NASA TECH BRIEF

High-Torque Power Wrench, A Concept

The problem:

A need exists for a power torque wrench small enough to be handled by one or two men yet with sufficient torque to remove 1-1/2- to 4-inch nuts from high-pressure tanks and valves. Frequently, nuts are "slugged" on the studs, making the nuts extremely difficult to remove should the necessity arise. Torque wrenches of the size required are not commercially available.

The solution:

Design a power torque wrench that has the capability of exerting an amount of controlled pressure within the desired limits.

How it's done:

This design concept consists of a 10,000-psi hydraulic ram that operates a dual-pawl onto a rachet which, in turn, has a square hole for an adapter to receive regular power-drive supersockets. A counteracting arm is connected to the ram and is adaptable to a hex-socket wrench to receive nuts or round female adapters for studs. This is a power-stabilizing arm to counteract the torque output from a selected fixation point. The arm can be pivoted from the body of the wrench to adjust to various anchor points. With a regulated hydraulic power supply, the "on torque" may be uniformly applied and monitored by use of a high-pressure gage. The "on" or "off" motion is accomplished merely by turning the wrench over. Wrench stroke drives the link arm through a 30-degree arc, and it is used only in the final stages of torque, either on or off.

Notes:

1. If desired, the action can be made automatic by use of solenoid-operated valves and suitable switches. Two wrenches have been designed, one weighing 60 pounds and having a 7300-ft-lb capacity and the other weighing 120 pounds with an 18,000-ft-lb capacity.
2. Critical analysis of this design indicates a minimal deflection of the hydraulic cylinder about the fixed pivot point during the stroke of the piston-ram. This deflection results in an error of less than 0.02 percent of the rated torque value; i.e., at 7300 ft-lb, the error, not including friction, would be less than 1.5 ft-lb.
3. This development is in conceptual stage only, and, as of date of publication of this Tech Brief, neither a model nor prototype has been constructed.

Patent status:

Inquiries about obtaining rights for the commercial use of this invention may be made to NASA, Code GP, Washington, D.C. 20546.

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