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Abstract:

The present invention relates to a heave compensation system designed to enhance the effectiveness, safety, and cost-efficiency of marine construction operations. It includes both active and passive heave compensation technologies and integrates dynamic positioning (DP1) capabilities to achieve high precision and efficiency in offshore positioning, with an accuracy of $\pm 300\text{mm}$. The system aims to improve overall operational performance and provides significant competitive advantages in the marine construction industry.

ABSTRACT

The invention relates to a telescopic rock fall pipe system for subsea rock installation, featuring a hybrid heave compensation assembly capable of both active and passive operation. The system comprises a telescopic pipe supported by a carriage and gimbal, a double drum lifting winch, and a hydraulic cylinder coupled to a moving sheave block. A logic-integrated hydraulic manifold, controlled by a PLC and a Motion Reference Unit (MRU), enables a Passive Heave Compensation (PHC) mode for low sea states using high and low-pressure accumulators as hydro-pneumatic springs, and an Active Heave Compensation (AHC) mode for higher sea states. The hydraulic circuit includes a specific bypass valve (SV3) configured to momentarily connect the cylinder's piston and rod chambers during over-pressure or over-speed events, ensuring mechanical integrity. The system provides precise, energy-efficient vertical stabilization of the fall pipe end point relative to the seabed, to compensate for vessel motion.

[Figure 1]