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NASA TECH BRIEF

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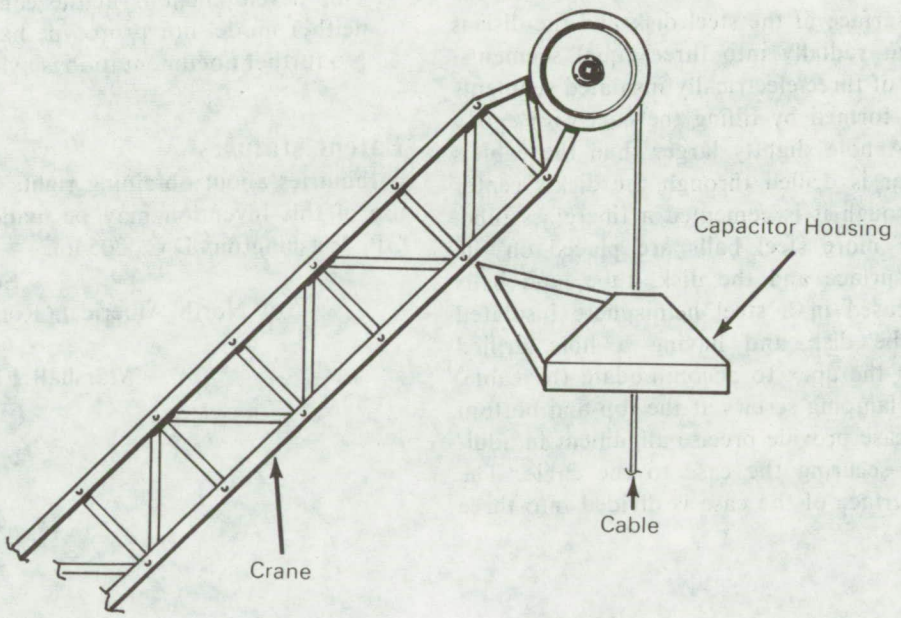
Proposed Technique for Vertical Alignment of a Crane's Cable



During movement of heavy damageable equipment by crane, accidents occasionally occur when the boom has not been properly positioned over the equipment, and the load swings or slides upon lifting. Currently, the boom is aligned over the load visually but this is a time consuming and often inaccurate operation. The boom's position could be better located by a detector mechanism attached to the boom; this mechanism, with associated circuitry, would sense the attitude of the cable and display any deviation from the vertical on a remote scope located in the operator's cabin. The proposed vertical alignment technique has potential application with either fixed-boom cranes or gantries (note 1).

The proposed system consists of two parts: a detector assembly fixed to the boom and a display scope located in the cabin. Four or more single-plate capacitors would be housed in the assembly with the cable, the second plate of the capacitor, running freely through the center. In operation the cable is attached to the object to be moved and the slack is taken up. If the boom is incorrectly positioned over the object, the cable hangs closer to one capacitor plate than to the others, and the deviation from the vertical is indicated on the scope. The boom's position is corrected in accordance with the scope's indication and lifting does not occur until the cable is precisely vertical.

. (continued overleaf)

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Notes:

1. No provisions are made for changing the position of the indicator mechanism as the boom's angle of elevation changes. This limitation may restrict application of this concept to fixed-boom cranes and gantries.
2. Since the cable's deviation from the vertical diminishes with height, the necessary attachment of the indicator mechanism near the top of the boom limits the system's capacity to indicate precisely the vertical alignment.
3. A number of variations of this concept are possible; two are outlined below:
   a. The surface of a steel disk is machined very faintly concave and polished. One half inch thick fiberglass insulation is bonded to the lower surface of the steel disk and the disk is then cut radially into three equal segments. A disk of three electrically insulated segments is then formed by filling the cuts with epoxy resin. A hole slightly larger than the cable's diameter is drilled through the disk's center and through it is cemented a fiberglass tube. One or more steel balls are placed on the disk's surface and the disk, tube, and balls are encased in a steel hemisphere insulated from the disk and having a hole drilled through the apex to accommodate the cable. Three clamping screws at the top and bottom of the case provide precise alignment in addition to securing the case to the cable. The outer surface of the case is divided into three equal electrically insulated segments to match the disk's segments. When the disk's surface is not horizontal, the balls roll to the periphery and electrical contact is made between the disk segment and the case segment. With simple wiring the contact could be displayed by battery-powered lights embedded in the case. When no lights are on, the disk is horizontal and the cable is precisely vertical.
   b. The unit described above (a) could be designed to clamp to the SIDE of the cable, thus eliminating the holes through the disk and hemisphere and making a much more portable unit.
4. This development is in the conceptual stage only; neither model nor prototype has been constructed.
5. No further documentation is available.

Patent status:

Inquiries about obtaining rights for the commercial use of this invention may be made to NASA, Code GP, Washington, D.C. 20546.

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