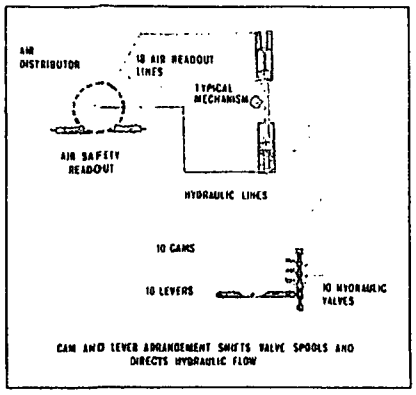
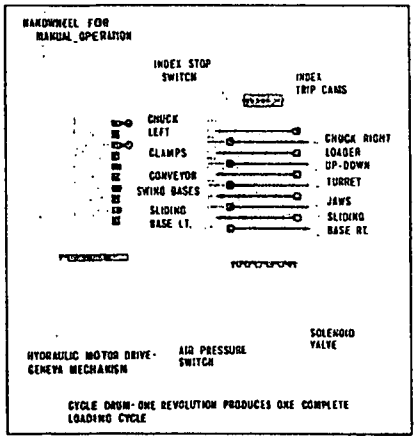


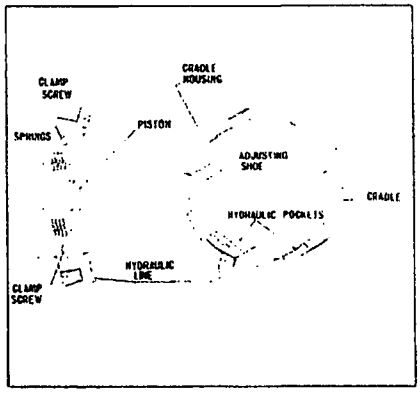


SIMPLIFIED CYCLE CONTROL

Control complexity has been minimized by use of a hydraulic cycle control drum. This regulates the timing and movements of the sliding bases, workheads, clamps, hydraulic chucks and the transfer mechanisms. The drum has 10 cams and it is rotated by a hydraulic motor and Geneva drive. Each cam directly actuates a hydraulic valve with no intermediate electrical function.

Through a pneumatic read-out safety system, all machine functions are monitored. It assures that each scheduled machine function has occurred before another starts.

For machine setup, the cycle control drum can be rotated manually. This allows the setup man to safely check individual functions as they occur.



CRADLE DESIGN

Cradles have been designed to remain in balance for any cradle, swivel, eccentric or tilt angle setting.

The front cradle bearing is of a unique semi-hydrostatic design. Cradle weight is supported by hydraulic oil under pressure. No metallic contact occurs between cradle and housing. As a result, wear is essentially eliminated. Another feature of the bearing design is the use of adjustable side pads which precisely center the cradle.

Semi-hydrostatic cradle bearings permit simultaneous rotation and axial feed motions which are entirely vibration-free and accurately controlled. The balanced design, together with the viscous damping effect of the semi-hydrostatic bearing eliminates the need for cradle brakes.

In addition, the range of adjustment of universal tilt has been extended to 40°, so as to increase flexibility in making developments.