

Tape - Controlled Boring

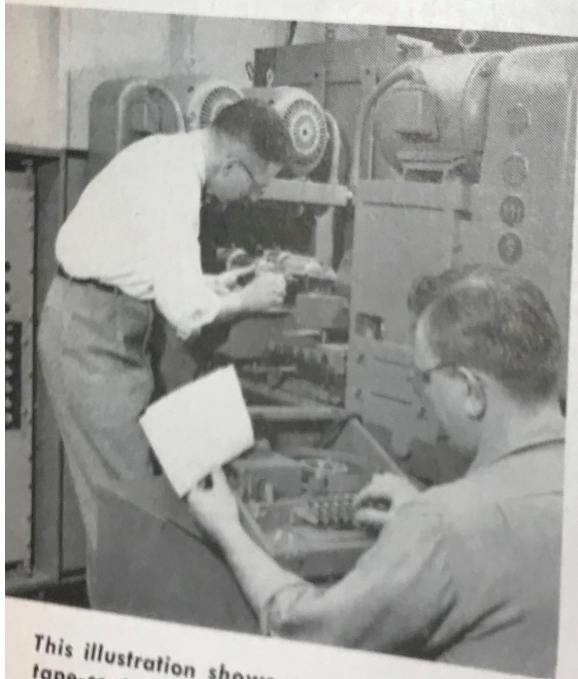
Application of the punched-tape principle of automatic operation to a boring machine producing instrument gear trains is outlined.

By JOHN RUDOLPH

The punched-tape principle of automatic operation has been applied to a precision boring machine used in the production of instrument gear trains. A system worked out by Minneapolis-Honeywell Regulator Company includes a standard four-spindle Ex-Cell-O precision boring machine modified with built-

in electronic controls and circuitry and a tape "reader" housed in a specially-built control cabinet.

Hole coordinates and feed instructions are punched on the tape by a perforating machine similar to a typewriter. Electronic signals from the tape regulate the linear travel of the boring machine's hydraulic cross



This illustration shows an overall view of the tape-controlled automatic boring machine. In the foreground, an operator uses a perforating machine similar to typewriter, to punch hole coordinates and feed instructions on the tape.

Operating instructions are punched on a tape and feed through the "reader" housed in the specially-built control cabinet. Electronic signals from the tape, shown being inserted in "reader," regulate boring machine operation.

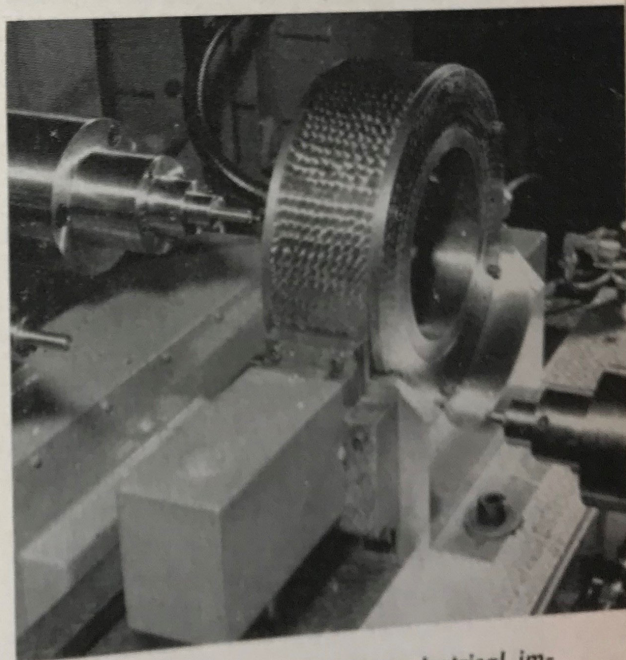
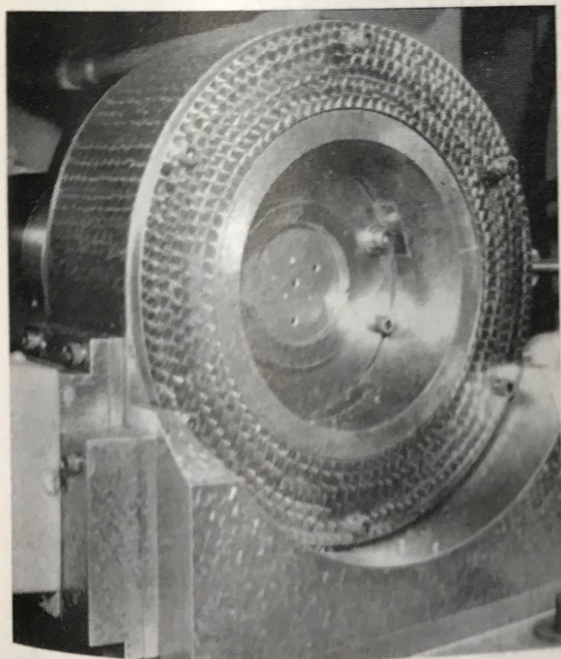
slide and the rotary motion of a specially-designed holding fixture mounted on the cross slide. Tape preparation requires approximately five minutes per hole, and complete changeover from one part to another can be accomplished in about 30 minutes.

To set up for automatic operation, the proper adapter ring is attached to the rotary fixture, cutting tools are mounted in the four spindles and the punched tape is placed in the "reader" of the control circuit. After inserting a blank piece in the fixture, the operator merely presses a button to initiate the automatic tape-controlled cycle. After the machine has "read" the complete strip of tape, it automatically stops to permit removal of the finished part.

Designed for boring shaft holes in gear plates in which the center-to-

center hole tolerances must be close to prevent binding or backlash, the machine is adaptable to a variety of hole patterns and sizes. Different piece parts can be handled merely by changing the adapter ring and inserting the appropriate tape. Where a small number of special plates is needed, the machine can be manually operated by adjusting 10 knobs to control linear travel of the cross slide and rotary motion of the holding fixture. Manual control knobs are located in the control cabinet.

In either manual or tape-controlled operation, coordinate information is fed to the machine in increments of 0.0001 inch over the 8-inch linear range and 0.01 degree over the 360-degree rotary range. Accuracy is claimed to be better than plus or minus 0.0005 inch.



The loop plastic tape sends out electrical impulses to regulate the linear travel of the machine's hydraulic cross slide (lower left) and the rotary motion of the holding fixture (center) which is mounted on the cross slide.

Center-to-center hole tolerances in bored gear plates must be close to prevent binding or backlash. Holes of various sizes have been machined in the particular workpiece shown here, which is held rigid in a rotary fixture.