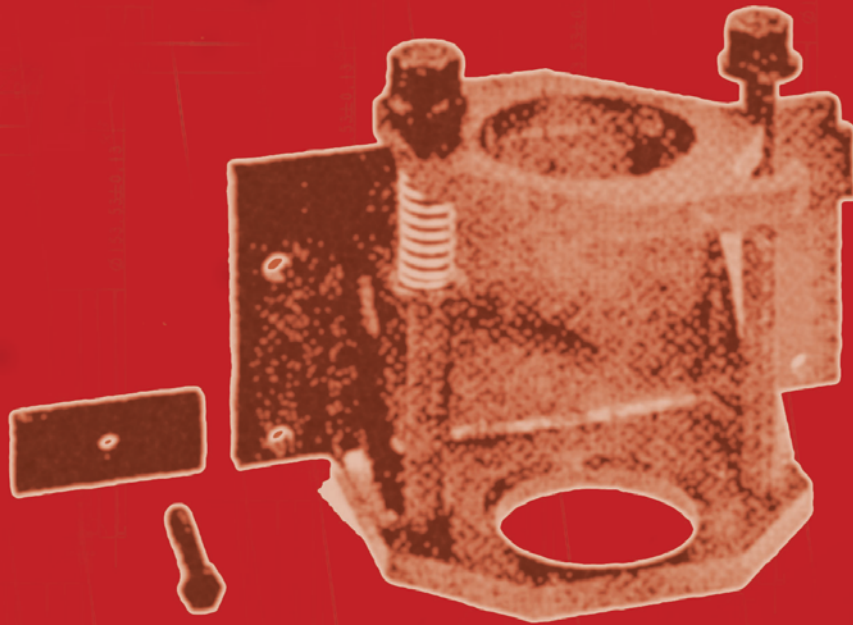


SUNNEN[®] HONING TECHNIQUES

DATA FILE: #109

VERTICAL HONING FIXTURES



NOTES

TECHNIQUES FOR HONING SHORT BORES

TABLE OF CONTENTS

CV FIXTURING

Primary Design Considerations	1
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PART FIXTURING CATEGORIES

Cylindrical Thick Walled Parts	2
Cylindrical Thin Walled Parts	2
Rectangular Parts	3
Parts with Mounting Base	3
Short Parts	4

FIXTURES

Toe Clamping	5
End Clamping Fixture	6
Chuck Fixture	7
Air Bag Fixture	8
Tunnel Fixture	9
Square Base Fixture	10
Pin and Clamp Fixture	11
Back Plate Fixture	12
End Clamping Fixture (Short Parts)	13

CV FIXTURING

This book is a general guide on fixturing for the Sunnen CV-616 Cylinder King Automatic Vertical Honing Machine. The photographs and related information are provided to enable you to design and build fixturing for your particular workpiece. Additional assistance is available from your local Sunnen Field Engineer or from Sunnen Products Company.

Primary Design Considerations

The fixture must:

1. Absorb honing torque and stroking thrust.
2. Not distort the part.
3. Allow for overstroking and cradle height adjustment.

The fixture should:

1. Roughly align bore and honing tool.
2. Enable the part to be easily reversed (turned end for end).

NOTE: Make fixture so center of bore length is at cradle pivot point. This eliminates unnecessary adjustment of the cradle height after reversal of part.

3. Permit quick and easy loading and unloading.

PART FIXTURING CATEGORIES

Cylindrical Thick Walled Parts

Toe Clamping (see page 5) can be used on parts with outside diameters of over 6 in. (150 mm) (see Figure 1).

An **End Clamping Fixture** (see page 6) can be used on parts with outside diameters of 6 in. (150 mm) or less (see Figure 2).

A **Chuck Fixture** (see page 7) can be used on long parts with small outside diameters (see Figure 3).

Cylindrical Thin Walled Parts

An **Air Bag Fixture** (see page 8) can be used cylindrical parts that distort under clamp pressure (see Figure 4).



Figure 1, Thick Walled Part



Figure 2, Thick Walled Part



Figure 2, Thin Walled Part



Figure 3, Thick Walled Part



Figure 5, Rectangular Part



Figure 6, Rectangular Part



Figure 8, Parts with Mounting Base

Rectangular Parts

A Square Base Fixture (see page 10) can be used on parts whose bore (to be honed) goes through a square base (see Figure 5).

A Tunnel Fixture (see page 9) can be used on parts whose overall shape is rectangular (see Figure 6).

Parts with Mounting Base

A Pin and Clamp Fixture (see page 11) can be used on light parts with a mounting base (see Figure 7).

A Back Plate Fixture (see page 12) can be used on heavy parts with a mounting base (see Figure 8).

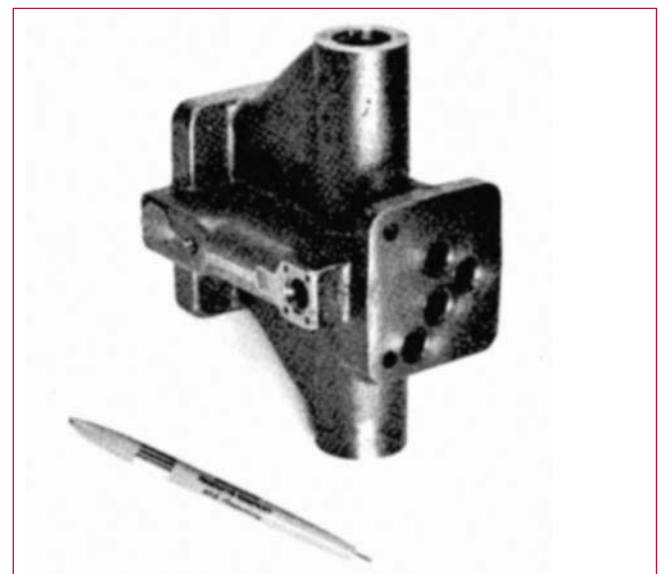


Figure 7, Parts with Mounting Base

Short Parts

(bore length smaller than bore diameter)

An End Clamping Fixture (see page 13) can be used with some short parts (see Figure 9).

FIXTURING

Toe Clamping

Different length Towers allow Toe Clamps to be positioned at various heights (see Figure 10).

Part Elevators must be made long enough to accommodate overstroke and any Cradle height adjustment that may be necessary (see Figure 11).

Part cannot be reversed without being removed from fixture.

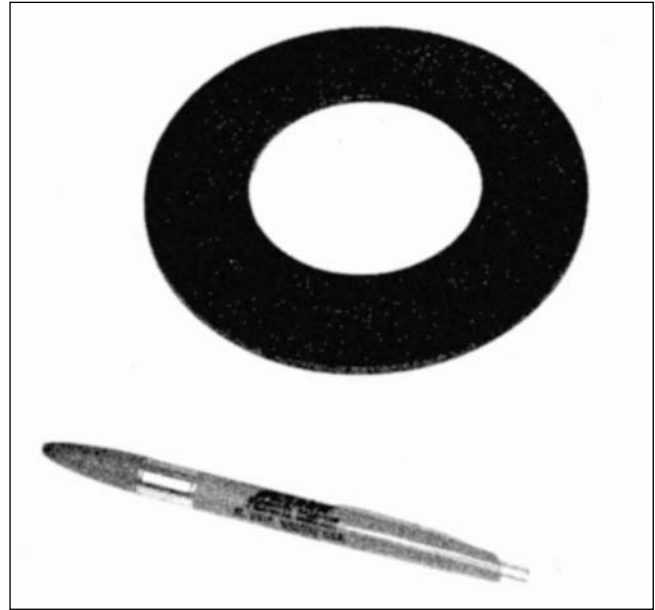


Figure 9, Short Part

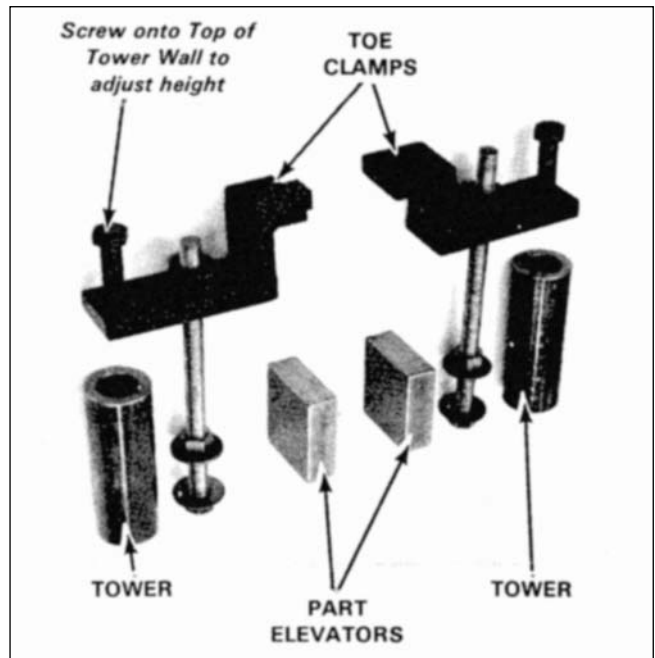


Figure 10, Toe Clamping

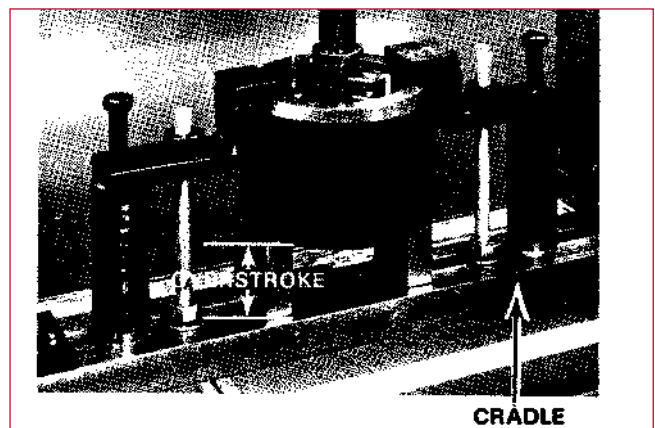
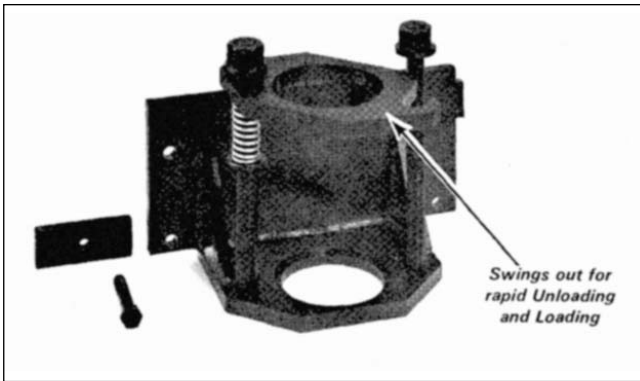


Figure 11, Toe Clamping

End Clamping Fixture.

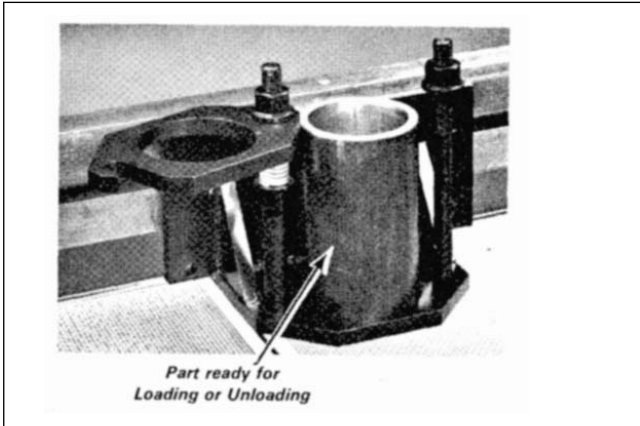
This fixture enables the part to be easily reversed (essential for extreme accuracy) by rotating the Cradle 180°. The fixture or the Cradle does not obstruct overstroking (see Figure 12).



Chuck Fixture

Mount chuck on channel iron as shown. A lathe chuck was used to make this fixture (see Figure 13).

NOTE: The hole through the chuck must be larger than the outside diameter of the workpiece (see photo below).



Pads should be loaded in the fixture to the same height to reduce the amount of Cradle height adjustment required. Height Indicators have been attached to the fixture for that purpose.

This fixture enables the part to be easily reversed (essential for extreme accuracy) by rotating the Cradle 180°. The fixture or the Cradle does not obstruct overstroking (see Figure 14).

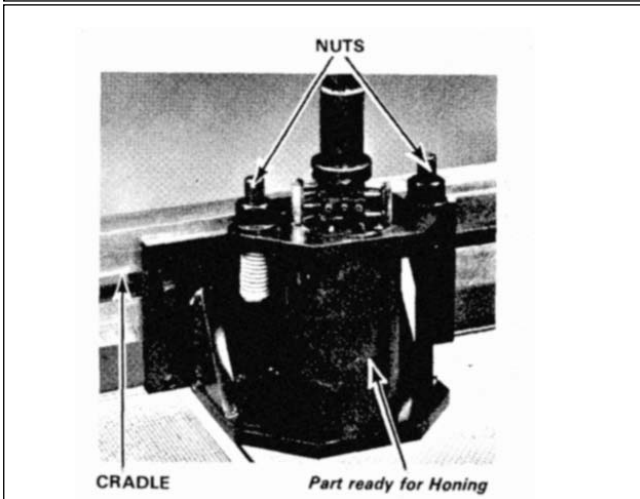


Figure 12, End Clamping Fixture

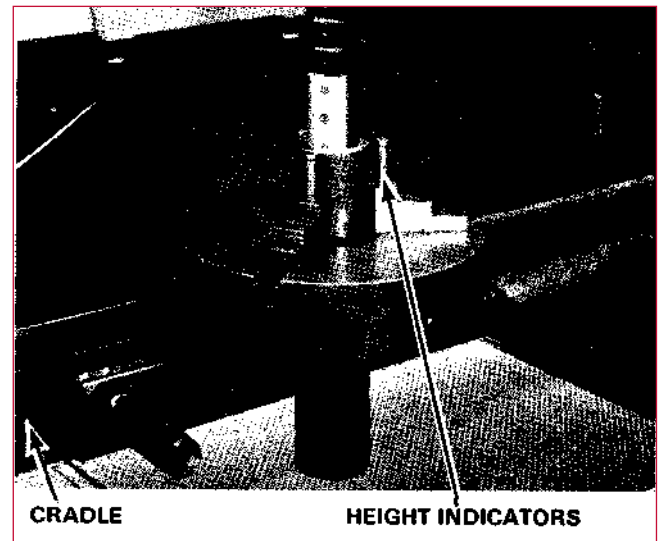


Figure 14, Chuck Fixture

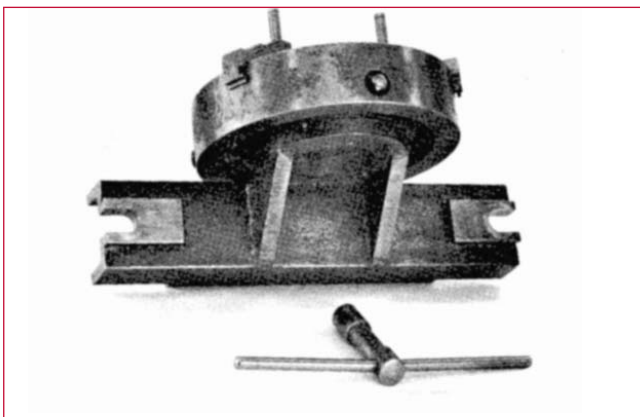


Figure 13, Chuck Fixture

Air Bag Fixture

The Air Bag consists of Tygon Flexible Plastic Tubing coiled around the inside diameter of a heavy metal tube. Nylon Strapping is wrapped around the plastic tubing with one end of the plastic tubing allowed to hang out. The Nylon Strapping is held in place with Hose Clamps. The thin wall part is inserted into the fixture and the plastic tubing is inflated with compressed air until the part is held fast in the fixture. Generally 5 to 10 psi of pressure is required to hold part (see Figure 15).

CAUTION

Honing oil causes most plastic tubing to get hard. Use Tygon Brand, or make sure the brand you use will not be affected by honing oil.

Any cylindrical part with a thin wall can be honed in this type of fixture.

This fixture enables the parts to be reversed (essential for extreme accuracy) by rotating the Cradle 180°. The fixture or the Cradle does not obstruct overstroking (see Figure 16).

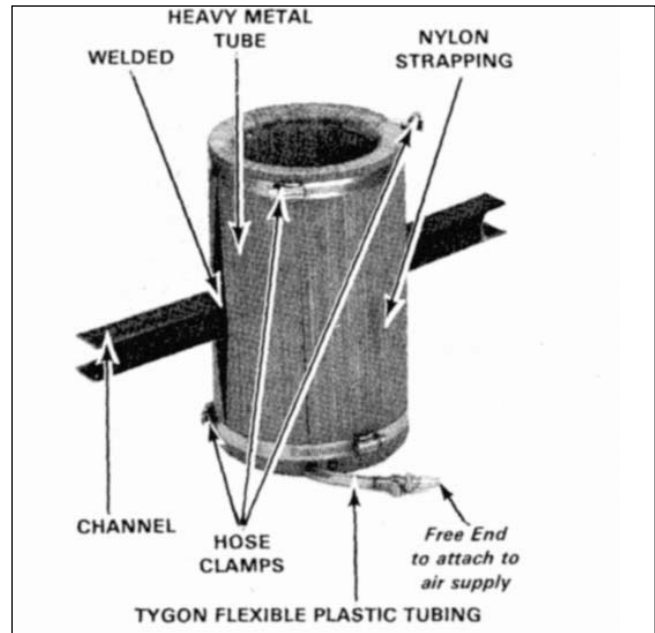


Figure 15, Air Bag Fixture

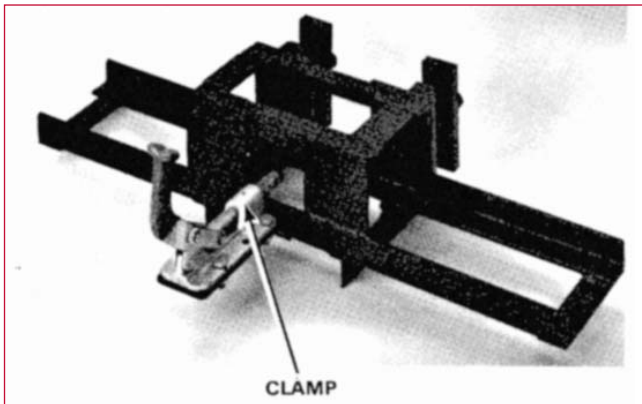


Figure 17, Tunnel Fixture

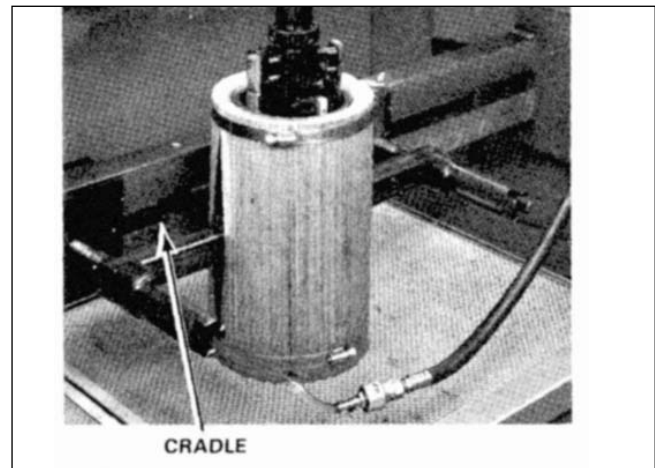


Figure 16, Air Bag Fixture

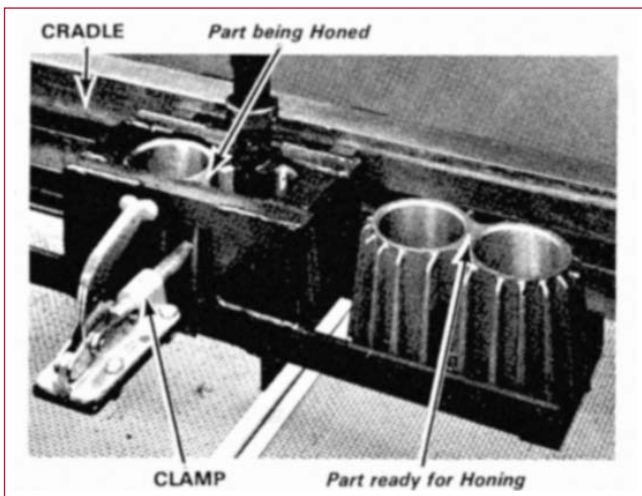


Figure 18, Tunnel Fixture

Tunnel Fixture

Leave .05" to .10" (1.3 mm to 2.5 mm) clearance on the height and width between tunnel and part so loading and unloading will be easy. The Clamp is used to keep the part located in the fixture, and not absorb honing forces (see Figure 17).

Air compressor cylinders are fixtured in this manner.

This fixture enables the part to be easily reversed (essential for extreme-accuracy) by rotating the Cradle 180°. The fixture or the Cradle does not obstruct overstroking (see Figure 18).

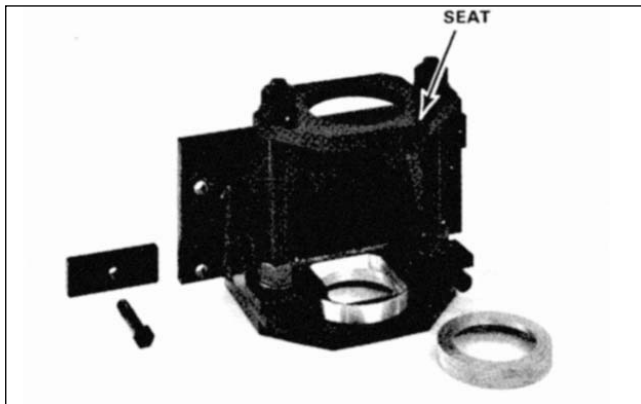


Figure 19, Square Base Fixture

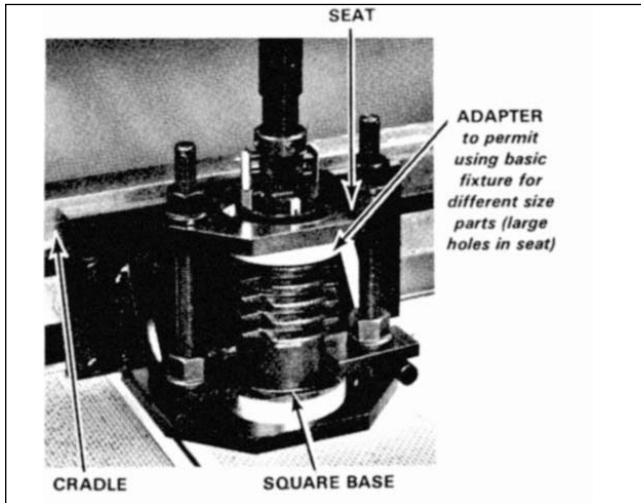


Figure 20, Square Base Fixture

Pin and Clamp Fixture

Parts, which are to be mounted when in use, should be fixtured using the mounting provisions when feasible.

The Pin and Clamp Fixture, used for light parts, consists of Pins to locate the part and simple Clamps to hold the part (see Figure 21).

Hydraulic valves are typical of the parts fixtured in this manner.

This fixture enables the part to be easily reversed (essential for extreme accuracy) by rotating the Cradle 180°. The fixture or the Cradle does not obstruct overstroking (see Figure 22).

Square Base Fixture

The Square Base Fixture is an End Clamping Fixture that has been modified for a part with a square base. The distinctive feature of the Square Base Fixture is that it enables honing torque to be absorbed by the square base of the part, rather than end clamping pressure. Therefore, parts that would deform under end clamping pressure can sometimes be successfully honed using this fixture.

Air compressor cylinders are typical of parts that can be fixtured this way.

To use this fixture with different size parts, make the hole in the Seat large and use Adapters to hold the part at the top (see Figure 19).

This fixture enables the part to be easily reversed (essential for extreme accuracy) by rotating the Cradle 180°. The fixture or the Cradle does not obstruct overstroking (see Figure 20).

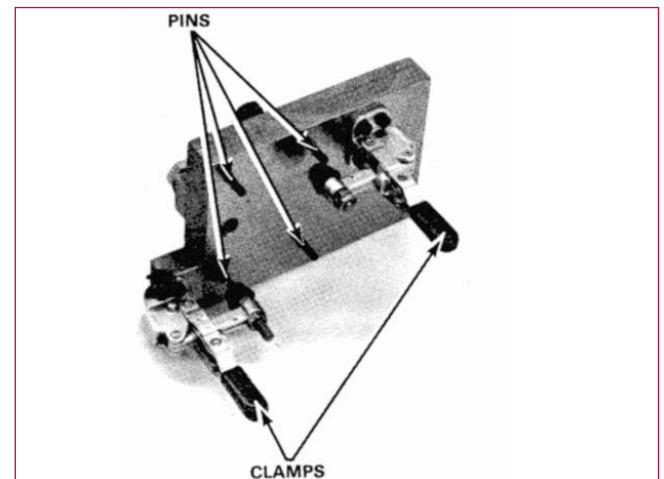


Figure 21, Pin & Clamp Fixture

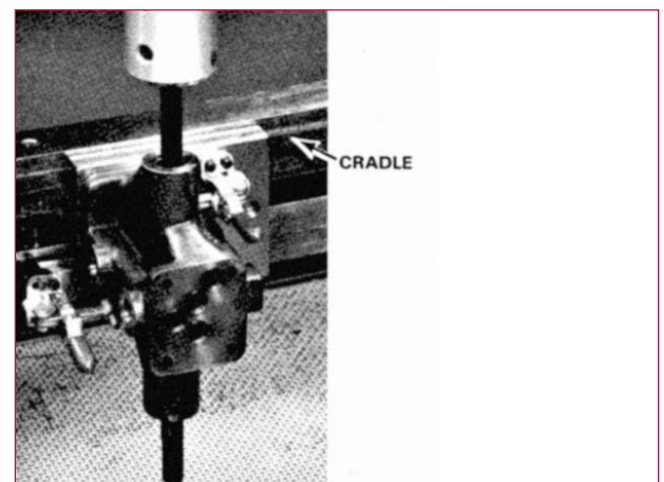


Figure 22, Pin & Clamp Fixture

Back Plate Fixture

Parts, which are to be mounted when in use, should be fixtured using the mounting provisions when feasible. The Pin and Clamp Fixture should be used in production honing whenever possible.

The Back Plate Fixture, used for heavy parts, consists of two Back Plates mounted to the cradle, and Mounting Bolts (to mount the part on the Back Plates) (see Figure 23).

Large hydraulic valves are typical of the parts fixtured in this manner.

This fixturing enables the part to be easily reversed (essential for extreme accuracy) by rotating the Cradle 180°. The fixturing on the Cradle does not obstruct overstroking (see Figure 24).

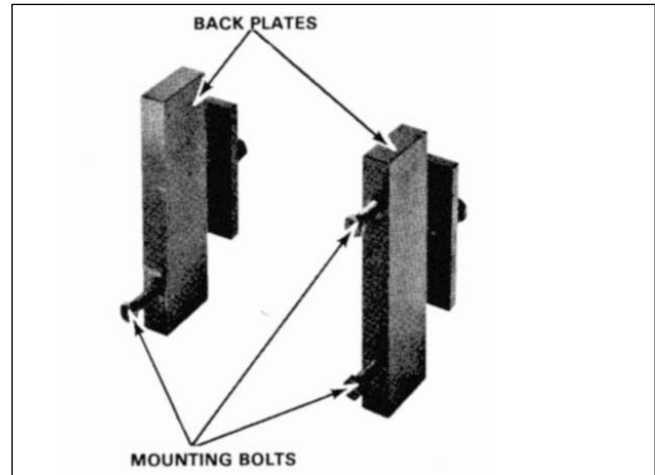


Figure 23, Back Plate Fixture

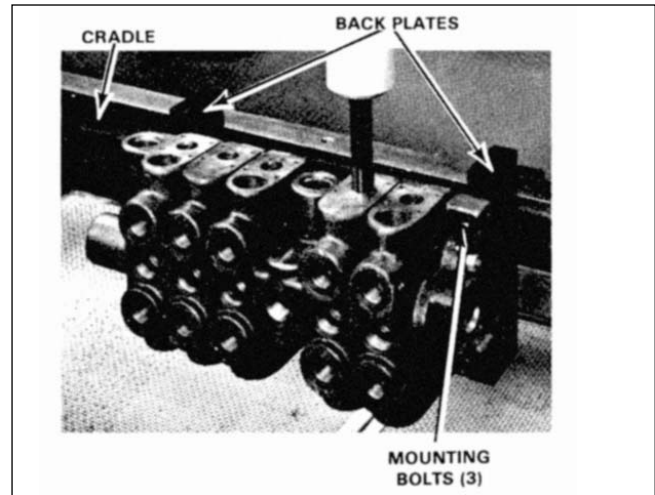
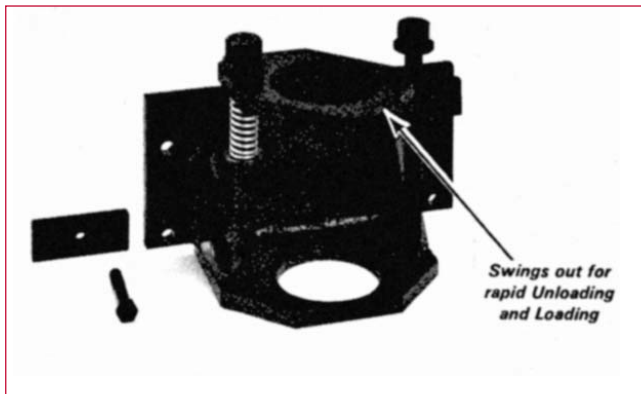
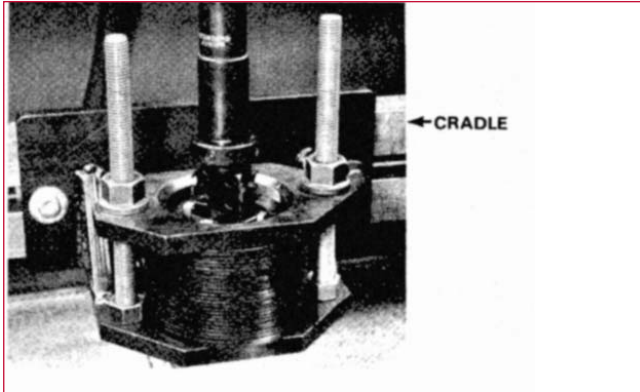


Figure 24, Back Plate Fixture

End Clamping Fixture (Short Parts)**Figure 25, End Clamping Fixture****Figure 26, End Clamping Fixture**

Preconditions for end clamping parts in a stack:

1. Parts must have flat, parallel end surfaces.
 2. Parts must not deform under end clamping pressure.
- Bore size variation prior to honing and out-of-squareness (bore to end surfaces) requires additional stock removal.

Concentricity can be maintained only when all bores have the same diameter prior to honing.

Fixture should be made to clamp as close as practical to the bore diameter to help avoid deforming parts during clamping (*see Figure 25*).

The height of the stack of parts must be less than the stone length. Align the bores by expanding the honing tool in the loose stack, and then tighten the end-clamping fixture. The stack can now be honed as one long bore (*see Figure 26*).

This fixture enables the stack of parts to be easily reversed (essential for extreme accuracy) by rotating the Cradle 180°. The fixture or the Cradle does not obstruct overstroking.

data files

- 101 - Honing Bores With Keyways And Splines
- 102 - Honing Short Bores
- 103 - Honing Blind Holes
- 104 - Obtaining Specified Finishes By Honing
- 105 - Choosing the Right Stone
- 106 - Honing Tandem Holes
- 107 - Making Manual Honing Easier With Workholders
- 108 - Fixturing Parts For Power Stroking
- 109 - Vertical Hone Fixture
- 110 - Honing Small Bores
- 111 -
- 112 - External Honing
- 113 - Fixturing Design Considerations For Automatic Crossgrinding® Machines

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