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"Quantum" interference with bouncing drops TOMAS BOHR, ANDERS ANDERSEN, JACOB MADSEN, CHRISTIAN REICHELT, Physics Department, The Technical University of Denmark, BENNY LAUTRUP, CLIVE ELLEGAARD, MOGENS LEVINSEN, The Niels Bohr Institute, University of Copenhagen — In a series of recent papers (most recently D. Harris, J. Moukhtar, E. Fort, Y. Couder and J. Bush, Phys. Rev. E **88**, 011001(R) (2013)) Yves Couder and collaborators have explored the dynamics of walking drops on the surface of a vibrated bath of silicon oil and have demonstrated a close analogy to quantum phenomena. The bouncing drop together with the surface wave that it excites seems to be very similar to the pilot wave envisaged by de Broglie for quantum particles. In particular, Couder and Fort (Phys. Rev. Lett. **97**, 154101 (2006)) have studied a double slit experiment with walking drops, where an interference pattern identical to the quantum version is found even though it is possible to follow the orbits of the drops and unambigously determine which slit it goes through, something which in quantum mechanics would be ruled out by the Heisenberg uncertainly relations. We have repeated the experiment and present a somewhat more complicated picture. Theoretically, we study a Schrödinger equation with a source term originating from a localised "particle" being simultaneously guided by the wave. We present simple solutions to such a field theory and discuss the fundamental difficulties met by such a theory in order to comply with quantum mechanics.

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