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(54) **CONTROL SYSTEMS AND METHODS FOR PERMANENT MAGNET ROTATING MACHINES**

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(57) **ABSTRACT**

Systems and methods for controlling a rotating electromagnetic machine. The rotating machine, such as a permanent magnet motor or hybrid switched reluctance motor, includes a stator having a plurality of phase windings and a rotor that rotates relative to the stator. A drive is connected to the phase windings for energizing the windings. A controller outputs a control signal to the drive in response to inputs of demanded torque, rotor position and/or speed. Control methods include calculating a scaled torque demand from the received torque demand to obtain substantially constant torque over a range of motor speeds, calculating an optimal d-axis injection current using a cost function and a starting method that switches from speed control mode to torque control mode at a predetermined rotor speed or at predetermined start-up timing intervals.

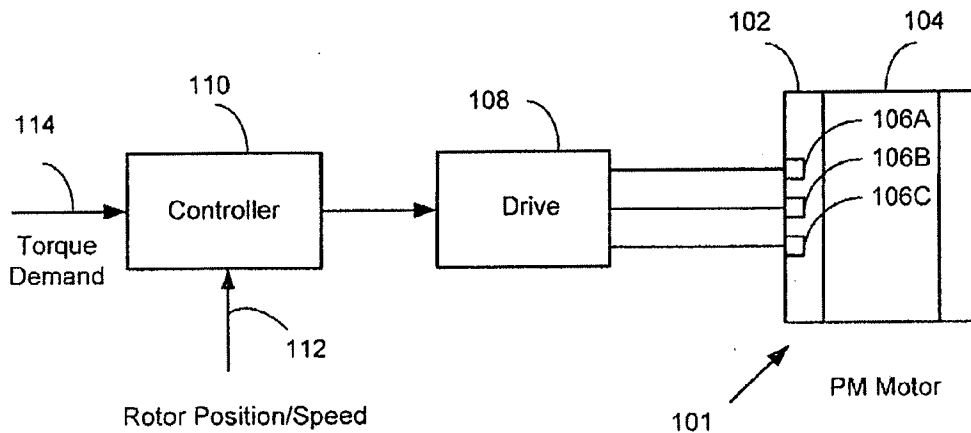
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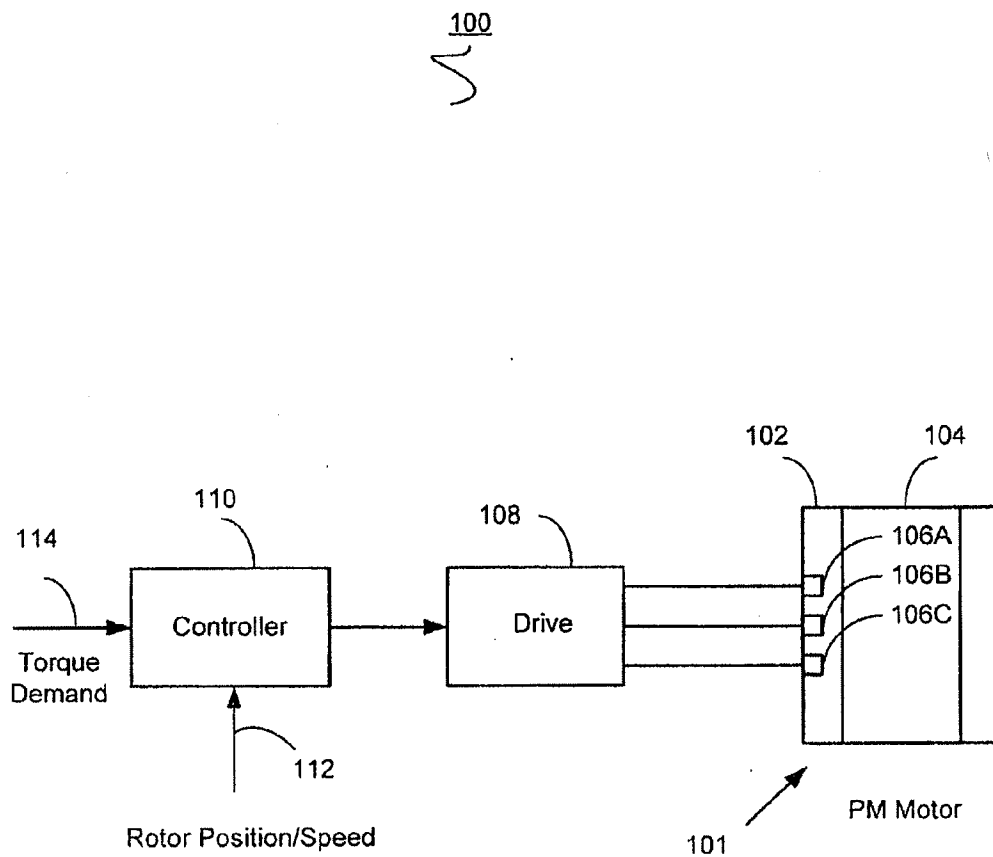


FIG. 1

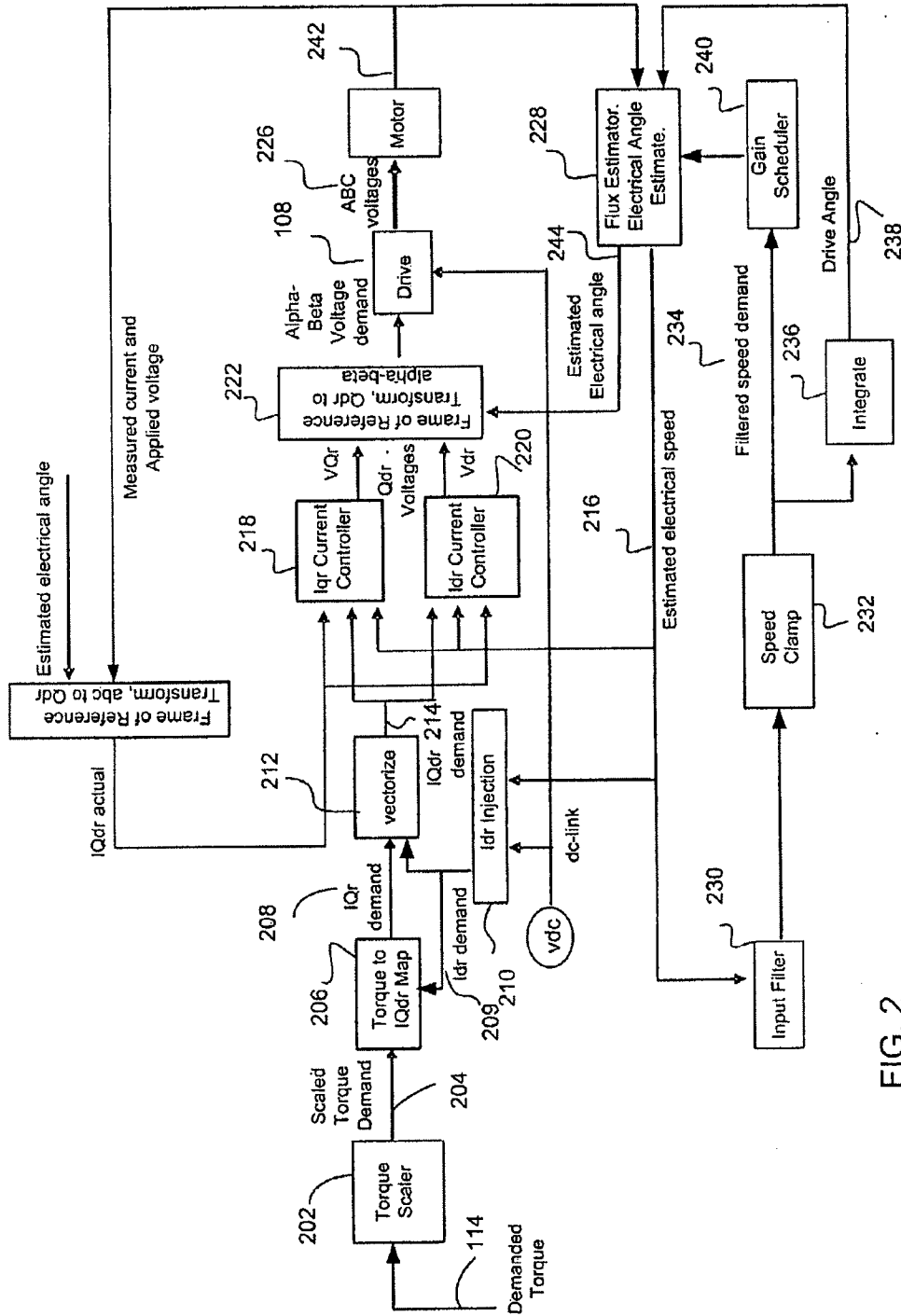


FIG. 2

300

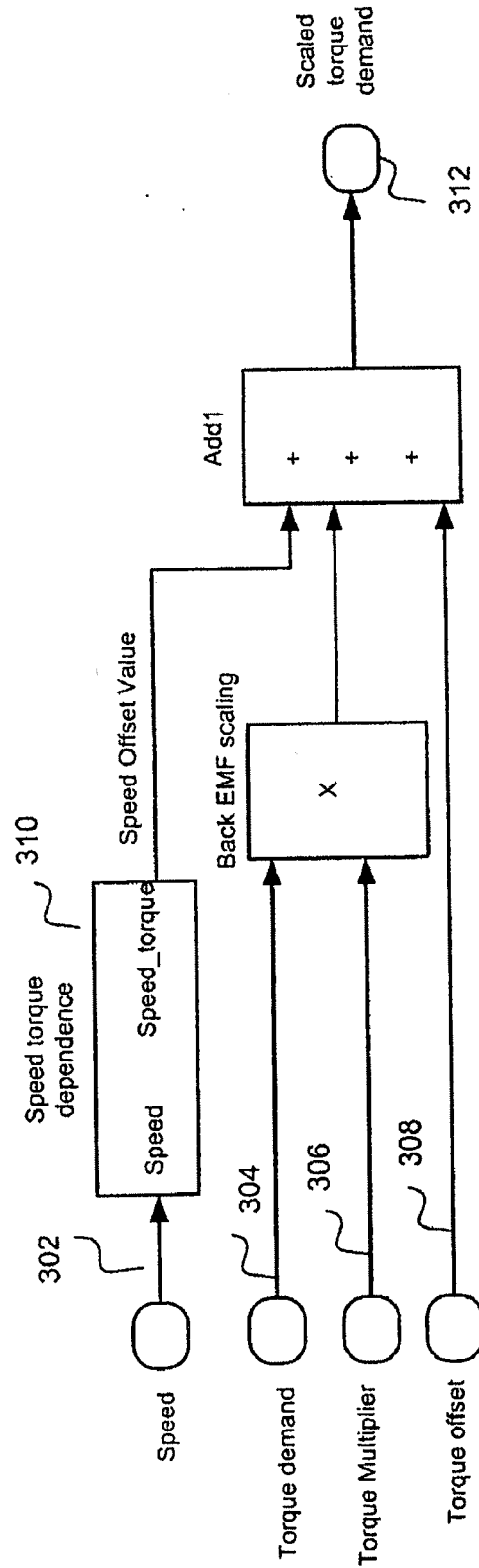


FIG. 3

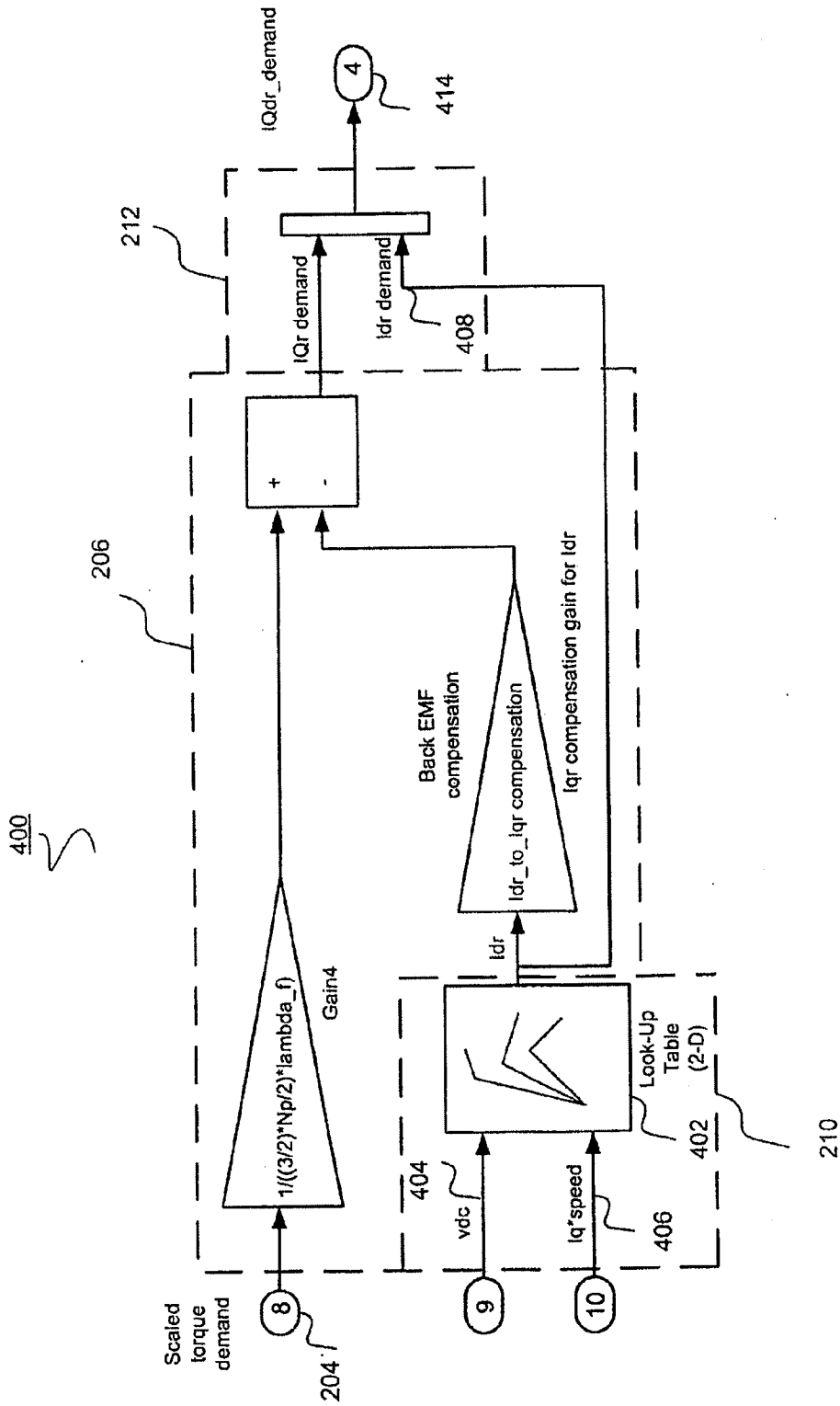


FIG. 4

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