STOWING APPARATUS FOR WORKING CABLES AND THE LIKE

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FIG. 3

FIG. 2

FIG. 4

FIG. 5

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A preferred embodiment of the invention which has been thoroughly tested in actual use and found satisfactory and hence which is at present preferred is shown in the accompanying drawings in which

FIGURE 1 is a front elevational view of a typical installation of the apparatus—on the spreader-frame-mounted control cab and supporting bridge crane carriage of a containership transfer hoist of the kind disclosed in Tantlinger Patent No. 3,042,227;

FIG. 2 is a front elevational view on a larger scale, showing the stowing container or hopper member of the apparatus in axial section;

FIG. 3 is a front elevational view, on the same scale as FIG. 2, showing the complete apparatus;

FIG. 4 is a horizontal cross-sectional view, taken on the line 4–4 of FIG. 3;

FIG. 5 is a detail vertical sectional view taken through one side of the hopper member showing how the flexible element coils in the annular storage space;

FIG. 6 is a plan view of the guide member;

FIG. 7 is a side elevational view of another form of guide member; and

FIG. 8 is a side elevational view of still another form of guide member.

In FIG. 1 the reference numeral 1 designates the carriage which transverses the jib 2 of a bridge crane 3, running on rails 4 and supporting, by cables 5, a spreader frame 6 which makes separable connection with the bodies 7 of highway trailer trucks stopped at shipside. The cables 5 are operated to hoist the bodies 7 into and out of position on the trailer chassis and into and out of position in the hold or on the deck of the ship 8 on which the bridge crane is mounted. During these operations the vertical spacing of the carriage 1 and the spreader frame 6 is constantly changing, as is also the effective length of the various flexible elongated elements that extend between the two for the transmission of electric power, hydraulic and air pressure, etc., between the carriage 1 and the control cab 9 which is mounted on the frame 6.

As will be understood from the introductory explanation of the invention, the purpose of the new apparatus is to provide for simple, effective and automatic wind-up or stowing of such transmission elements (hereinafter generically designated cables) during reduction in the vertical spacing of the virtual terminals on the cab and carriage as the frame 6 rises and to provide for equally simple, effective and automatic paying out of the elements as that spacing increases on lowering of the frame.

This is accomplished by the combination of a special form of hopper 10 mounted on the cab or at least in fixed relation to it, a clamping device 11 which is mounted on the carriage, and an intervening guide 12 which is positioned in fixed relation to the hopper and slightly above it for directing the cable into and out of the hopper during ascending and descending movements of the hopper.

The hopper 10 is essentially a circular container having an outer cylindrical wall 20, an inner wall 22 which defines a concentric cylindrical shape of smaller diameter and is capped by a conical top 24, and a bottom 26 spanning the annular space 27 at the lower ends of the two cylinders. All these parts may be made of appropriately heavy sheet metal welded or otherwise united to form a stout rigid unit which may be conveniently mounted in fixed position on the cab 9 (or contiguous to it) as by angle iron legs 28. The hopper is thus fixed in upright position, with the annular space 27 open at the top and preferably trimmed and stiffened by a bead 30 on the top edge of the outer wall 20.
The clamping device 11 is best made as a simple standard having its base fixed to the carriage and having a top arm projecting horizontally out over the hopper 10 and terminating in a clamp 42 adapted to receive and securely hold the cable 50 against any kind of movement, as will be hereinafter explained.

The guide 12 is basically an eye or loop element disposed over and close to the hopper 10 and having its aperture aligned substantially with the hopper axis or the apex of the conical top 24 for passing the cable and guiding it into and out of stowed relation with the hopper, as will also be hereinafter explained. The guide is best made in the form of an upright 60 standing from the cap or the hopper, as by being welded to one of the legs 28, with the eye element horizontally outstanding and preferably adjustable vertically on the upright, as by the sleeve and setscrew arrangement 62.

An important feature of the hopper is a clamping device 52 fixed in the bottom of the annulus 27 which may be, as shown in FIG. 5, simply a U-bolt, for the purpose of fixing the cable 50, at what may be regarded as one of its ends, securely against any kind of movement, just as the clamp 42 holds what may be regarded as the other end of the cable against any kind of movement.

Actually, of course, these portions of the cable that are held by the clamps 52 and 42 are not the ends of the cable. However, they are virtual ends, insofar as the present apparatus is concerned. From these virtual ends the cable extends to the units that it connects for transmission of electrical power, fluid pressure or the like.

The portion of the cable 50 between the two clamps 52 and 42 is convoluted within the annulus 27 of the hopper 10 and extended upwardly from the top of the hopper through the guide 12 to the clamp 42. The cable may be installed, with the hopper at the topmost position of its range of movement, shown in FIG. 3, by fishing the cable through a hole in the hopper outer side wall, as indicated at 70 in FIGS. 3 and 4, coiling the cable in stacked convolutions in the hopper annulus, leading it through the eye 12, and finally securing its upper virtual end of the clamp 42.

The coiling operation is performed without imposing any force or stress on the cable except such as is necessary to lay it in place in convolutions in the annulus. However, the free end of the cable is maintained free, being as yet not secured by the clamp 42, so that it undergoes turning against its own axis, i.e., it twists one full turn for each convolution that becomes laid down in the annulus. When the cable is fully stowed, as indicated in FIG. 3, the virtual upper end is secured in the clamp 42, so that thereafter the cable is firmly held, at both virtual ends, against any turning on its own axis, i.e., against twisting.

Thus, when the cable is pulled out from the enclosing annulus, by descent of the hopper, the twist is maintained in it, being manifested in the portion extended from the top of the hopper and up to the clamp 42 as a helix of high pitch, as indicated in FIGS. 3 and 1. And, when the space between the hopper and the clamp 42 decreases, by ascent of the hopper, the stress of this twist operates to lay the cable automatically and naturally down in the annulus in its original stowed condition, with the cable convoluted in coils and unstressed by reason of conversion of the twist stress into coiled condition.

In a sense it may be said that the portion of cable paid out from the hopper and extending between the upper clamp 42 and the topmost convolution in the hopper has a coil memory function impressed into it and that this coil memory functions to convert the stress into the laying of coils in the hopper as the paid out portion of cable falls through the guide back toward the hopper or, what amounts to the same thing, as the hopper rises to take the paid out portion back in.

It will be recognized that various modifications and substitutions may be made in the individual elements of the combination constituting the invention and that the proportions shown in FIGS. 3, 7 and 8 depict three different types of guide that may be used. The simple eye or loop form is shown at 12 in FIG. 6. FIG. 7 shows a small helical coil 80 of heavy rod stock terminating in a flat circular end-turn so as to provide a sort of skeletonized cylinder. FIG. 8 shows a cylindrical sleeve 82 of pipe stock.

Dimensions are of little importance, but it may be stated that in one of the operative embodiments a pipe section guide of 1/2 inch diameter pipe is used in connection with a cable of 1/8 inch diameter.

The proportions shown in FIG. 5 are preferred. That is to say, it is advantageous to space the inner and outer walls of the hopper, forming the annular space 27 that receives the coils of cable, so as to provide an intervening distance equal to somewhat less than twice the cable diameter. In this way the adjacent turns of cable are disposed at staggered elevations and are prevented from jamming and binding, and thus free paying out is facilitated.

1. Claim:

1. Stowing apparatus for an elongated flexible transmission element of the class consisting of cables, hoses, wires and the like disposed in connecting relation between points fixed respectively on two stations which are movable vertically relatively to each other, one of said stations being normally above the level of the other, said apparatus comprising a stowing hopper fixed on the lower of said two stations and providing an upright cylindrical annulus formed of radially spaced apart inner and outer walls adapted to contain convolutions of the element and having means adjacent its bottom for securing the lower end portion of the element and guiding it against twisting, a superjacent clamping device fixed on the upper of said two stations, movable therewith, gripping the other end portion of the element and holding it against twisting, and a guide mounted on the lower of said two stations above the hopper for passing the intervening portion of the element and guiding it back into convolutions in the hopper when the two stations move toward each other.

2. Stowing apparatus as claimed in claim 1, in which the guide is substantially axially aligned with the hopper.

3. Stowing apparatus as claimed in claim 1, in which the hopper is formed with a substantially conical top rising from the inner wall of the annulus.

4. Stowing apparatus as claimed in claim 1, including a substantially conical top mounted on the inner wall of the annulus, with said guide positioned directly above the vertex of the cone.

5. Stowing apparatus as claimed in claim 1, in which the guide is adjustable through a range of different elevations above the hopper.

6. Stowing apparatus as claimed in claim 1, in which the radial width of the annulus is less than twice the diameter of the element whereby adjacent convolutions of the element coiled in the annulus are staggered in relatively non-binding relation.

7. Stowing apparatus as claimed in claim 1, including a side standard adjacent the hopper the guide being adjustable mounted on the standard for setting at various elevations above the hopper.

8. Stowing apparatus for an elongated flexible transmission element of the class consisting of cables, hoses, wires and the like disposed in connecting relation between points fixed respectively on two stations which are spaced one above the level of the other and are movable vertically relatively to each other, said apparatus comprising a stowing hopper fixed on the lower station and providing an upright cylindrical annulus having radially spaced apart inner and outer walls adapted to contain convolutions of the element and having means adjacent its bottom for securing the lower end portion of the element and
holding it against twisting, and a superjacent clamping device fixed on the upper station movable therewith, gripping the other end portion of the element and holding it against twisting, whereby, as the two stations move vertically relatively to each other, said two end portions of the element are maintained at all times against relative axial rotation and the intermediate portion of the element between said fixed points undergoes increasing torsion as the stations move in separation and decreasing torsion as the stations move toward each other.

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