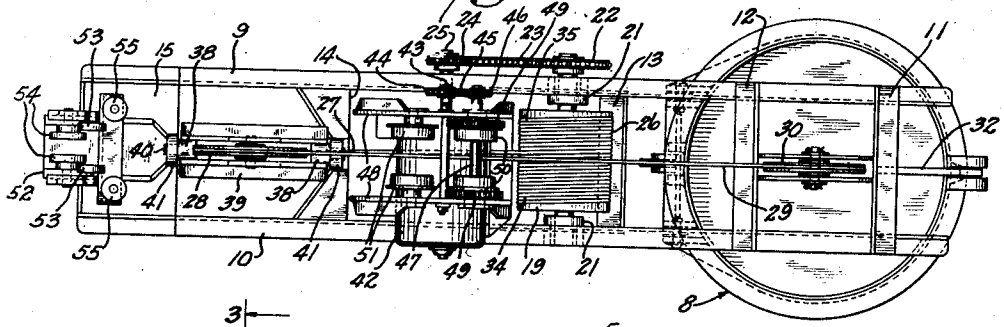
Nov. 30, 1943. J. RICHARDSON 2,335,446

OVERHEAD BUCKET CARRYING DEVICE

Filed Jan. 19, 1942

Fig. 2.



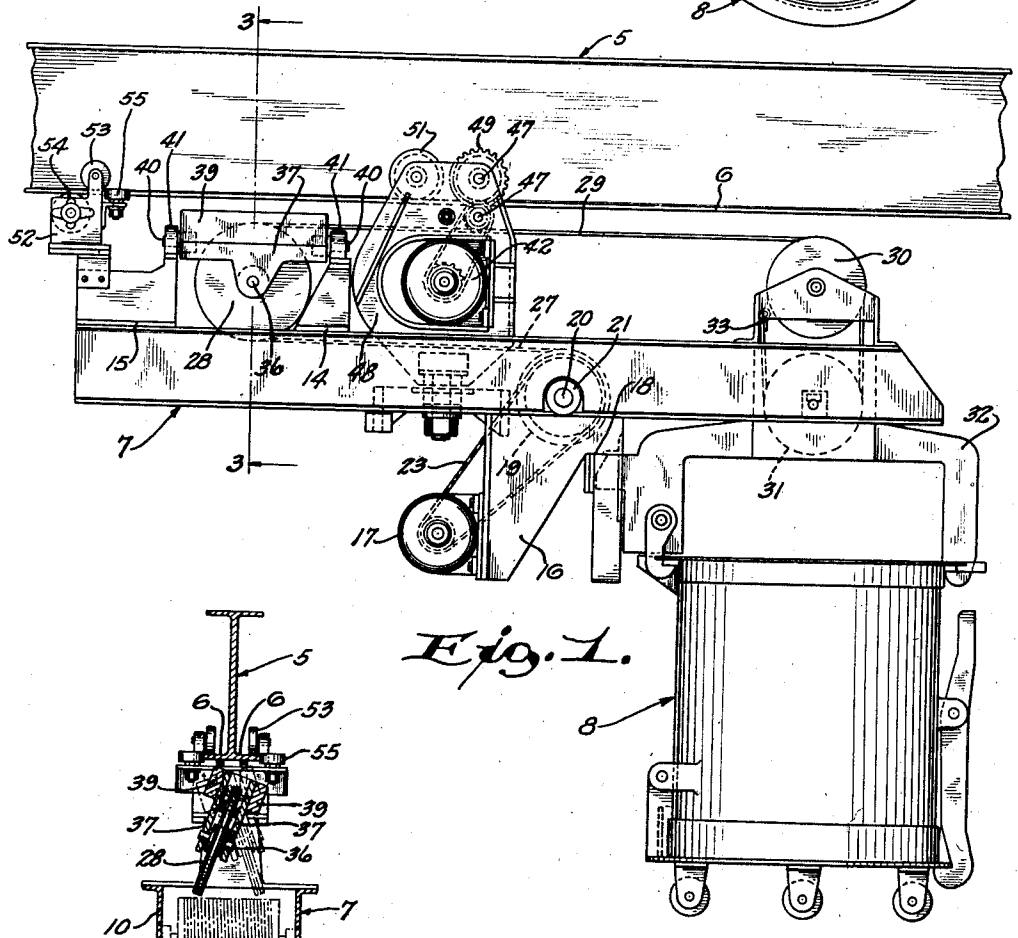


Fig. 1.

Fig. 3.

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OVERHEAD BUCKET CARRYING DEVICE

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Application January 19, 1942, Serial No. 427,299

1 Claim. (Cl. 212—126)

This invention relates to improvements in overhead bucket carrying devices, and more particularly to an improved monorail type of cupola charger.

Heretofore it has been common practice to move a charging bucket to and from a cupola by having the bucket suspended from an overhead carriage with the latter movable along a single overhead rail. In this type of device the carriage is equipped with a power operated drum, and the bucket is supported by a cable which is windable on the drum to raise and lower the bucket. In view of the fact that the bucket must be lowered a substantial distance into a loading pit, a cable of relatively great length is required and the drum must be of sufficient length to accommodate all of the cable thereon. As a result, when the drum is operated, the cable leaves the drum with a back and forth movement limited in lateral extent only by the length of the drum. This cable is then usually guided around the idler pulley and then over the top of a second bucket supporting pulley which is positioned directly over the bucket. Due to the back and forth unwrapping movement of the cable as it leaves the drum, the idler pulley has heretofore been positioned a relatively great distance from the drum in order to minimize the angle which the cable assumes when it is being unwrapped from or wrapped upon an endmost portion of the drum. If the idler pulley were close to the drum, this angle would be so great as to cause the cable to slip out of the pulley groove. On the other hand, to have sufficient distance between the drum and pulley to prevent such disengagement of the cable from the pulley necessitates the use of an excessively long carriage. This is objectionable because of the increased expense in manufacture and because of the increased power required to move a relatively large and heavy carriage along the overhead rail.

It is, therefore, an object of the present invention to obviate the above difficulties by providing an improved construction wherein a relatively short carriage may be used and wherein the tendency of the cable to slip off of the idler pulley is effectively overcome.

A more specific object of the invention is to provide a construction as above described wherein the idler pulley and bearing assembly therefor is mounted to swing on an axis extending at right angles to the axis of the pulley, whereby the lower periphery of the pulley may swing through an arc of substantial length to follow the back and forth movement of the cable at the drum.

A further object of the invention is to provide a device as above described wherein the axis for swinging movement of the idler pulley is near the top of said pulley so that lateral back and forth movement of that portion of the cable extending away from the top of the pulley is minimized. In other words, due to the short arc of movement of the top of the idler pulley, said top portion never moves far enough out of alinement with the top of the bucket supporting pulley to cause the cable to slip out of the groove of either pulley.

With the above and other objects in view, the invention consists of the improved overhead bucket carrying device, and all its parts and combinations as set forth in the claim, and all equivalents thereof.

In the accompanying drawing illustrating one complete embodiment of the preferred form of the invention, in which the same reference numerals designate the same parts in all of the views:

Fig. 1 is a side elevational view of the improved bucket carrying device showing the bucket in fully raised position, only a fragment of the overhead rail being illustrated;

Fig. 2 is a top view of the bucket carrying device with the overhead rail omitted;

Fig. 3 is a sectional view taken on line 3—3 of Fig. 1 with, however, the drum shown in dot-and-dash lines to bring out the relationship between the drum and the swinging movement of the idler pulley. The idler pulley is shown in full lines in one extreme position of swinging movement, and in dot-and-dash lines in the opposite extreme of swinging movement.

Referring more particularly to the drawing, the numeral 5 designates an overhead rail which is preferably of I construction in cross-section having lower edge laterally extending flanges 6. The numeral 7 designates generally a carriage, and the numeral 8 a cupola charging bucket which is adapted to be raised and lowered from the carriage and to be moved by the carriage to and from a cupola.

The carriage 7 comprises side members 9 and 10 connected by cross members 11, 12, 13, 14, and 15. Brackets 16 which extend downwardly from each side of the carriage support an electric motor 17. The brackets are each formed with a shoulder 18 which forms a stop for limiting the upward movement of the bucket 8. A drum 19 is mounted rigidly on a shaft 20, and the ends of said shaft are journalled in bearings 21 on the side members 9 and 10, with one end of the

shaft projecting through the bearing and side rail and being equipped with a sprocket wheel 22. A sprocket chain 23 connects the sprocket wheel 22 with a sprocket wheel 24 mounted rigidly on the drive shaft 25 of the motor 17. Thus operation of the motor drives the drum.

Cable 26 is wound on the drum 19 in such a way that the cable portion 27 unwinds from the top of the drum with a back and forth movement from one end of the drum to the other. From the drum the cable portion 27 extends under the lower side of an idler or guiding pulley 28, around the rear of said pulley, and the cable portion 29 leaving the top of said pulley passes over the top of a bucket supporting pulley 30 at the opposite end of the carriage. From the bucket supporting pulley the cable passes under and around a pulley 31 carried by the bucket bail 32. The extreme end of the cable is rigidly connected to the carriage at 33. It is thus apparent that as the cable unwinds from the drum the bucket descends in a straight line from its position of Fig. 1. When the motor 17 is operated to cause the drum to wind the cable thereon, then the bucket is returned to the position of Fig. 1.

It has heretofore been common practice to have the carriage a great deal longer than the carriage illustrated herein, so that the guiding pulley 28 could be positioned a relatively great distance from the drum 19. This was necessary in order to reduce the angle of the cable portion 27 between the drum and idler pulley 28; otherwise if the cable was being unwound from or wound upon either of the extreme ends 34 or 35 of the drum, the angle of the cable portion 27 would be so great as to cause the cable to slip out of the groove of the idler pulley 28. The excessively long and heavy carriage required to obtain a sufficient distance between the pulley 28 and the drum was naturally objectionable.

With the present invention the idler guiding pulley 28 rotates on an axis 36 supported in spaced bearing plates 37. These bearing plates are connected at the ends by blocks 38, and the blocks 38 are spaced apart a sufficient distance to permit the upper portion of the pulley 28 to extend close to the upper edges of the bearing plates. Secured to the outer sides of the bearing plates are weights 39 (see Fig. 3). Trunnions 40 projecting from the blocks 38 and extending at right angles to the pulley axis 36 are journalled in bearings 41 so that the entire pulley assembly may swing on the trunnions 40 in the manner clearly shown in Fig. 3. It is to be noted that the axis of the trunnions 40 is near the upper portion of the pulley 28 so that the lower portion of the pulley can swing through a relatively large arc, as indicated in Fig. 3, to follow the action of the cable portion 27 as it moves from one end 34 of the drum to the opposite end 35 during winding or unwinding of said cable. Thus the lower portion of the pulley 28 always keeps itself in automatic alinement with the cable portion 27, and the weights 39 are positioned to effectively counterbalance this swinging action. Due also to the high location of the trunnions 40, the upper portion of the pulley 28 swings through only a very restricted arc so that the upper portion of the pulley is never far enough out of alinement with the bucket supporting pulley 30 to cause the cable portion 29 to slip out of the groove of either pulley. In addition the bearing plates 37 project somewhat above the upper portion of the pulley 28 and form a guide for the portion of the cable leaving the pulley 28 and extending toward the pulley 30.

The carriage 7 also supports another electric motor 42, and the drive shaft 43 of this motor carries a rigidly mounted sprocket wheel 44, which is connected by an endless chain 45 with a sprocket wheel 46 mounted rigidly on a shaft 47. The shaft 47 is journalled between bearing plates 48 and carries rigidly mounted pinions which drive gears 49 connected to wheels 50. These wheels ride upon the flanges 6 of the overhead rail and cause movement of the carriage therealong. Other undriven wheels 51 rotatably supported by the plates 48 also ride upon the flanges 6 of the overhead rail.

At the rear end of the carriage spaced plates 52 support an assembly which includes rollers 53 engaging on top of the flanges 6 of the overhead rail, rollers 54 engaging the under side of said flanges, and rollers 55 engaging the edges of the flanges 6. Thus the carriage is firmly supported on the overhead rail and the rear end is effectively supported against the weight of the bucket 8 and also against lateral movement.

While the invention has been shown as applied to a monorail type of carriage, it is obvious that the invention is applicable to other types of carriages and crane structures wherever the problem of pulley and drum alinement is present, and all such adaptations, as well as modifications, are contemplated as may come within the scope of the claim.

What I claim is:

In an overhead horizontally movable carriage having spaced side members, a rotatable drum extending transversely of said carriage intermediate the length thereof, a cable having a portion wound on said drum, a pulley spaced longitudinally of the carriage from the drum on one side thereof, around which another portion of the cable is guided, a second pulley supported on the opposite side of the drum from the first pulley and in substantial alinement with said first pulley, the cable extending horizontally and longitudinally of the carriage from the top of said first pulley over the top of said second pulley, the axis of both pulleys extending in the same general direction as the axis of the drum, an axle for said first pulley, spaced bearings for said pulley axle, trunnions having a horizontal axis extending longitudinally of the carriage for supporting said bearings and pulley to swing on an axis at right angles to the pulley axis, said trunnions being located nearer to the top peripheral portion of the pulley than to the bottom peripheral portion so that the top peripheral portion swings through only a short arc to maintain substantial alinement with the top of the second pulley while the bottom peripheral portion of the first pulley may swing through a relatively large arc to follow the back and forth movement of the cable at the drum when the drum is rotating, the bottom peripheral portion of the first pulley being approximately in the same horizontal plane as the top peripheral portion of the drum, and the distance between the axis of the trunnions and the bottom peripheral portion of the first pulley being such that the bottom peripheral portion may swing transversely a distance substantially equal to the length of the drum.

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