CLAIMS

1. A drill bit, comprising:

a bit body;

a self-adjusting pad associated with the bit body;

a rate control device coupled to the pad that extends from a bit surface at a first rate to reduce vibration and retracts from an extended position to a retracted position at a second rate in response to external force applied onto the pad to decrease friction and increase maneuverability, the rate control device including:

a piston for applying a force on the pad;

a biasing member that applies a force on the piston to extend the pad at the first rate;

a fluid chamber associated with the piston; and

a pressure management device for controlling a fluid pressure within the fluid chamber, wherein the pressure management device is a multi-stage orifice.

2. A drill bit, comprising:

a bit body;

a self-adjusting pad associated with the bit body;

a rate control device coupled to the pad that extends from a bit surface at a first rate to reduce vibration and retracts from an extended position to a retracted position at a second rate in response to external force applied onto the pad to decrease friction and increase maneuverability, the rate control device including:

a piston for applying a force on the pad;

a biasing member that applies a force on the piston to extend the pad at the first rate;

a fluid chamber associated with the piston; and

a pressure management device for controlling a fluid pressure within the fluid chamber, wherein the pressure management device is a high precision gap disposed between the piston and the fluid chamber.

3. The drill bit of claim 2, wherein the fluid chamber is a triple walled cylinder having a first wall, a second wall and a third wall, and at least one of the first wall, the second wall, and the third wall includes the high precision gap.

4. A drill bit, comprising:

a bit body;

a self-adjusting pad associated with the bit body;

a rate control device coupled to the pad that extends from a bit surface at a first rate to reduce vibration and retracts from an extended position to a retracted position at a second rate in response to external force applied onto the pad to decrease friction and increase maneuverability, the rate control device including:

a piston for applying a force on the pad, wherein the piston is a plurality of hydraulically linked pistons;

a biasing member that applies a force on the piston to extend the pad at the first rate;

a fluid chamber associated with the piston; and

a pressure management device for controlling a fluid pressure within the fluid chamber.

5. A drill bit, comprising:

a bit body;

a self-adjusting pad associated with the bit body;

a rate control device coupled to the pad that extends from a bit surface at a first rate to reduce vibration and retracts from an extended position to a retracted position at a second rate in response to external force applied onto the pad to decrease friction and increase maneuverability, the rate control device including:

a piston for applying a force on the pad;

a biasing member that applies a force on the piston to extend the pad at the first rate;

a fluid chamber associated with the piston; and

a pressure management device for controlling a fluid pressure within the fluid chamber;

wherein the pad is a plurality of pads that extend from the rate control device, wherein the rate control device is centrally disposed.

6. A drill bit, comprising:

a bit body;

a self-adjusting pad associated with the bit body;

a rate control device coupled to the pad that extends from a bit surface at a first rate to reduce vibration and retracts from an extended position to a retracted position at a second rate in response to external force applied onto the pad to decrease friction and increase maneuverability, the rate control device including:

a piston for applying a force on the pad;

a biasing member that applies a force on the piston to extend the pad at the first rate;

a fluid chamber associated with the piston; and

a pressure management device for controlling a fluid pressure within the fluid chamber;

wherein the rate control device is oriented with a tilt against the direction of rotation of the drill bit to minimize a tangential component of a frictional force experienced by the piston

7. A method of drilling a wellbore, comprising:

providing a drill bit including a bit body, a self-adjusting pad associated with the bit body, and a rate control device;

conveying a drill string into a formation, the drill string having a drill bit at the end thereof;

selectively extending the pad from a bit surface at a first rate via the rate control device to reduce vibration;

selectively retracting from an extended position to a retracted position at a second rate in response to external force applied onto the pad via the rate control device to decrease friction and increase maneuverability, the rate control device including:

a piston for applying a force on the pad;

a biasing member that applies a force on the piston to extend the pad at the first rate;

a fluid chamber associated with the piston; and

controlling a fluid pressure within the fluid chamber via a pressure management device, wherein the pressure management device is a multi-stage orifice; and

drilling the wellbore using the drill string.

8. A method of drilling a wellbore, comprising:

providing a drill bit including a bit body, a self-adjusting pad associated with the bit body, and a rate control device;

conveying a drill string into a formation, the drill string having a drill bit at the end thereof;

selectively extending the pad from a bit surface at a first rate via the rate control device to reduce vibration;

selectively retracting from an extended position to a retracted position at a second rate in response to external force applied onto the pad via the rate control device to decrease friction and increase maneuverability, the rate control device including:

a piston for applying a force on the pad;

a biasing member that applies a force on the piston to extend the pad at the first rate;

a fluid chamber associated with the piston; and

controlling a fluid pressure within the fluid chamber via a pressure management device, wherein the pressure management device is a high precision gap disposed between the piston and the fluid chamber; and

drilling the wellbore using the drill string.

9. The method of claim 8, wherein the fluid chamber is a triple walled cylinder having a first wall, a second wall and a third wall, and at least one of the first wall, the second wall, and the third wall includes the high precision gap.

10. A method of drilling a wellbore, comprising:

providing a drill bit including a bit body, a self-adjusting pad associated with the bit body, and a rate control device;

conveying a drill string into a formation, the drill string having a drill bit at the end thereof;

selectively extending the pad from a bit surface at a first rate via the rate control device to reduce vibration;

selectively retracting from an extended position to a retracted position at a second rate in response to external force applied onto the pad via the rate control device to decrease friction and increase maneuverability, the rate control device including:

a piston for applying a force on the pad, wherein the piston is a plurality of hydraulically linked pistons;

a biasing member that applies a force on the piston to extend the pad at the first rate;

a fluid chamber associated with the piston; and

controlling a fluid pressure within the fluid chamber via a pressure management device; and

drilling the wellbore using the drill string.

11. A method of drilling a wellbore, comprising:

providing a drill bit including a bit body, a self-adjusting pad associated with the bit body, and a rate control device;

conveying a drill string into a formation, the drill string having a drill bit at the end thereof;

selectively extending the pad from a bit surface at a first rate via the rate control device to reduce vibration;

selectively retracting from an extended position to a retracted position at a second rate in response to external force applied onto the pad via the rate control device to decrease friction and increase maneuverability, the rate control device including:

a piston for applying a force on the pad, wherein the pad is a plurality of pads that extend from the rate control device, wherein the rate control device is centrally disposed;

a biasing member that applies a force on the piston to extend the pad at the first rate;

a fluid chamber associated with the piston; and

controlling a fluid pressure within the fluid chamber via a pressure management device; and

drilling the wellbore using the drill string.

12. A system for drilling a wellbore, comprising:

a drilling assembly having a drill bit, the drill bit including:

a bit body;

a self-adjusting pad associated with the bit body;

a rate control device coupled to the pad that extends from a bit surface at a first rate to reduce vibration and retracts from an extended position to a retracted position at a second rate in response to external force applied onto the pad to decrease friction and increase maneuverability, the rate control device including:

a piston for applying a force on the pad;

a biasing member that applies a force on the piston to extend the pad at the first rate;

a fluid chamber associated with the piston; and

a pressure management device for controlling a fluid pressure within the fluid chamber, wherein the pressure management device is a multi-stage orifice.

13. A system for drilling a wellbore, comprising:

a drilling assembly having a drill bit, the drill bit including:

a bit body;

a self-adjusting pad associated with the bit body;

a rate control device coupled to the pad that extends from a bit surface at a first rate to reduce vibration and retracts from an extended position to a retracted position at a second rate in response to external force applied onto the pad to decrease friction and increase maneuverability, the rate control device including:

a piston for applying a force on the pad;

a biasing member that applies a force on the piston to extend the pad at the first rate;

a fluid chamber associated with the piston; and

a pressure management device for controlling a fluid pressure within the fluid chamber, wherein the pressure management device is a high precision gap disposed between the piston and the fluid chamber.

14. A drill bit, comprising:

a bit body;

a pad associated with the bit body;

a rate control device coupled to the pad that extends from a bit surface at a first rate to provide a low depth of cut and retracts from an extended position to a retracted position at a second rate in response to an external force applied, the rate control device including:

a piston for applying a force on the pad;

a biasing member that applies a force on the piston to expose the pad at the first rate; and

a rotary device that applies a force on the piston to hide the pad at the second rate, wherein the second rate is less than the first rate.