Feb. 20, 1962 B. W. WARF 3,022,023

SHUTTLE CAR FOR MINES

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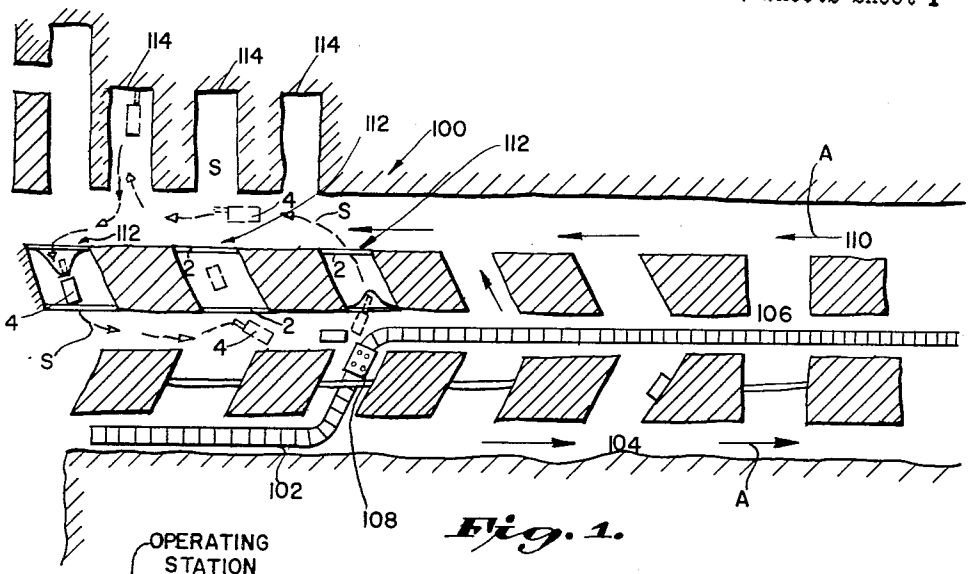


Fig. 1.

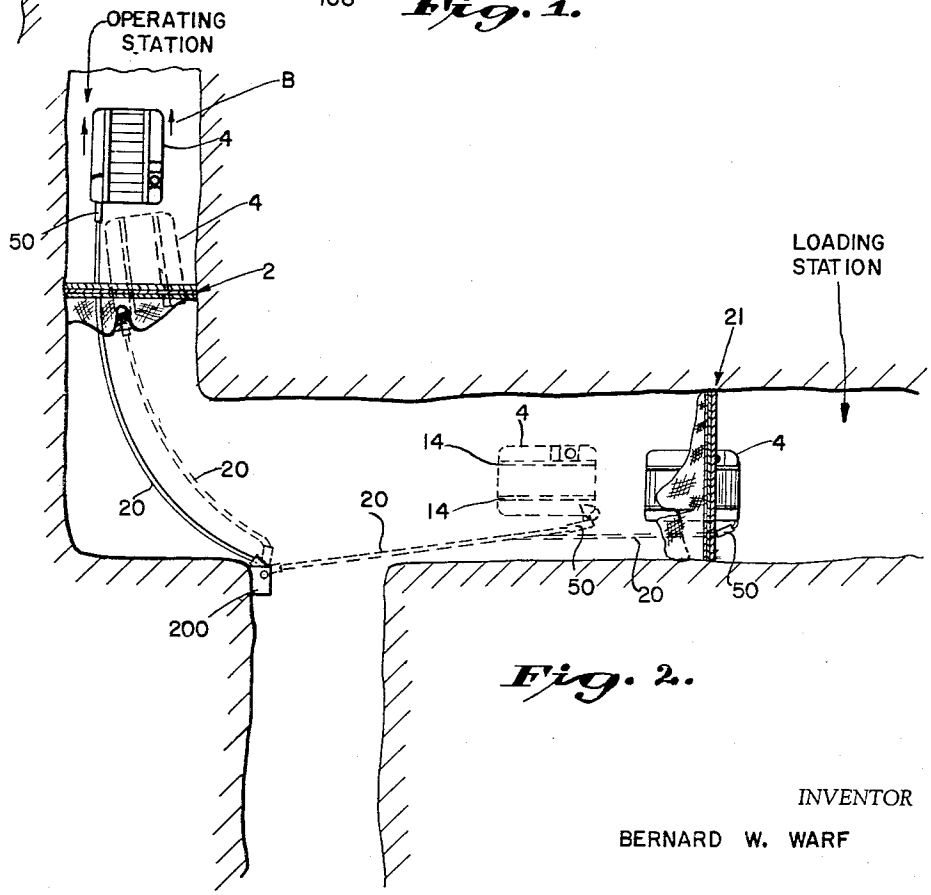


Fig. 2.

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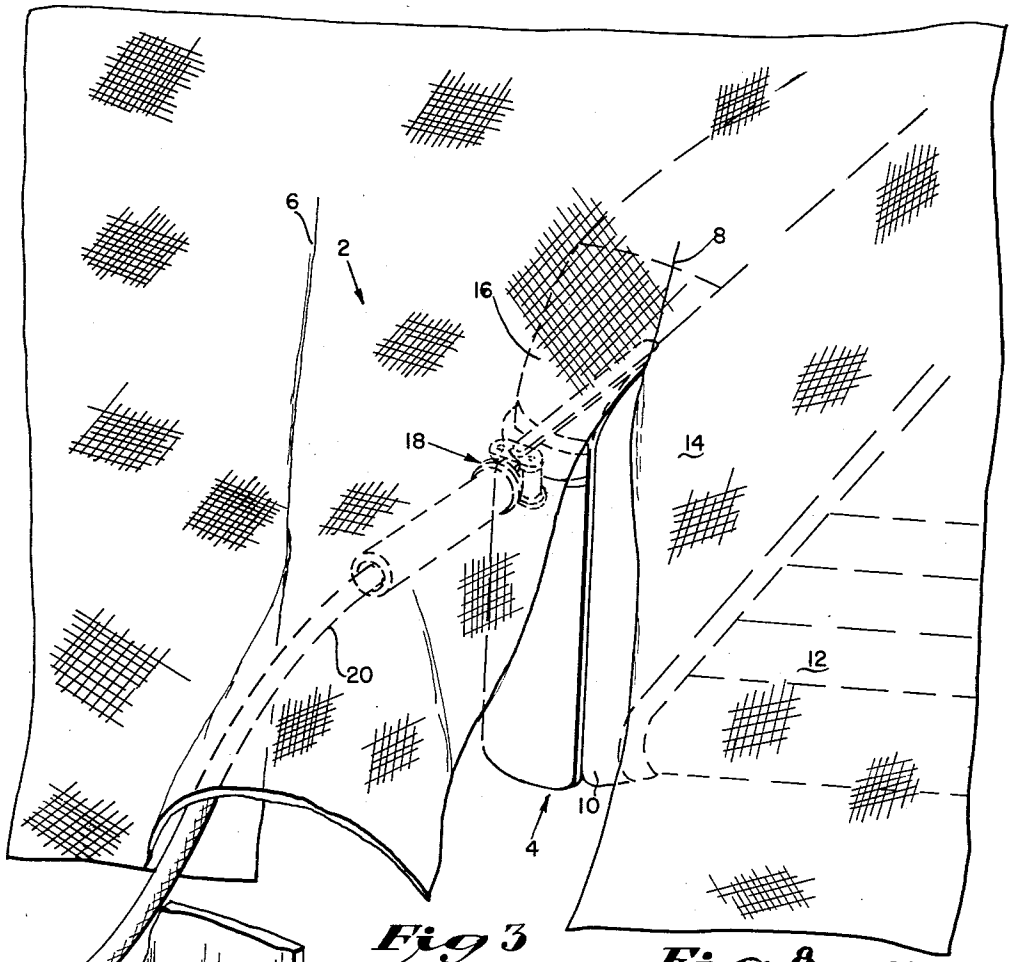


Fig 3

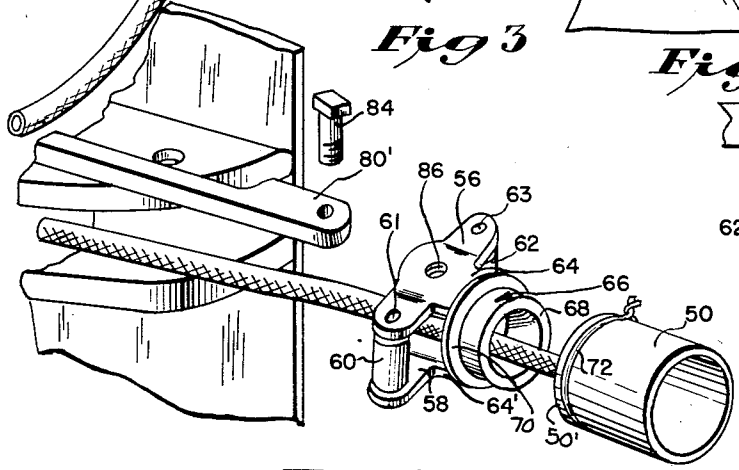


Fig 7.

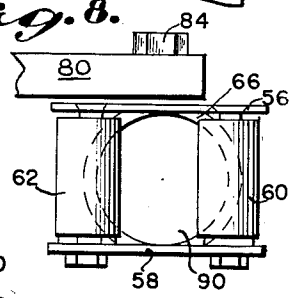


Fig. 8.

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SHUTTLE CAR FOR MINES

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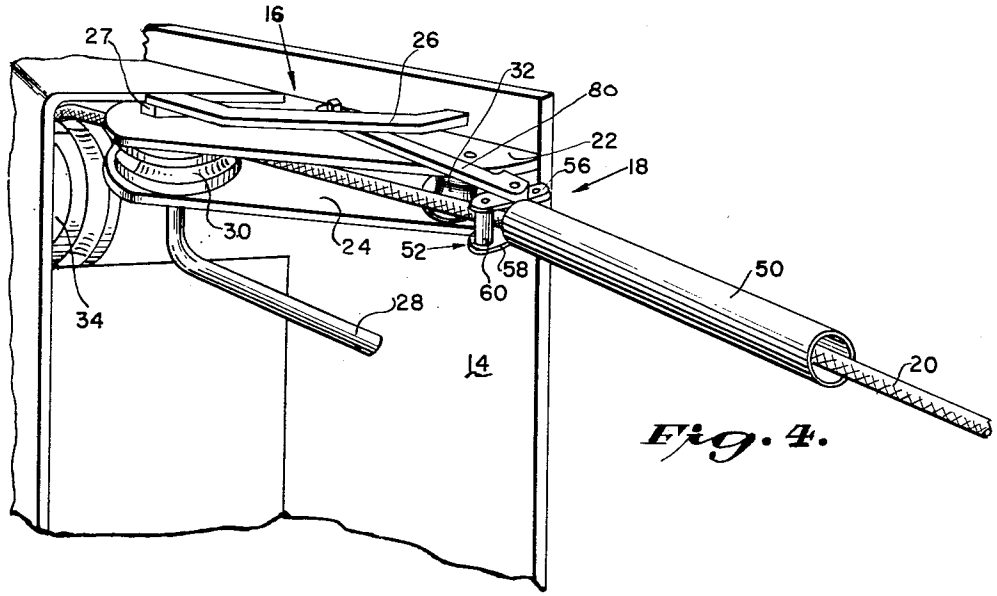


Fig. 4.

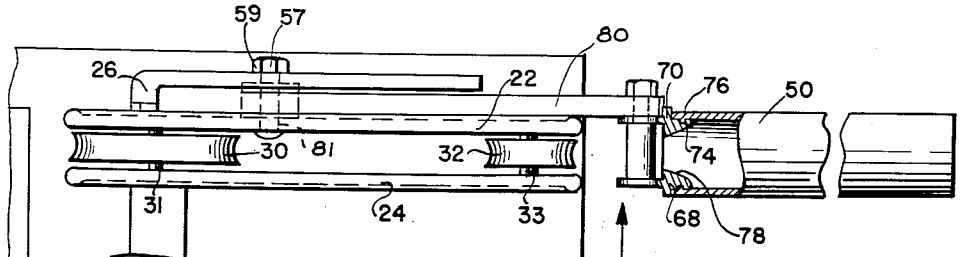


Fig. 5.

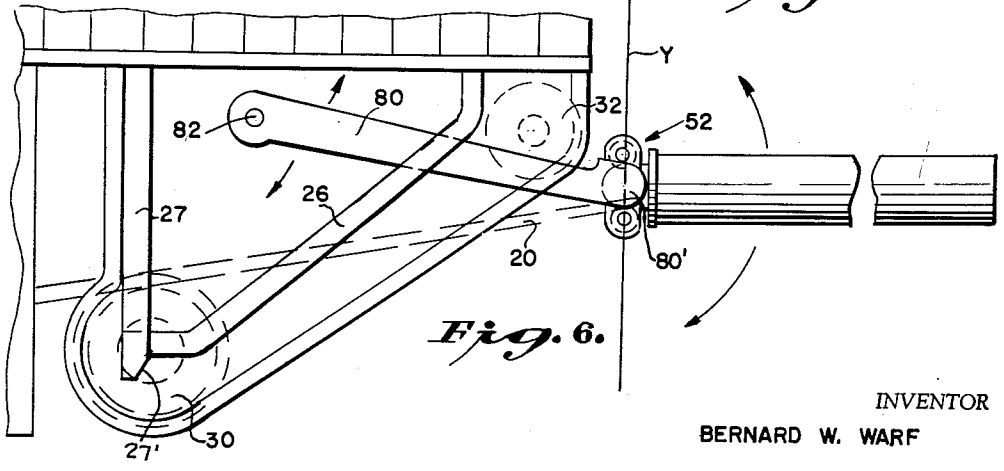


Fig. 6.

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3,022,023

SHUTTLE CAR FOR MINES

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Filed Dec. 23, 1958, Ser. No. 782,579
5 Claims. (Cl. 242—86.51)

This invention relates to a safety device for use on cable powered shuttle cars of the type commonly employed in mining operations. Although the structural aspects of the invention are easily comprehended, the importance of the invention may be better understood if consideration is first given to operating conditions within a mine.

In order to provide proper ventilation within mines, it is common to employ check curtains along the headings of coal mine sections to properly direct air through sections where mining operations are being performed. It is also common to employ electrically driven shuttle cars to carry coal or other material from an operating section to a loading station remote from the operating station. Such shuttle cars are powered by cables running from a given point, usually close to a source of power, to the shuttle car, and each car carries a reel upon which cable is wound, or from which cable is let out, as the car travels toward or away from the given point respectively. As a shuttle car moves away from the given point at which one end of the cable is fixed, it passes from one operating section of the mine to another and therefore through or past series of check curtains. When a car moves away from the given point, it passes under a curtain, leaves cable behind, and when the car moves toward the given point, it picks up the cable.

The check curtains are usually hung from the ceiling of the mine and extend to the floor, and the cable normally is taken in by the shuttle car at a point between the floor and ceiling. Thus, as a shuttle car approaches a curtain under which a cable has passed, the cable is lifted up, and as a result the bottom of a curtain under which cable lies is lifted up and rides on the cable in the direction of cable movement. As a result the curtain is often caught in the cable takeup mechanism or guide therefor.

More particularly, it is conventional to employ a take-up guide means comprising a pair of parallel plates having guide rollers therebetween over which the cable passes. The cable input side between these plates is an open slot so as to allow the cable to shift between the extremities of the slot for various directions of movement of the shuttle car. Because of this open space, a curtain edge which has been lifted up by the cable and which rides on the cable, can pass into the open slot of the cable guide means, whereupon the curtain gets caught and is pulled down.

As set forth above the curtains are used to properly ventilate the mine, and it is apparent that if some curtains are torn down, proper ventilation is impaired. Lack of ventilation results in the accumulation of ignitable or explosive gas, such as methane gas, in the face area of a working section, and many explosions have been caused by failure to prevent such accumulations of gas. Of course, the curtains are expensive, and this is a secondary reason why it is important to prevent tearing them down.

The instant invention has as a primary object the provision of safety means for preventing check curtains from becoming entangled with cable guide mechanisms on cable powered mine shuttle cars. A still further object of the invention is to provide such a safety means which allows for take-up of the cable into the guide means at

any angle with respect to the forward direction of the shuttle car without injury to the cable.

Yet another, and still further object of this invention is to provide a safety means for use with a cable take-up or reeling means as described above, which safety means is inexpensive to manufacture, easy to install on presently existing equipment, and yet rugged enough to withstand heavy use.

Basically the invention provides a device to be used with a cable take-up means of the type having an open slot and used on mine shuttle cars, said device comprising the combination of a cable shielding means, means to support the cable shielding means, and means to guide a cable from the cable shielding means into the cable take-up means. The invention will be better understood, and objects other than those specifically set forth above will become apparent, when consideration is given to the following detailed description of an exemplary embodiment of the invention. This exemplary embodiment is presented in, and discussed in connection with, the annexed drawings wherein:

FIGURE 1 is a plan view of an exemplary mine of the type in which shuttle cars provided with the invention may advantageously operate;

FIGURE 2 is a plan view of part of an exemplary mine, and presents the operation of a shuttle car provided with the invention;

FIGURE 3 is a partial perspective view of a shuttle car provided with a safety device constructed in accordance with the teachings of this invention and traveling past a check curtain;

FIGURE 4 is a perspective view of a cable take-up mechanism on the side of a shuttle car, to which mechanism is attached the safety device provided by this invention;

FIGURE 5 is a side view of the take-up mechanism and safety device shown in FIGURE 2;

FIGURE 6 is a plan view of the take-up mechanism and safety device shown in FIGURES 2 and 3;

FIGURE 7 is an exploded view of the safety device provided by this invention; and

FIGURE 8 is a fragmental detail showing a portion of the safety device provided by this invention including the roller assembly.

In FIGURE 1, the mine section shown is generally designated by numeral **100**. Through this section runs a loading track **102** which curves between corridors **104** and **106** on which a railroad car **108** travels. The solid arrows A in FIGURE 1 show the direction of travel of ventilating air through the corridors **104** and **110** and past headings **112** which are closed by check curtains **2**. Because of such ventilation, gas cannot accumulate at the room faces **114**. Shuttle cars **4** move past the curtains **2** in various directions as shown by the dotted arrows S.

In FIGURE 2, a shuttle car **4** is shown in various positions as it moves toward and away from the cable connecton **200**. Cable connection **200** is merely a means of fixedly securing one end of a cable to a wall of the mine. It should be noted from FIGURE 2 that shuttle car **4** may move past and under check curtains **2**.

Now, referring to FIGURE 3, wherein the invention is shown in some detail, it will be seen that a shuttle car **4** is shown passing under check curtains **2**. These check curtains, as is customary, may be made of the canvas-like material "brattice cloth," and hang down like draperies. The curtains are slit as at **6** and **8** to allow for the passage of a vehicle thereunder. Although only one ply of curtain is shown in this figure, there may be several plies as shown in FIGURE 2 with slits in one ply staggered with respect to those in the next ply so that an effective seal is maintained. Of course, the check curtains may be made of any material, and disposed in any desired

manner without departing from the scope of this invention. The above explanation is merely given so as to facilitate comprehension of the invention.

The shuttle car 4 comprises a frame 10 carrying a conveyor 12 and having upstanding sides 14. Only one side of the shuttle car is shown in FIGURE 3, but it will be understood by referring to FIGURES 1 and 2 that the other side is the same as that shown. Attached to the upper forward end of side 14 is a cable take-up guide 16 and a safety device 18 constructed according to the instant invention. The shuttle car 4 is shown passing forward under curtain 2, and a cable 20, from which power is taken to operate the car, is shown passing through the safety device 18 and into the takeup guide 16. It will be noted that the cable 20 is lifting the curtain 2 due to the location of the safety device 18 and takeup guide 14 at the upper portion of the side 14 of the shuttle car.

Now by referring to FIGURE 4, the take-up guide and safety device may be more clearly seen. The take-up guide comprises a pair of parallel plates 22 and 24 attached to shuttle car side 14 by any suitable means, such as by a weld. Plates 22 and 24 as shown are supported by bracket members 26 and 28. Bracket 28 has one end fixed, by weld or otherwise, to plate 24 and the other end fixed to side 14 by the same, or similar means. Bracket 26 has one end fixed to a support and stop bar 27 carried on plate 22 and the other end fixed to side 14, by any suitable means, such as again, by welding.

Disposed between plates 22 and 24 are two rollers or pulleys 30 and 32 over which cable 20 passes. By referring to FIGURE 6 it will be noted that the cable 20 may pass over either roller 30 or 32 or both depending on the angle of intake of cable 20, and also depending on the position of the leveling or "even-wind" mechanism (not shown) if such mechanism is provided. Rollers 30 and 32 are fixed on shafts 31 and 33 which are coupled in plates 24 and 22, and suitable bearings may be provided as housings on the shafts if desired.

As set forth above, and as shown in FIGURE 4, cable 20 passes between rollers 30 and 32 through an open input slot or side formed between plates 22 and 24. The cable is wound-up on, and let out from, a take-up reel 34 which may be driven by any suitable means, such as by a hydraulic motor (not shown). The take-up guide 16 has been described in some detail above, although it is not part of the present invention, because the safety device provided by this invention is particularly adapted to be used with such a take-up guide. For a more complete explanation of such device reference should be made to U.S. Letters Patent No. 2,589,235.

As is apparent from the above discussion, the take-up guide may be described as comprising a pair of parallel plates with a plurality of rollers disposed therebetween, said device having an open input side or slot. As is also apparent, if no safety device is provided, cable passing into that side may carry a part of a curtain such as that designated by numeral 2 in FIGURES 2 and 3, into the open slot, and if such happens, the curtain is likely to get caught in the rollers or between the cable and a roller or to be wound-up on reel 34 resulting in a tearing down of the curtain as the shuttle car moves past the curtain. The safety device provided by this invention and designated generally by numeral 18 prevents such occurrences.

The safety device 18 as shown includes a cable shield 50 surrounding the cable 20, a guiding means 52 for guiding the cable 20 into the cable take-up guide 16, and a supporting arm 80 pivotally mounted on plate 22. The cable shield 50 is preferably a hard plastic hose, however, it may be made of rubber or any other suitable material. The cable guide 52 comprises a pair of parallel bracket members 56 and 58 spaced apart by a pair of rollers 60 and 62. The rollers, as shown in FIGURE 7, are mounted for rotation about shafts 61 and 63 which are fixed in cooperating bores in the brackets 56 and 58. Each bracket has a flange 64, 64' to which is fixedly secured, by weld or otherwise, a yoke 66. The yoke is a coupling comprising a bored cylindrical member 68 affixed to, or integral with a ring member 70. The bore of the cable shield 50 is adapted to tightly engage the outer surface of cylindrical member 68, and the end 50' of shield 50 abuts against ring member 68. The shield 50 may be securely fastened to cylindrical member 68 by means of a twisted wire loop 72 as shown in FIGURE 7; or as in the modification shown in FIGURE 5, recesses 74 may be provided in the outer face of cylindrical member 68 and a cooperating ring lug 76 may be provided on the interior of shield 50.

By reference to FIGURES 5 and 7, it will be noted that the coupling member is preferably an integral structure consisting of ring 70 and cylinder 68, and is provided with a tapering internal bore 78. This tapered bore is an important feature of the invention because it provides a surface at the coupling which minimizes wear on the cable passing through the coupling.

Now, if reference is again made to FIGURE 6, it will be noted that the guide means or roller assembly 52 and thereby the cable shield are supported by an arm 80 pivotally secured as at aperture 82 therein to plate 22. Arm 80, as is evident from FIGURE 4, may swing between side 14 of the shuttle car and the terminal extension 27' of stop bar 27. The free end 80' is bored so that a threaded bolt 84 (FIGURE 7) may pass therethrough to cooperate with the threaded aperture 86 in bracket member 56 of the cable guide. With this construction the roller assembly and cable shield allow the assembly and shield to swing back and forth across the open slot. The arm 80, as shown in FIGURE 5 is pivoted by means of bolt 57 passing through aperture 81 in plate 22 and aperture 82 in arm 80 and fastened in position by nut 59.

Since arm 80 may pivot through approximately 90° between side 14 and the stop bar 27, and since cable guide means 25 and cable shield 50 are pivotally secured thereto, cable may be taken in at any angle within the pivotal range of shield 50.

It should be pointed out that the rollers 60 and 62 are preferably spaced apart such that the cable does not engage the side walls of the coupling 66 at the rear end thereof. That is, as shown in FIGURE 8, a portion of the bearing surfaces of rollers 60 and 62 lie within the area defined by bore 90 in coupling member 66 so that cable does not bear against the end of the bore 90. It should also be pointed out that stop bar 27 limits movement of arm 26 just as side 14 limits movement of that arm. Of course, bracket 26 restrains any vertical movement of arm 80.

Operation

In operation, initially cable is threaded through cable shield 50, between rollers 60 and 62, through the input side of cable take-up guide 16 between rollers 30 and 32, and one end is fastened onto reel 34. The other end is fixedly secured to a wall or the like of a mine as at 200 (FIGURE 2). As the shuttle car moves away from the point where the cable is fixed to the wall in the direction of arrow B, FIGURE 2, and under the electrical power delivered by the cable, cable is let out from reel 34 and lies on the floor of the mine. Since the shuttle car will pass under check curtains during the course of its travel to an operating station, some cable lies under the curtains.

After the shuttle car has been loaded at an operating station, it travels to an unloading station, and while so traveling cable is taken in and wound upon reel 34 as the car approaches point 200 and let out as the car passes point 200 and moves toward a loading station. As the shuttle car approaches a check curtain, the curtain is lifted as shown in FIGURE 3, and because of the provision of a cable shield, the curtain travels above the cable and free of the open slot of the cable take-up guide 16. Thus, the curtain cannot get caught in the cable take-up

guide and the possibility of tearing down a curtain is eliminated.

Since the cable shield is supported by the pivotally mounted roller assembly **52**, the shield may swing back and forth to align itself with the cable to be taken in. Additionally arm **80** may swing back and forth as well as roller assembly **52** allowing for adjustment of the cable shield to various positions. The roller assembly **52** provides a guide means for the cable passing from shield **50** into the cable take-up guide **16**.

It should be apparent that with the construction shown in the drawings, the cable shield **50** may move from a position adjacent and perpendicular to side **14** of the shuttle car to a position remote from, and parallel to side **14**. This means that the cable shield may move from a position where it is aligned with arrow *y* (FIGURE 6) to a position where it is aligned with arrow *x*, so that the lie of the cable does not interfere with operation of the shuttle car.

For example, as shown in FIGURE 2, the shield **50** may move from the straight out position which it occupies at the operating station to the reverse position which it occupies at the loading station. In either position, however, it should be apparent that as the car approaches a check curtain, the cable shield deflects the curtain and prevents it from entering the take-up guide slot. Moreover, if reference is made to FIGURE 1, it will be noted that a shuttle car **4** may move in various directions, as in the path defined by dotted arrows S, and under a number of check curtains **2**, still operating in the above described manner to prevent tearing down the curtains.

From this discussion of the operation of the invention, it should be apparent that the safety device provided by this invention accomplishes the various objects set forth above by displacing the check curtains with respect to the moving cable in the vicinity of the cable take-up guide so that the curtains cannot enter the take-up mechanism.

As pointed out above, a preferred embodiment of the invention has been illustrated in the drawings and discussed in detail. Various modifications may be made to the embodiment shown, however, without departing from the scope and spirit of the invention. For example, stop bar **27** might be replaced by a small block underlying the end of bracket **26** above roller **30**, or different pivoting means may be provided than those presented with particularity. Although a cylindrical cable shield is shown, the shape may be changed if desired. Additionally, it should be understood that while the invention is particularly adapted for use on shuttle cars powered by cables such as shown in U.S. Patent No. 2,589,235 it may find use on various other types of shuttle cars.

Certainly, other modifications than those specifically suggested will become apparent to those of ordinary skill in the art, and therefore the foregoing description should be interpreted as illustrative, and the invention should be limited only as described in the appended claims.

I claim:

1. A mine shuttle car for use in mines having a power source remote from the shuttle car and a cable for delivering power from the remote power source to the car comprising: frame means; a cable reel attached to said frame means; means for guiding cable onto the cable reel; and safety means for deflecting a mine check curtain away from said cable reel including an elongated shield covering a portion of said cable, said shield being pivotally connected at one end thereof to said cable guide means, and extending towards the power source of the cable.

2. A shuttle car defined in claim 1 wherein said cable guiding means includes spaced apart rollers operatively mounted adjacent the inner end of said elongated shield for receiving the cable therebetween so that the cable moves freely into and out of said cable reel as the elongated shield is pivoted.

3. A shuttle car defined in claim 1 wherein said cable reel is mounted adjacent the forward end of the shuttle car, and said elongated shield extends forwardly of the front frame of the shuttle car when pivoted to its forward position.

4. A shuttle car defined in claim 1 wherein said said cable guiding means is pivotable in a generally horizontal plane from a forward position generally parallel to the side of the shuttle car to a position generally transverse thereto.

5. A mine shuttle car for use in mines having a power source remote from the shuttle car and a cable for delivering power from remote power source to the car comprising: frame means; a cable reel attached to said frame means on the side of the car adjacent the forward end thereof; means pivotally connected to said frame means for guiding the cable onto said cable reel said cable guiding means being pivotal from a forward position adjacent the car and forward of said cable reel to a rearward position generally transverse to the side of the car; safety means for deflecting a mine check curtain away from said cable reel including an elongated tube surrounding the cable, said tube being pivotally connected at one end thereof to said cable guide means, and extending towards the power source of the cable; and spaced apart rollers operatively mounted adjacent the inner end of said elongated tube for receiving the cable therebetween so that the cable moves freely into and out of said cable reel as said elongated tube is pivoted.

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