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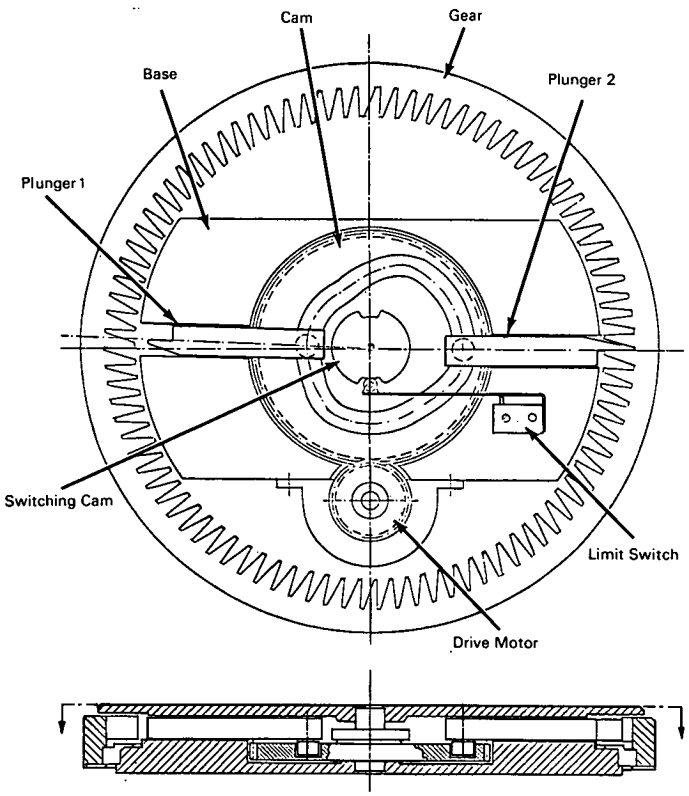
Brief 68-10549

NASA TECH BRIEF

High-Torque Precision Stepping Drive



A stepping drive has been designed for precise incremental angular positioning of scale models of spacecraft about a horizontal axis in order to accurately measure antenna receiving and transmitting characteristics. It replaces an ordinary gearhead drive which has proven inadequate in precision and torque output for the intended purpose.

In operation the stepping drive functions in the following manner. The base is attached to the model structure. Throughout 180°, the assembly shown above operates in 60° increments as shown in the four sketches shown overleaf. At starting position, the gear is locked and held in precise position by plunger 2. The cam now begins a 180° clockwise rotation. During the first 60° , the cam shifts plunger 1 to the left, halfway into the space between two teeth as shown in 2. During the second 60°, the cam withdraws plunger 2 completely from the gear. The final 60° rotation moves plunger 1 all the way to the left, which, in turn, by wedge action rotates the gear about the angle $\alpha/2$.

(continued overleaf)

Upon completion of 180° rotation, the cam is stopped by the limit switch. Plunger 1 is now the gear in precise position after travel of exactly 2°. Thus, it is seen that a 180° cam movement results in $2° = \alpha/2$ of gear movement.

Notes:

1. Precise positioning of the gear is assurred by spring-loaded plungers and, due to the small wedge angle of 24°, the plungers are self-locking.
2. Documentation for the innovation is available from:

   Clearinghouse for Federal Scientific
   and Technical Information
   Springfield, Virginia 22151
   Price $3.00
   Reference: B68-10549

Patent status:

This invention is owned by NASA, and a patent application has been filed. Royalty-free, nonexclusive licenses for its commercial use will be granted by NASA. Inquiries concerning license rights should be made to NASA, Code GP, Washington, D.C. 20546.

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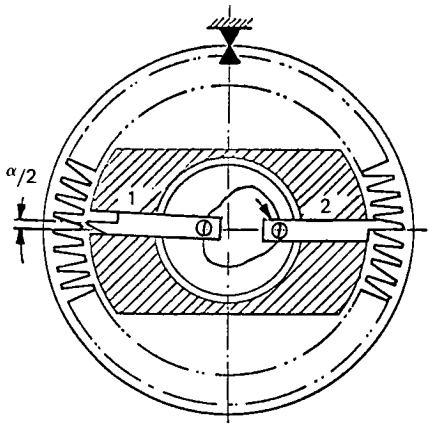
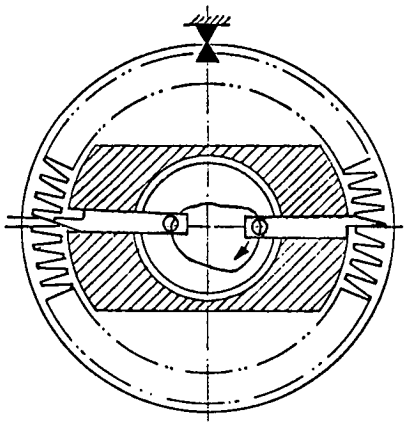
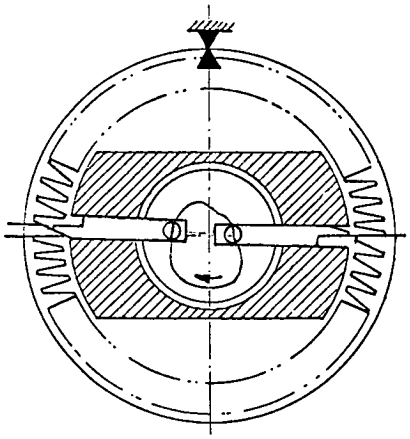


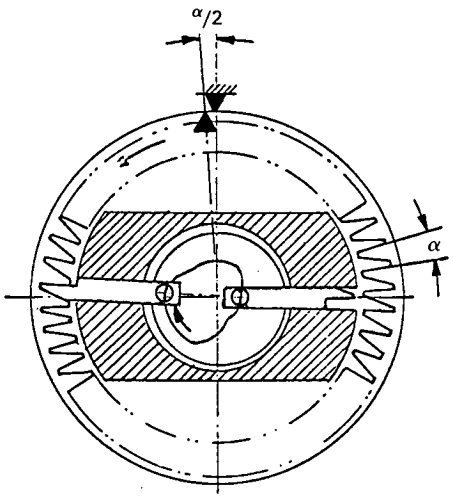
1. Starting Position.
Plunger 2 Determines And Locks Position of Gear 3.
Plunger 1 Is Disengaged.
Cam Position: 0°



2. Cam Rotates 60° CW.
Plunger 1 Proceeds Halfway To The Left.
Plunger 2 Does Not Move.
Cam Position: 60°.



3. Cam Rotates Another 60° CW.
Plunger 1 Does Not Move.
Plunger 2 Is Completely Withdrawn To the Left.
Plunger 1 Prevents Gear From Free-Wheeling. Cam Position: 120°



4. Cam Rotates 60 More Degrees CW.
Plunger 1 Completes Stroke Moving The Gear $\alpha/2$ CCW.
Plunger 1 Now Holds Gear In Position.
Cam Position: 180°.