CHAPTER I

Set-up Adjustments and Operating Controls

This chapter explains the purpose and use of the controls and adjustments used in setting up and operating the No. 510 Surface Grinding Machine. In addition, it covers points to be remembered to obtain the best results.

Drive. Machine is furnished with 1 H.P. motor driven Antifriction Bearing Spindle or a Plain Bearing Spindle. Either spindle can be furnished with Oriflex Drive (Fig. 1) through 5 "O" rings.

Illustration (Fig. 2) shows motor location in upright compartment when Oriflex Drive is used. This drive, though flexible transmits the full power of the motor to the spindle.

If preferred the Antifriction Bearing Spindle can be furnished with Direct Motor Drive.

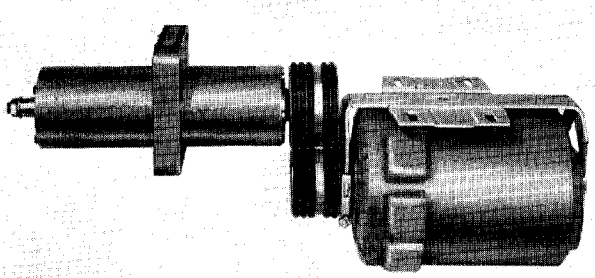

Fig. 1. Antifriction-Bearing Spindle with Oriflex Drive.

Starting the Machine. The push-button switch located on the left side of machine starts and stops the motor for the spindle drive. In starting the machine follow instructions below under the heading of "Starting the Spindle".

Wheel Spindle

Starting the Spindle. The antifriction-bearing spindle can be started immediately at any time.

When starting a plain-bearing spindle for the first time or after a few days' idleness, press the Start button and almost immediately push the Stop button. Do this three or four times so that the bearings will be adequately lubricated before running the spindle at operating speed.

Instructions on oiling the plain-bearing spindle are given on a plate on the front of the upright, and should be followed carefully in operating the machine.

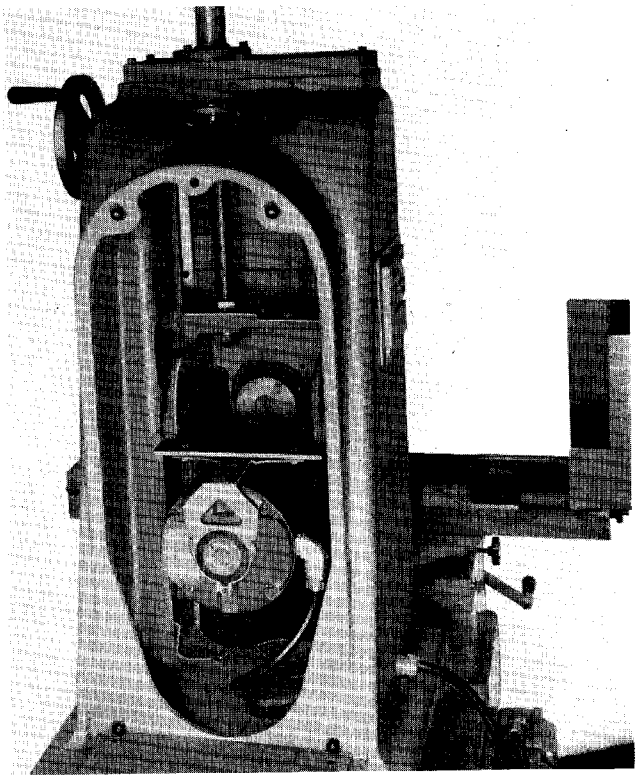

Fig. 2. Motor mounted in rear of upright when Oriflex Drive is used.

Vertical Adjustment. The vertical adjustment handwheel is located on the right side of machine at the top of the upright. (Fig. 3) Graduations on the handwheel read to 0.000,2" and are widely spaced to facilitate estimating smaller fractions. One revolution of the handwheel moves the spindle head 0.050" and clockwise rotation raises the head.

End Play Take-up. In the antifriction-bearing spindle, end thrust in both directions is taken by two opposed preloaded ball thrust bearings.

End play in the plain-bearing spindle is taken up by compression springs which act against a thrust collar in the spindle assembly. (A section drawing of the spindle is shown on page 25.) To take up end play, release and then tighten the clamp screw. CAUTION: The clamp screw should be tightened only while the spindle is running,

and only after it has reached its maximum temperature (½ hour of running).

Since the clamp screw merely holds the thrust collar in position and does not govern the closeness of adjustment, there is no reason to use excessive clamping pressure.

For normal surface grinding or when grinding shoulders with the outer face of the wheel, the clamp screw can be released, leaving the thrust springs to take up end play automatically.

Wheel Speed. When the Spindle is driven by a 60 cycle direct drive motor, the full load speed is 3450 R.P.M. using a 7" diameter wheel, ½" thick.

With the spindle using the "Oriflex drive, the full load speed is 2800 R.P.M. using an 8" diameter wheel, ½" thick.

Wheel Guard. The wheel guard is fastened to the wheel guard support by two knurled nuts located at the top rear of the guard. Loosen the two knurled nuts and the guard can be removed.

Two clamp screws located on the clamping edge of the wheel guard support can be loosened and the guard tipped either side of horizontal if necessary.

Always make sure that the guard is securely clamped before starting the machine; and never run a wheel without having the guard and its cover in place.

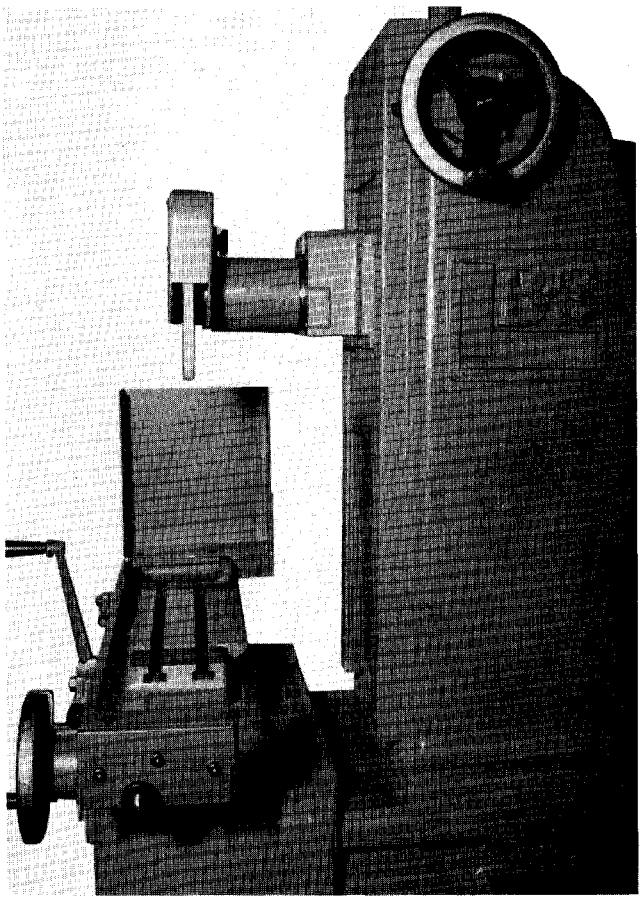

Fig. 3. The vertical adjustment handwheel is shown near the top of the upright.

Care and Use of Grinding Wheels

Selecting the Wheel. In order to produce the desired quality of work in the shortest time, real care is necessary in choosing the wheel which is best for the job at hand. The items to consider in making this choice are discussed in Chapter IV (page 21).

Mounting Wheels. One general-purpose grinding wheel and one wheel sleeve are furnished with the machine. When additional wheels are used, extra wheel sleeves should be procured so that each wheel can be kept on its own sleeve. Thus, in changing from one type of wheel to another, the wheel and sleeve can be changed as a unit and will remain concentric, requiring only a minimum amount of truing.

The wheel should fit easily on the wheel sleeve, yet not loosely, for if it is loose it cannot be centered accurately and will consequently be out of balance. Do not wrap the sleeve with paper etc. to make a wheel fit when the hole is too large. It is better from all standpoints either to discard such a wheel or recast the core.

A wheel that fits a trifle tightly may crack if forced on the sleeve. If the hole is only a little under size it can easily be scraped out to fit.

Before mounting a wheel, hang it in the air on one finger; then lightly tap the edge of the wheel and see if it gives a clear ringing sound. A wheel that does not ring clear is probably cracked and should not be used.

The inner of the two flanges between which the wheel is mounted is a part of the wheel sleeve (see Fig. 4). The outer flange consists of a steel disk or washer which is keyed to the wheel sleeve to keep it from turning and loosening the clamping nut.

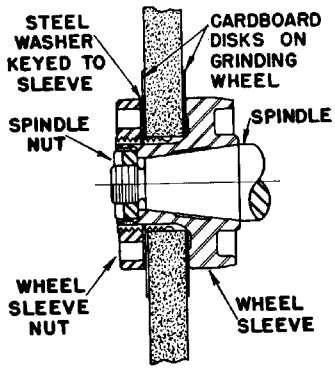

Fig. 4 Proper mounting of grinding wheel.

To equalize the clamping pressure, washers of cardboard or rubber should be placed between the wheel and the two flanges. Most wheels of the size used on this machine have a ring of heavy blotting paper on each side, which serves the purpose.

Using the pin wrench furnished, tighten the clamping nut enough to hold the wheel firmly in place on the sleeve. Do not tighten too much, however, as excessive clamping pressure will crack the wheel.

Changing Wheels. In removing a wheel sleeve from the spindle, always *use the wheel sleeve puller* (furnished with the machine) to avoid any chance of cracking the wheel or damaging the spindle bearings by pounding. Remove the spindle nut (this nut has a *left-hand* thread) ; then thread the outer member of the wheel sleeve puller into the wheel sleeve and tighten the inner screw against the spindle, thus loosening the wheel sleeve without harmful jarring.

In putting a wheel on the spindle, first see that both the wheel sleeve hole and the spindle end are perfectly clean. Then slip the sleeve onto the spindle, seat it by hand and tighten by means of the clamping nut and wrench.

Balance of Wheel. It is essential that the wheel run perfectly true and without vibration. Grinding wheels are balanced by the manufacturer and, in the case of wheels of the size used on this machine, should not require attention in this respect other than truing. A wheel that runs badly out of balance after truing should be discarded or returned to the wheel manufacturer—though in cases of necessity the condition may be corrected by digging out part of the wheel beneath the flange and filling with lead as indicated by a test for static balance.

Wheel Truing. A wheel truing fixture is furnished with the machine. The truing diamond (not furnished) may be applied to the wheel along any line on the lower half of the wheel circumference, though preferably at the bottom of the wheel as shown in Fig. 5. To prevent gouging, the center line of the diamond tool should point slightly beyond the center of the wheel in the direction of movement of the wheel surface.

The wheel should be trued each time it is put on the spindle and whenever it becomes loaded, dull or glazed. Pass the diamond across the wheel with a slow, steady manual cross feed, taking care to avoid any longitudinal movement of the table.

In truing a wheel for rough grinding, take a cut about 0.000,5″ deep in one pass of the diamond across the wheel and finish with a similar cut 0.000,25″ deep. If the wheel is to be used for finish grinding, take two 0.000,5″ cuts; then take two or three additional cuts removing about 0.000,25″ each time, and finally pass the

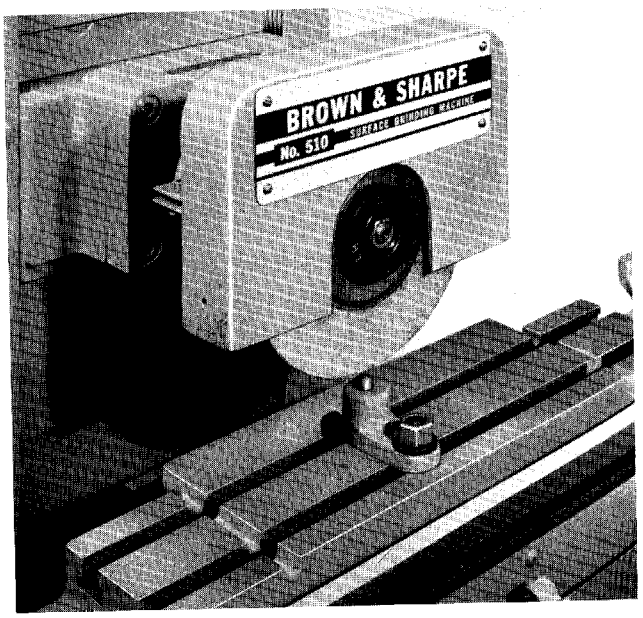

Fig. 5. Wheel truing fixture in use.

diamond across the wheel once or twice without further advance of the wheel. The figures stated are approximate and under some conditions should be varied somewhat to give desired results.

The wheel can be trued to a radius or angle and combinations of radial and angular shapes can be obtained by using the Radius and Angle Wheel Truing Attachment described on page 18.

Accurate radii, both concave and convex, with accurate tangents at either or both sides of the radii can be formed with the Continuous Radius and Tangent Wheel Truing Attachment described on page 18.

Table Movement. Table is mounted on ground and precision lapped steel rollers that give an extremely easy gliding movement. The table is mounted on the bed. The rollers under the front of the table are on a flat way. The rollers under the rear are in a 90° V-way (Fig. 6). This arrangement gives extreme accuracy for side-wheel grinding, such as grinding of slots, forms, etc.

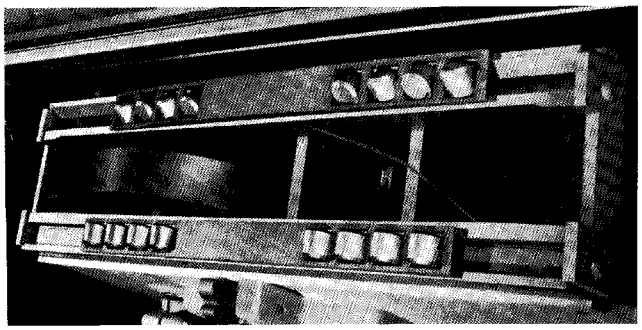

Fig. 6. Arrangement of precision-ground rollers for easy table movement.

Table movement is by means of a hand-operated lever located at the left front of the machine. Lever is easily adjusted to the position most convenient for the operator. A 32° movement of the lever moves the table 2″ and the full travel of 11″ is obtained by approximately 180° lever movement. Table movement is effortless even when grinding tough die steel.

A Knob on the end of the bed adjacent to the lever permits applying any amount of "drag" on the table movement. The same Knob is used to lock the table in the proper position for wheel truing, without the necessity of moving the table dogs.

Backlash is eliminated as drive is by means of a steel tape wrapped around a drum (360° contact) and fastened to each end of the table. Drum movement is controlled by the hand lever on the front of machine. Knurled nuts at each end of the table adjust the tension in the steel tape.

Stop Dogs. Adjustment table dogs operating against a positive stop can be set to limit table travel in either direction. If desired the positive stop can be swung out of the way to allow movement of the table beyond the limits set by the dogs.

Hand Cross Feed. The Cross Feed Handwheel has a dull chrome finish with clear wide-spaced graduations reading to 0.000,2″ for precise adjustment of the grinding wheel.

The dial on the rim of the Cross Feed Handwheel is adjustable and has graduation marking that read both clockwise and counter-clockwise. One turn of the Handwheel gives 0.100″ feed and clockwise moves the wheel forward.

Suggestions on Set-Up and Operation

Clamping Work to Table. In clamping workpieces, chucks, vises etc. to the table of the machine, use only enough clamping pressure to hold the part from slipping. Tight clamping is not necessary, since the forces exerted on the work are quite small; and excessively hard clamping might spring the table enough to cause inaccuracies in the work.

Rough and Finish Grinding. In general, it is not advisable to use one machine consistently for heavy hogging cuts and for highest-quality finish grinding as well. If large amounts of heavy roughing work are to be done, it is best to use one machine for that class of work and do the finish grinding on a machine reserved for finish grinding only.

Form Grinding. Under proper conditions of maintenance and by using adequate care in operation, highly accurate form grinding can be performed on these machines.

Spindle Alignment. The contacting surfaces of the spindle head and spindle sleeve flange are ground at our factory to give a good commercial accuracy of alignment of the spindle with relation to the table ways. For shoulder grinding jobs which demand greater-than-ordinary closeness of parallelism between the side of the wheel and the table travel, the required alignment can be secured by carefully scraping the spindle sleeve flange. Note that any alteration by scraping should be done on the flange and not on the face of the spindle head; for the spindle head should remain untouched so as to permit other spindles to be used in the machine.

Dry Grinding. In dry grinding operations use an exhauster to protect the operator, the machine itself and neighboring machines from the grit and dust produced. Either connect the machine to a central exhaust system or use an exhaust attachment such as the one described on page 13.