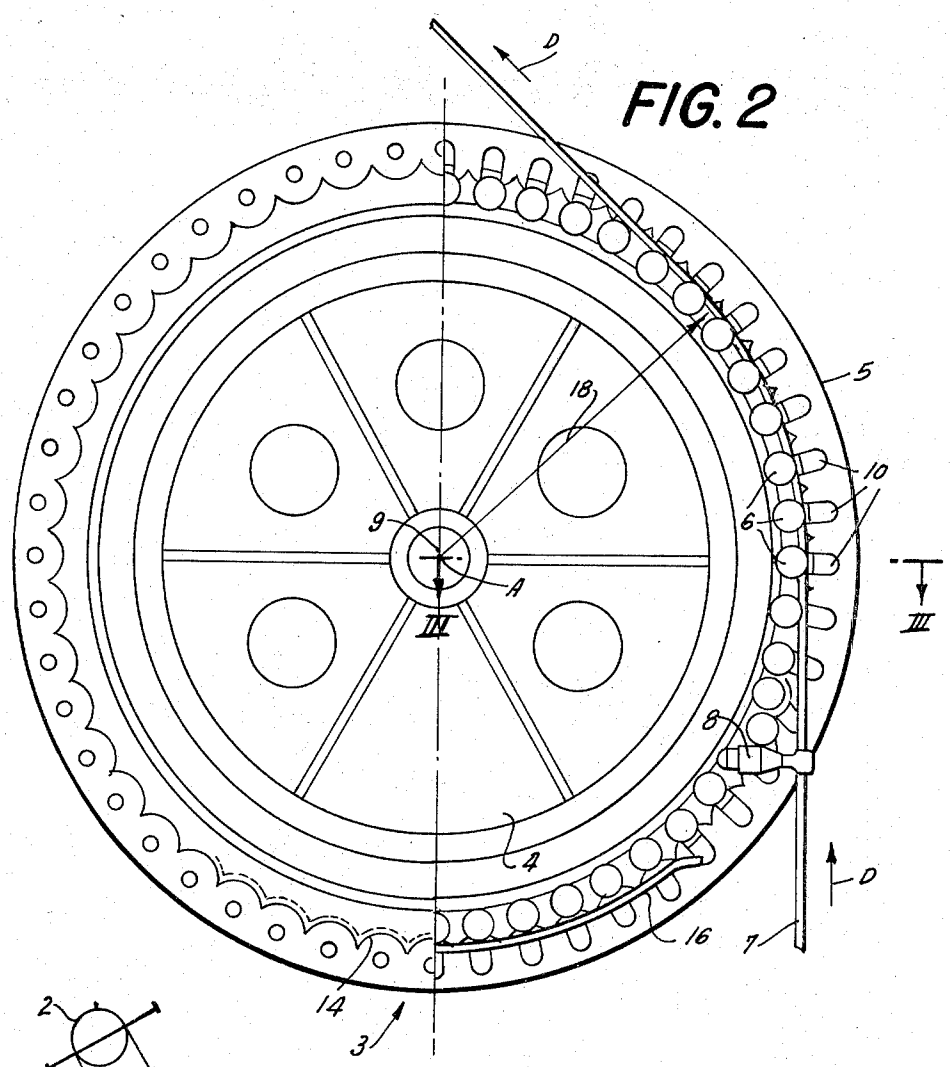


FIG. 2



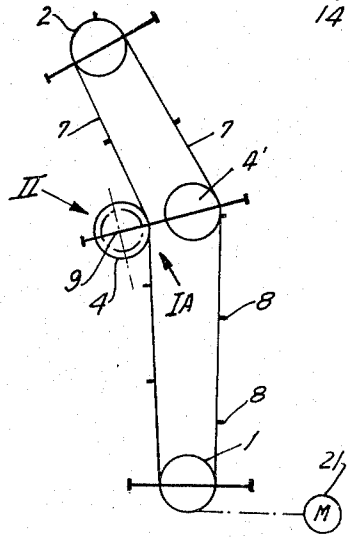


FIG. 1

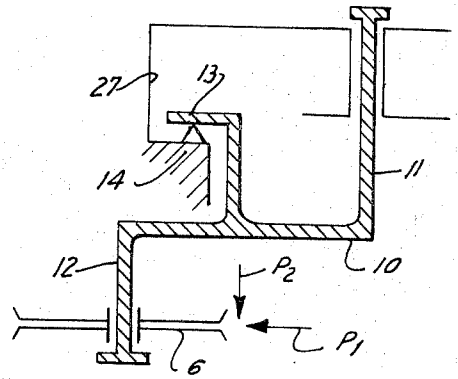
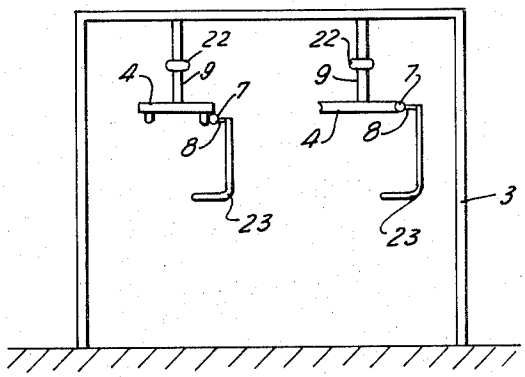


FIG. 5

FIG. 1A



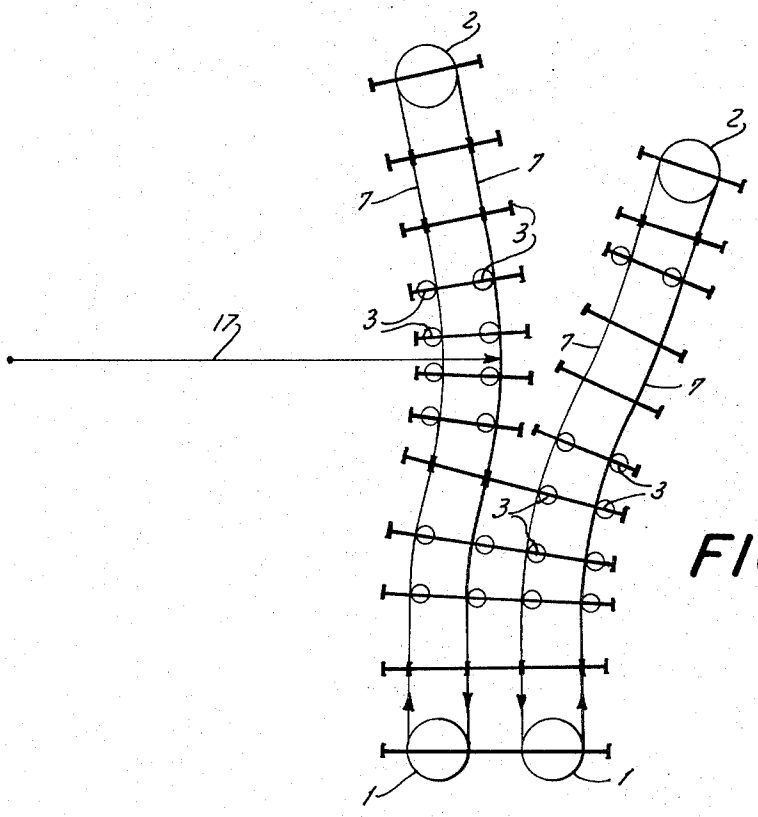


FIG. 6

FIG.3

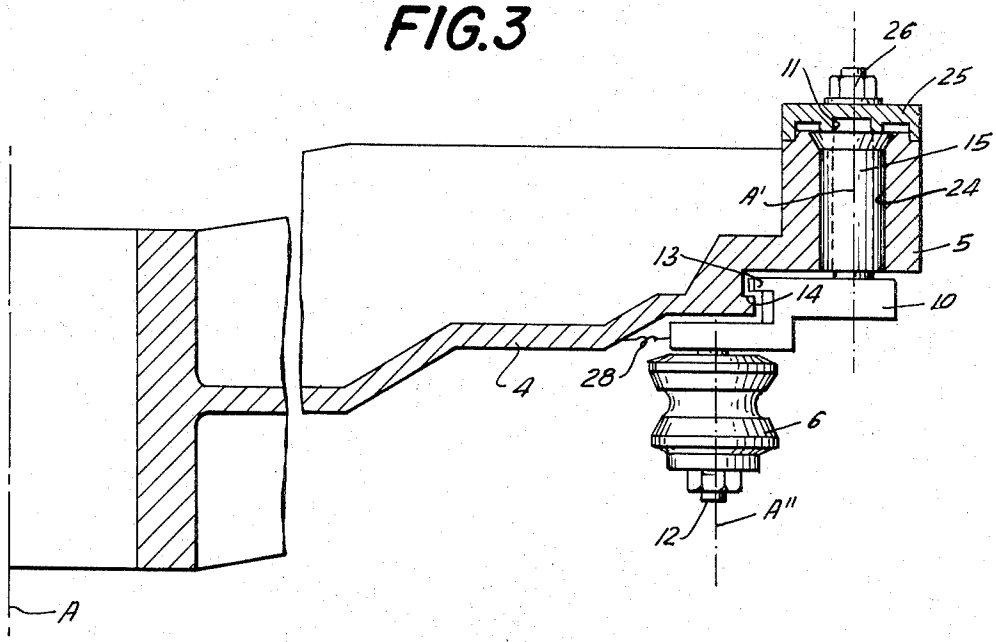


FIG.4

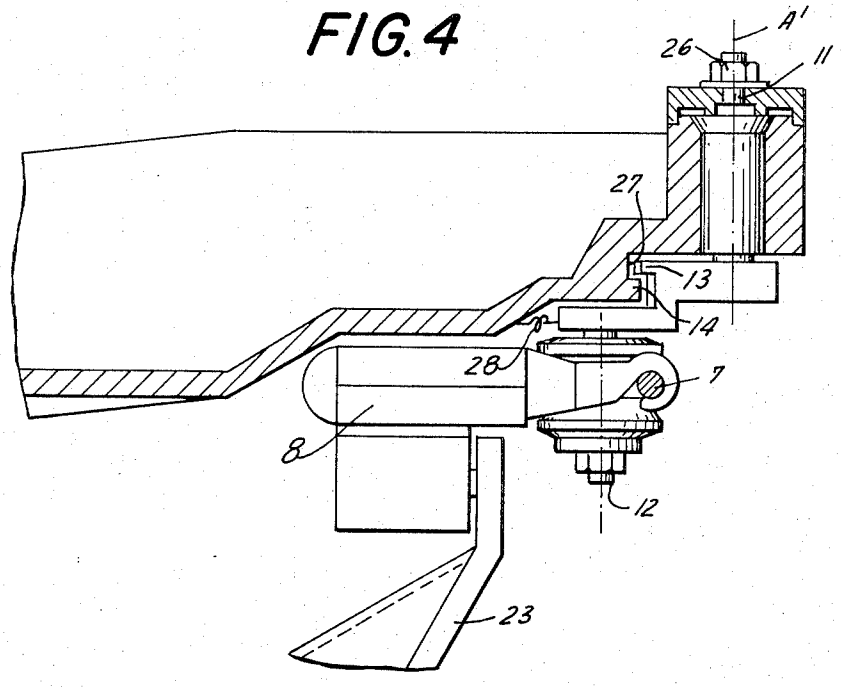
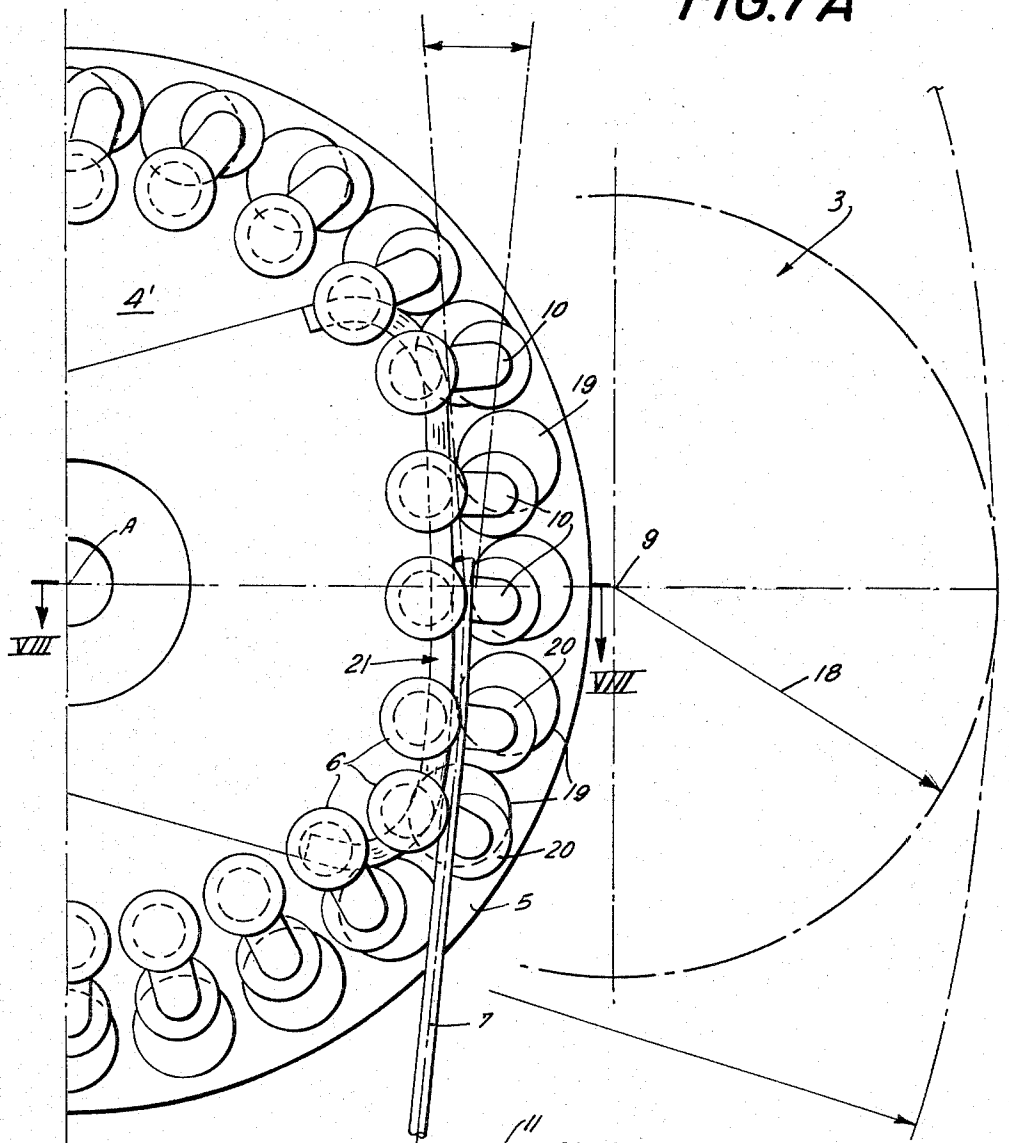


FIG.7

FIG.7A



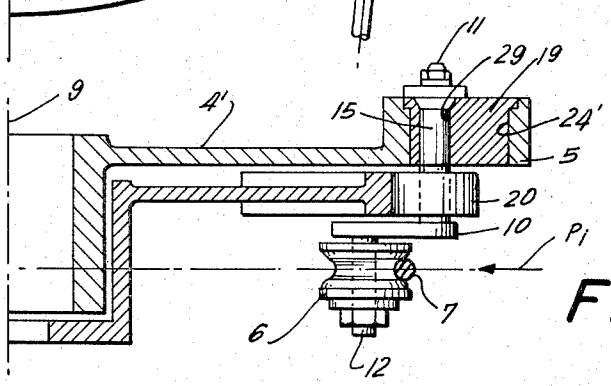


FIG.8

DEFLECTOR FOR CABLE TRANSPORT

1. Field of the Invention

The present invention relates to a cable transport system. More particularly, this invention concerns a single-rope transport system wherein a longitudinally displaced endless cable is provided with spaced-apart members each carrying a load, such as an ore bucket or a ski-lift chair.

2. Background of the Invention

In a cable transport system it is often necessary to deflect the cable or rope at one or more locations along its path, since rarely can a straight conveyor path be employed. This deflection can be carried out simply with a large sheave rotatable about an upright axis when the inside of the deflection curve is to the side of the cable opposite that side from which the load-carrying members or outriggers extend. When the cable must be deflected in the opposite direction, however, it is extremely difficult to hold it securely, since the load-supporting outriggers will extend toward the axis of the deflecting wheel.

In one system a plurality of pairs of notched jaws are provided which are opened by a cam as the cable comes between them and are then closed on this cable. In case an outrigger comes between these jaws they merely close on it. The jaws are opened again to permit the cable to leave the deflecting wheel. Such an arrangement is quite complicated and liable to fail under heavy load. In addition, the mechanism which opens and closes the jaws must be protected from the elements, necessitating a closed housing around each deflection tower.

3. Objects of the Invention

It is, therefore, an object of the present invention to provide an improved cable transport system.

Another object is the provision of an improved deflector for such a system.

A further object is to provide a cable deflector which is inexpensive to manufacture and which has a long service life.

4. Summary of the Invention

These objects are attained according to the present invention in a system wherein the deflector wheel is provided on its periphery with a plurality of angularly equispaced pivots each supporting one end of an arm whose other end is provided with a cable-receiving guide. These arms normally extend radially inwardly on the wheel and can be biased into this position. Between the outriggers the cable merely seats itself in the guides, and when an outrigger comes to the wheel it pivots one or more of the arms to the side, allowing the cable immediately next to each side of the outrigger to be supported by a guide. As the outrigger leaves the wheel it merely pulls from between the guides. No complicated opening and closing is necessary, and failure is virtually impossible. The arms simply pivot out of the way of the outrigger, but otherwise serve to support the cable and guide it through a curve with complete security.

According to another feature of this invention, each guide is a small synthetic-resin pulley or sheave rotatable on the other end of its respective arm about an axis parallel to the pivot axis for the one end of the arm,

which in turn is parallel to the rotation axis of the wheel on whose periphery the arms are carried.

In accordance with another feature of this invention each arm is provided with a projection engaging over a formation on the wheel so that the vertical and torsional forces applied to the arm are not all taken up by the pivot. This projection can rest on an arcuate lip having a center of curvature coinciding with the arms pivot axis.

When the cable is to be deflected through a curve having a flatter curvature greater than is practical to provide as the curvature of the deflecting wheel, means is provided to displace the pivot axes of the arms so that in the region they engage the cable they lie in an upright warped plane parallel to the curve that the cable is supposed to follow. This is accomplished by providing the pivot axes in eccentric bushings which are engaged by a relatively fixed cam so that these axis lie in a plane having the desired radius of curvature.

5. Description of the Drawing

The above and other objects, features, and advantages will become more readily apparent from the following description, reference being made to the accompanying drawing in which:

FIG. 1 is a top diagrammatic view of a system according to the present invention;

FIG. 1A is a view of the portion of the system indicated by arrow IA of FIG. 1;

FIG. 2 is a bottom view, in enlarged scale, of that portion of the system indicated by arrow II of FIG. 1;

FIG. 3 is a section taken along line III—III of FIG. 2;

FIG. 4 is a view similar to FIG. 3 showing a cable and outrigger in place;

FIG. 5 is a schematic force diagram corresponding to FIG. 4;

FIG. 6 is a diagrammatic top view of another system according to the present invention;

FIG. 7 is a bottom view of the deflector wheel indicated by arrow VII of FIG. 6;

FIG. 7A is a diagram illustrating FIG. 7; and

FIG. 8 is a section along line VIII—VIII of FIG. 7.

6. Specific Description

As shown in FIGS. 1 and 1A a cable transport system has a drive sheave 1 powered by a motor 21, an idler sheave 2 and a deflecting tower 3 from which are suspended two wheels 4 and 4'. The latter wheel is a simple circumferentially grooved sheave and the former is described below. Both wheels 4 and 4' are hung on shafts 9 from universal joints 22 and 22', respectively, which are spring loaded and allow limited rocking of these wheels. A cable 7 is spanned over the wheels 1, 2, 4 and 4' and is provided with a plurality of laterally projecting outriggers 8 each suspending a respective load 23, here a two-man ski-lift chair. The wheel 4 is on the inside of the bend in the path of the cable 7 and to that side of the cable 7 from which the outriggers 8 project.

As shown in FIGS. 2–5 the wheel 4 is generally circular and rotates about an upright axis A. The periphery of this wheel 4 is provided with forty-eight angularly equispaced cable guides 6 in the form of small hyperboloidal sheaves made of a polyamide such as Nylon. Each such guide 6 is rotatable about an axis A'' defined by a pivot bolt 12 extending down from one end of a

short arm **10** whose other end is provided with an upwardly extending pivot bolt **11** defining an axis A'. The axes A, A' and A'' are parallel so that the arms **10** swing in planes orthogonal to these axes. The bolt **11** is received in an elastic bushing **15** in a hole **24** in the wheel's periphery **5**. A cap **25** extending beyond the bushing **15** is secured by a nut **26** to prevent the bolt **11** from falling through. The friction between bolt **11** and the bushing **15** prevents displacement of the bolt unless a certain amount of torsional force is exerted on it, so that this bolt does not rotate very freely. In addition, each arm **10** is formed with a short projecting tongue **13** which engages over a respective arcuate lip **14** formed on the wheel **4** inside of its outer periphery. Each lip has a center of curvature at the respective axis A' and a constant radius of curvature so that the tongue **13** engages over it and supports the arm **10** so long as this arm is directed generally inwardly. The cable **7** is received in the peripheral groove of the sheave **6** and exerts, as shown in FIG. **5**, an inward component P_1 of force resulting from the deflection, and a downward component P_2 resulting from the weight of the cable and its load. This latter component P_2 is taken up almost completely by the lip **13** resting on the ledge **14** so that the bushing **15** is not unduly stressed. In addition, the edge of the lip or projection **13** may engage surface **27** of the wheel **4** to transmit to it the component P_1 of force should the bushing **15** be sufficiently deformed.

A spring as shown schematically in FIGS. **3** and **4** at **28** is provided at each arm **10** to urge this arm into a position normally extending radially inwardly from the axis A'.

FIG. **2** shows how as the cable **7** is displaced in the direction indicated by arrows D an outrigger comes into contact with a guide **6** and pushes it axially to the side. This allows the cable to seat itself securely on the guides **6** to either side of the outrigger **8** for most even application of force on the tower **3**. As the outrigger leaves the arc of contact of the cable **7** with the wheel **4**, it merely pulls out from between the guides, which then are returned to their radial positions by the springs **28**. A cam **16** which is fixed on the shaft **9** and is not rotatable with the wheel **4** insures that these guides **6** are in this radial position as they come against the cable **7**.

Such an arrangement is extremely simple. It provides very secure support for the cable in spite of the outriggers. The arms are moved neatly to the side by the outrigger itself and in this displaced position serve to support the cable. No complicated mechanism is needed to fit the guides to the cable around the outrigger, nor to disengage them to allow the outrigger to withdraw.

FIG. **6** shows an arrangement wherein the same reference numerals as used in FIGS. **1–5** are employed where structure is identical. Here, however, a plurality towers **3** are employed to deflect the cables **7** through bends having radii **17** of curvature which are much greater than the radii **18** of the respective deflecting wheels **4'** shown in FIGS. **7** and **8**.

In order to array the guides along the arc **2**, each pin **11** is pivoted in an eccentric hole **29** in a bushing **19** which is rotatable within an enlarged hole **24'** in the periphery **5** of the wheel **4'**. Each such bolt **11** carries a metal collar **20** which in the region of contact of the guides **6** with the cable **7** is engageable with a nonrotatable guide cam **21** whose edge has the same radius of curvature as the radius **17**. In this manner the pins **11** are pulled toward the axis A so that the collars **20**, which are advantageously rotatable on the pins by means of bearings, ride along the edge of the cam **21**. Since the distance between axes A' and A'' is constant, this means that the guides **6** will lie along an arc having the radius of curvature **17**, causing the cable to bear with the same component P_1' on all of the guides **6** rather than loading one more than others as would be the case if these guides lay along a path having a radius of curvature smaller than radius **17**. It is also possible to provide the pins **11** in small slidable elements, rather than eccentric rotatable bushings **19**, for their positioning.

I claim:

1. A deflector for a cable transport system wherein a transport cable is provided with spaced-apart laterally projecting outriggers suspending respective loads, said deflector comprising:

a support defining an upright axis;

a wheel having a periphery and mounted on said support for rotation about said axis;

a plurality of pivots spaced around said periphery and each having a respective upright pivot axis offset from the wheel axis;

respective arms each having one end secured to a respective pivot and another end spaced from said respective pivot, said arms being swingable about said pivots; and

respective cable guides each carried on said other end of a respective arm, said cable being engageable with said guides.

2. The deflector defined in claim **1** wherein said guides are sheaves rotatable on their respective arms about axes parallel to said pivot axes.

3. The deflector defined in claim **2** wherein said arms are underneath said wheel and are each provided with an upwardly extending pivot pin journaled in said wheel at the respective pivot axis and a downwardly extending pivot pin rotatably carrying the respective sheave.

4. The deflector defined in claim **3** wherein each arm is provided with a projection and said wheel is formed with respective outwardly directed recesses receiving said projections.

5. The deflector defined in claim **4** wherein each recess is circularly arcuate and has a center of curvature at the respective pivot axis, each projection overlying the respective recess.

6. The deflector defined in claim **3**, further comprising means for displacing said pivot axes on said wheel along a portion of the periphery thereof to lie along an arc having a center of curvature offset from the wheel axis.

7. The deflector defined in claim **6** wherein said means for displacing includes a cam nonrotatable relative to said wheel and extending along said portion of said periphery, said cam being operatively engageable with said upwardly extending pivot pins of said arms.

8. The deflector defined in claim **7** wherein said means for displacing further comprises respective bushings rotatable in said wheel and having an offset hole rotatably receiving a respective upwardly extending pin of a respective arm, whereby rotation of said bushings displaces the respective pivot axes relative to said upright axis.

9. The deflector defined in claim 8 wherein each upwardly directed pivot pin is provided with a guide collar engageable with said cam.

10. The deflector defined in claim 1, further comprising means for arraying said arms normally into a position extending radially inwardly from their respective pivot axes.

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