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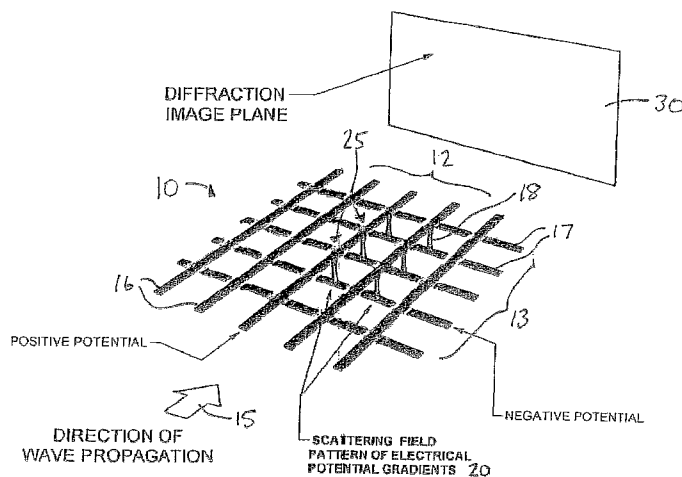
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(54) Title: PARTICLE OPTICS AND WAVEGUIDE APPARATUS



(57) Abstract: An apparatus for manipulating or modifying electromagnetic waves or electromagnetic waves or a beam of particles, eg atoms, ions, molecules or charged particles, the apparatus comprising a micro or nano electrical conductor crossbar network having multiple cross-over junctions that define respective scattering points for electromagnetic waves or the particles of the beam. At least one structural parameter of the crossbar network is selectively tuneable to obtain a desired manipulation or modification of said wave or beam when incident on the network in a pre-determined directional electrical conductor crossbar network (10) configured as an atomic beam diffraction grating. The direction of wave propagation of the atomic beam is indicated by the arrow (15). The atomic beam is sufficiently slowed for it to exhibit wave behaviour having a de Broglie wavelength of the order of magnitude of the lattice spacing of a lattice of scattering points (20) defined by crossbar network (10), and is thereby diffracted so as to form a diffraction pattern on downstream image plane (30). In this way, incident beam (15) is manipulated or modified by crossbar network (10) whereby the beam emerges from the network manipulated or modified with respect to incident beam (15).



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