NASA SP-5910 (05)

TECHNOLOGY UTILIZATION

MACHINE TOOLS AND FIXTURES

(NASA-SP-5910(05)) MACHINE TOOLS AND FIXTURES: A COMPILATION Technology Utilization (NASA) 29 p HC $1.00 N74-30964

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A COMPILATION

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

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Foreword

The National Aeronautics and Space Administration and the Atomic Energy Commission have established a Technology Utilization Program for the dissemination of information on technological developments which have potential utility outside the aerospace and nuclear communities. By encouraging multiple application of the results of their research and development, NASA and AEC earn for the public an increased return on the investment in aerospace and nuclear research and development programs.

This Compilation is one of a series of documents intended to present such information. It includes a collection of innovations developed by NASA, AEC, and their contractors concerning tools, adaptors, jigs, and fixtures useful in machining a wide variety of materials. The Compilation is divided into three sections. Section One describes a variety of machine tools allowing new approaches to special or unique jobs. The second section presents a number of adaptations that extend the usefulness of standard machine tools. Section Three features a collection of jigs and fixtures that permit the use of standard machine tools in unusual or difficult situations.

Additional technical information on individual devices and techniques can be requested by circling the appropriate number on the Reader Service Card included in this Compilation.

The latest patent information available at the final preparation of this Compilation is presented on the page following the last article in the text. For those innovations on which NASA and AEC have decided not to apply for a patent, a Patent Statement is not included. Potential users of items described herein should consult the cognizant organization for updated patent information at that time.

We appreciate comment by readers and welcome hearing about the relevance and utility of the information in this Compilation.

Jeffrey T. Hamilton, *Director*
Technology Utilization Office
National Aeronautics and Space Administration

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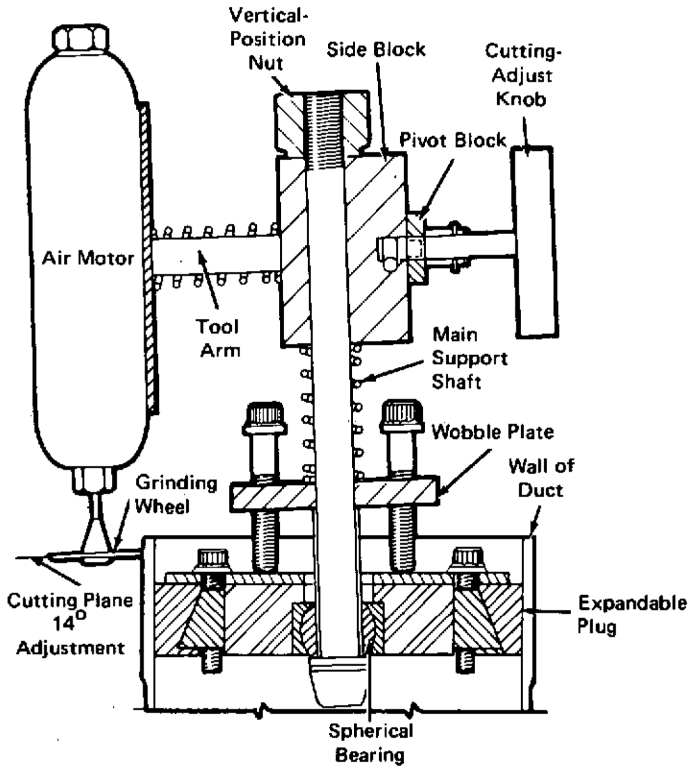
Contents

Section 1. Machine Tools

LOW-COST ORBITING GRINDER FOR CUTTING DUCTS



Portable Grinder

A new grinder has been designed for cutting ducts. It is relatively inexpensive, simple, and portable. The machine is suitable for straight and offset, "on-the-spot" cutting, and can cut heat-treated alloys without extra jigs, fixtures, or hand tools.

The machine consists of an abrasive wheel, powered by a small high-speed air motor. The motor is supported by an expandable plug that is mounted inside the duct (see figure). Conventionally, such operations have been carried out with hacksaws and files.

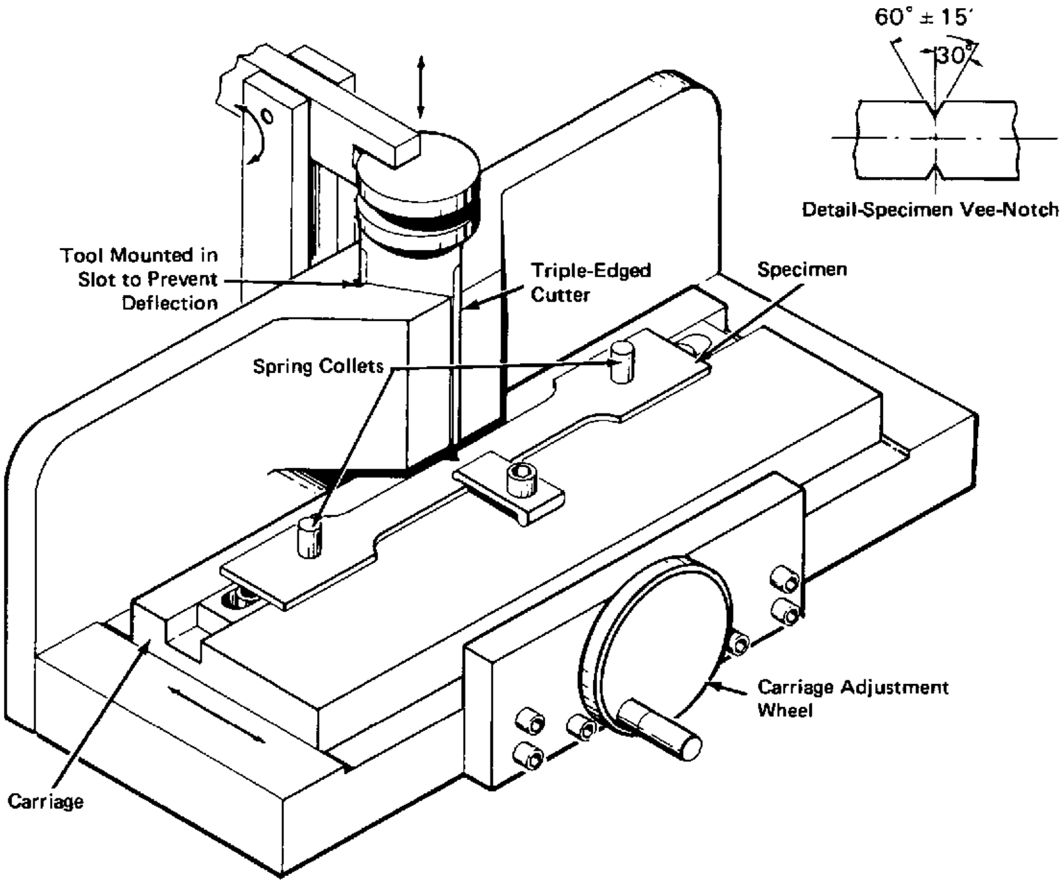
After the cutting plane has been established and scribed on the duct surface, a support plug is inserted into the duct and secured by means of expanding wedges. A small high-speed air motor with a directly-mounted grinding wheel is installed on the tool arm in the approximate cutting location. Axial adjustment is made by tightening or loosening a vertical-position nut at the end of the main support shaft. Angular adjustment is made by tightening or loosening the three screws in the wobble plate. The grinding wheel is then fed into the duct by tightening the cutting-adjust knob and is orbited around the duct repeatedly until separation occurs.

This device can be adapted to differently sized ducts by using various chuck plates and tool arms, and can save considerable time and money.

Source: E. J. Lang of
Rockwell International Corp.
under contract to
Marshall Space Flight Center
(MFS-20684)

Circle 1 on Reader Service Card.

VEE-NOTCH TOOL CUTS SPECIMENS



Vee-Notch Cutter in Use

This Vee-notch cutting tool, for use on tensile specimens, (see figure) costs less, is easier to set up, and is more precise than similar existing equipment.

The cutter is rigidly mounted in a slot of similar shape to prevent deflection during the cutting operation. Since no expensive equipment is required, the tool can be mounted on a stand or table and operated by laboratory technicians.

The cutter is hollow ground on the end, so that all three edges can be used before resharpening. Since neither the carriage nor the cutter can be deflected, the Vee-notch is uniformly positioned in relation to the holes. In addition, spring collets are provided for positioning of the specimen from the existing holes. This precise positioning eliminates misalignment of opposed notches that could be caused by variations in the hole size. A rocker, activated by an electrically driven bellcrank (not shown), causes the triple-edged cutter to oscillate up and down. Simultaneous turning of the carriage adjustment wheel moves the specimen against the cutter blade. The triangular shape of the cutter allows the use of carbide tips for notching heat-treated or abrasive materials as well as exotic alloys contemplated for use in structures subjected to high stresses. Furthermore, the tool can be adapted to other types of notching and/or light duty punching of holes or slots.

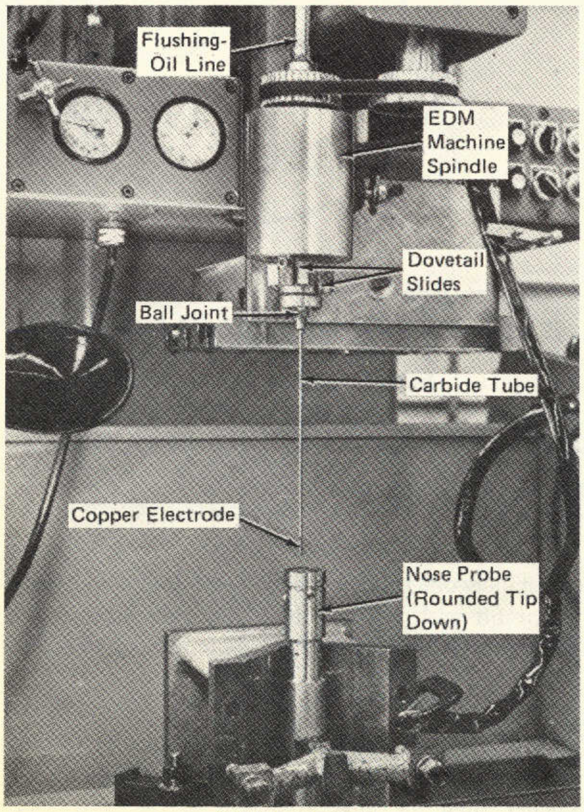
Source: R. A. Spier
Marshall Space Flight Center
(MFS-20730)

Circle 2 on Reader Service Card.

MACHINING BLIND HOLES IN STAINLESS STEEL

Five 0.152 ± 0.0025-cm (0.060 ± 0.001-in.) diameter, blind, longitudinal holes, 125 diameters deep, had to be machined into the flat end of a 304 stainless-steel sounding-rocket nose probe. Tolerance for the location of holes was 0.0127 cm (0.005 in.). Each hole had to intersect a 0.10-cm (0.04-in.) hole in the rounded tip of the probe. Each of those four holes, equally spaced from the center hole, was required to angle outward 45° off the center line of the mating 0.15-cm hole. Specified tolerances could not be met with any known drilling or boring method.

To meet this requirement, a new machining tool has been developed (see figure). It employs a 19-cm (7.5-in.) carbide tube, with a copper electrode soldered to the tip and forms the holes by electrical-discharge machining (EDM). The tube holds the electrode in place rigidly and channels a flow of dielectric flushing oil through the tubular electrode to the point where the electric-discharge erosion takes place. A small copper wire in the mouth of the electrode erodes away the stainless-steel core, which is left inside as the electrode progresses. The electrode is attached to the spindle of the EDM machine by two perpendicular dovetail slides followed by a ball joint. The slides permit the upper end of the electrode, the ball joint, and the lower end of the electrode to be centered. The nose probe is positioned under the spindle by the movable work table of the EDM machine. The nose probe and electrode are submerged in dielectric oil after adjustment. With the electrode rotating at 20 rpm, a 65-kHz, 60-V, 0.8-A discharge between the electrode and the nose probe erodes a straight cylindrical hole in the 304 stainless steel in the same manner as a boring bar.



EDM Equipment

The following precautions must be taken if accurate machining is to be obtained:

1. The carbide tube must be lapped straight to prevent it from touching the sides of the hole.
2. To assure proper alignment, the copper electrode should be machined to size after it has been soldered to the carbide tube.
3. The EDM must be isolated from any motors, pumps, etc., that could cause vibration in the electrode.
4. Clean dielectric flushing oil must be used. Dirt will cause excessive overcut.

Source: Anthony Walch, Jr., and
Edmund Smigocki
Goddard Space Flight Center
(GSC-10545)

No further documentation is available.

Section 2. Machine Tool Adaptations

CORE DRILL'S BIT IS REPLACEABLE WITHOUT WITHDRAWAL OF DRILL STEM: A CONCEPT

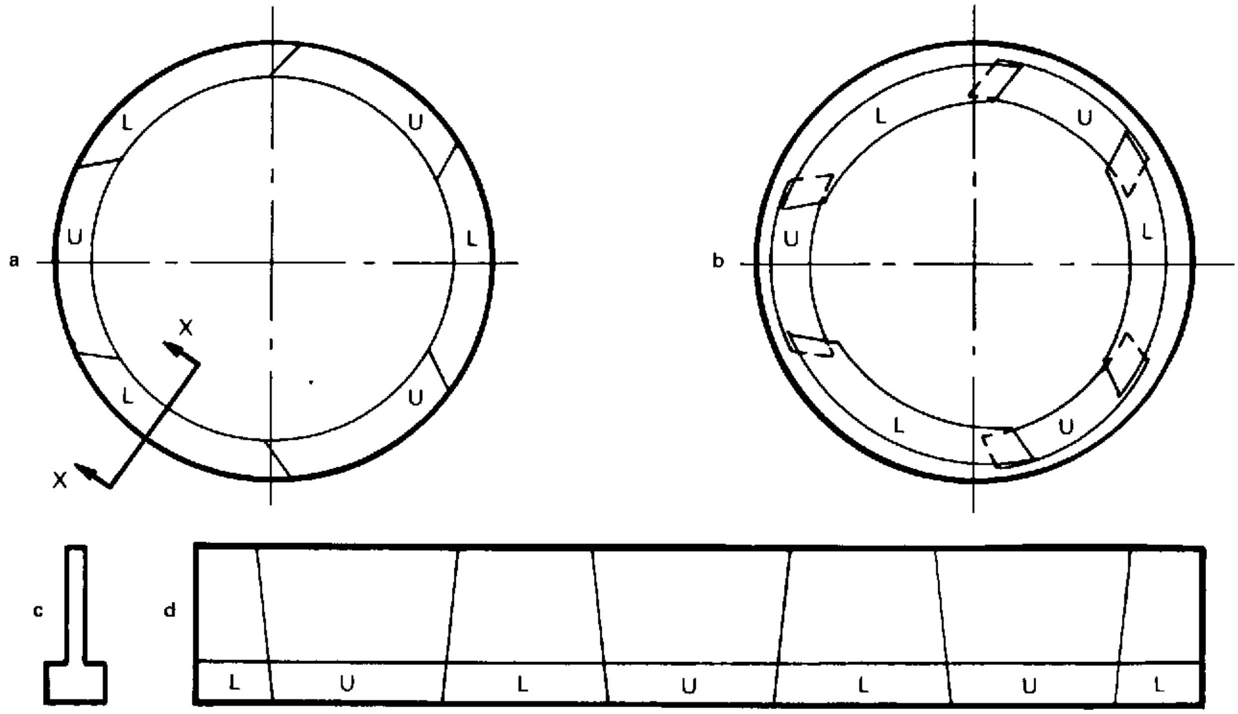


Figure 1. Sectors in Cutting Position (a), Collapsed within Drill Stem (U above L) (b), in Transverse Section (c), and Viewed from the Inside, as if Flattened from X-X (d).

A new concept for drill bits allows a deep hole to be drilled in the earth for recovery of a core without withdrawing the drill stem for replacement of dulled bits.

The bit is divided into several sectors (see Figure 1). When the bit assembly is collapsed, its outside diameter is small enough for it to be forced down the drill stem; when it reaches bottom, the sectors are forced outward and together to form a cutting bit (Figure 2a). For drilling, all sectors are clamped between the drill stem and a longitudinally movable inner tube that is part of the insertion and withdrawal assembly. The clamped portion of each sector can be thinner than the cutting face. A dulled bit is retracted by reversal of this procedure.

With two or more assembly rings, as many bit sectors as are needed may be used (in certain special circumstances one ring is enough). Here described is a six-sector bit with two assembly rings for drilling of a 4.763-cm (1.875-in.) diameter hole and recovery of a 3.493-cm (1.375-in.) diameter core.

Figure 1 shows that when the three "upper" (U) sectors slide upward relative to the three "lower" (L) sectors the outside diameter of the collapsed bit is smaller than the inner diameter of the drill stem. Around the inner tube are two sliding assembly rings; the U-sectors are attached to the top ring by leaf springs; the L-sectors, are similarly attached to the bottom ring. The springs tend to spring the sectors inward.

With the inner tube drawn upward relative to the assembly rings and the sectors sprung inward by the springs, the bit assembly is placed within the drill stem and forced to the bottom. When the L-sectors

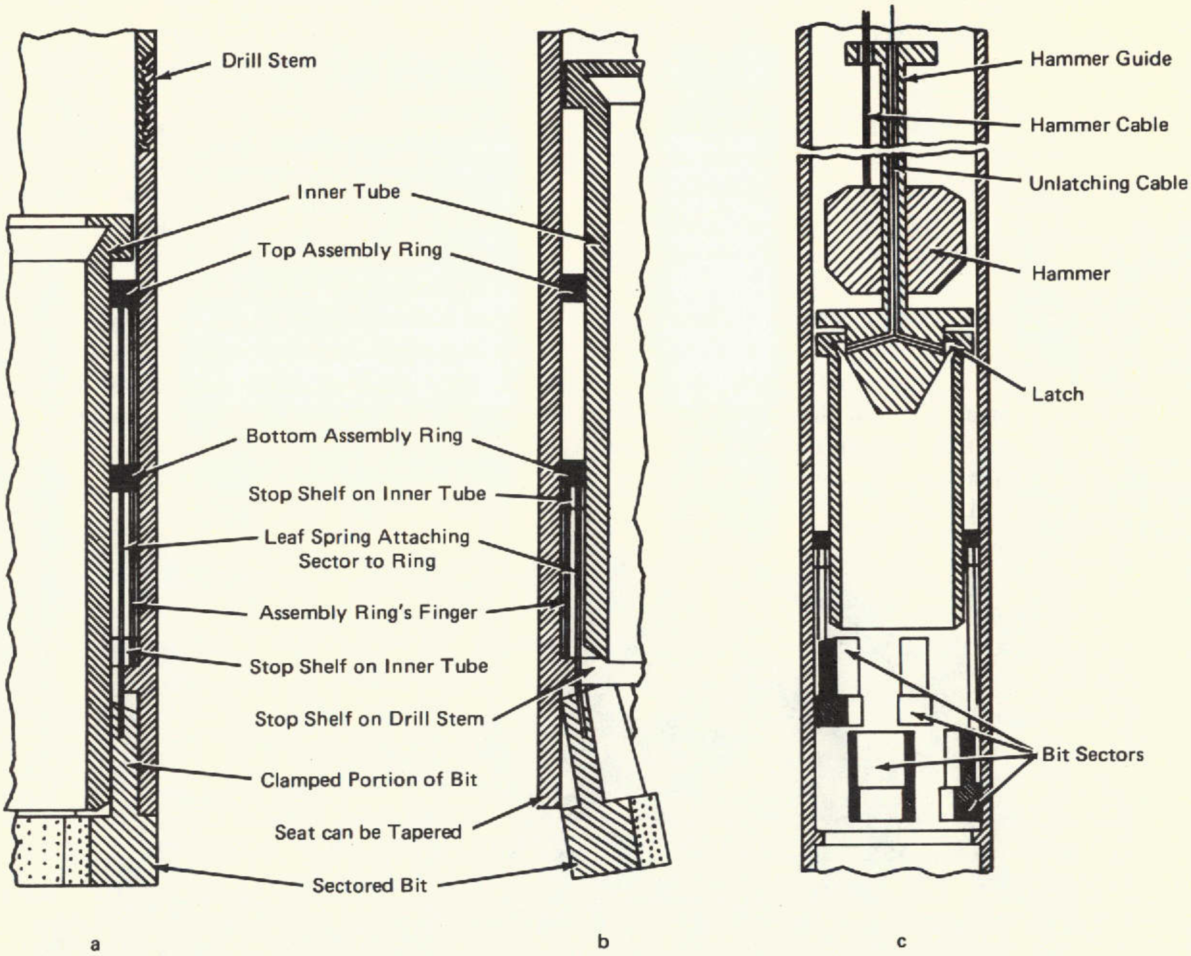


Figure 2. Bit Locked for Drilling (a), Beginning of Removal; Sector Sprung Inward (b), Hammer Mechanism and Bit Assembly Sliding through Drill Stem (c).

reach drilling depth, their assembly ring is stopped when its finger engages a shelf on the inner surface of the stem. As the inner tube continues downward, the top assembly ring is stopped by its finger when the U-sectors are at drilling depth. Finally the inner tube is forced further downward until its outer stops engage the shelf on the stem, thus forcing the sectors outward and clamping them between the tube and the stem. Drilling torque is transmitted by friction between sectors and stem; the interfacial surfaces can be roughened if necessary. Specific orientation of the bit is unnecessary, but all parts of the bit assembly are angularly keyed by vertical grooves in the inner tube's stop ring.

A dulled bit is withdrawn from the hole by reversal of this procedure. As the inner tube is pulled upward, it unclamps the sectors, allowing them to spring inward. The stops force the assembly rings with the sectors attached upward. A hammer mechanism is used for insertion or withdrawal of a bit. Hammering may be upward or downward (Figure 2c).

Source: F. C. Rushing and A. B. Simon of Westinghouse Electric Corp. under contract to Marshall Space Flight Center (MFS-20819)

No further documentation is available.

MECHANISM FOR ORIENTING THE MODULAR WELD HEAD

The new tilt mechanism permits a tungsten/inert gas (TIG) orbital welder to efficiently weld ducts that have mismatched abutting ends. The device tilts the modular welder by adjusting cantilevered arms extending from the weld support member. Thus, the carrier head of the welder follows the abutted mismatch of two ducts.

The all-automatic system consists of four basic elements:

(1) a welding power supply (not shown);
(2) a weld programmer (not shown), which automatically controls and synchronizes all welding process functions as predetermined by an established weld schedule;
(3) an inert-gas supply source; and
(4) a welding head which contains the mechancial and electrical elements required to produce the weld. The weld head responds to control signals from the weld programmer and provides feedback signals to the programmer to ensure compliance with the weld schedule.

Figure 1 shows the weld-head assembly positioned to join ducting mounted in a support fixture. Figure 2 shows the weld-head drive mechanism, which is located in back of the weld-head assembly. The output gear of the weld-head drive motor (Figure 1)

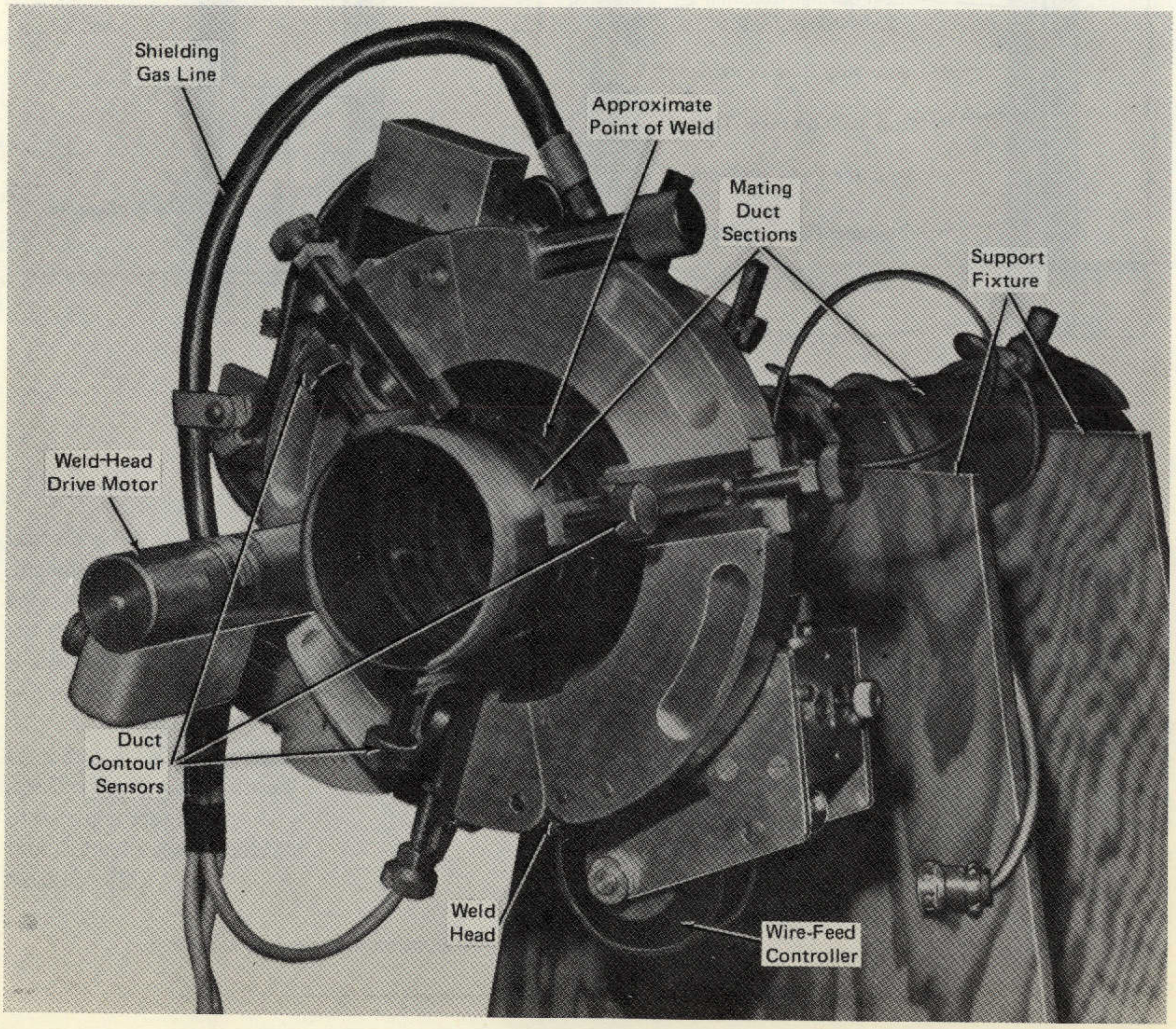


Figure 1. Weld-Head Assembly

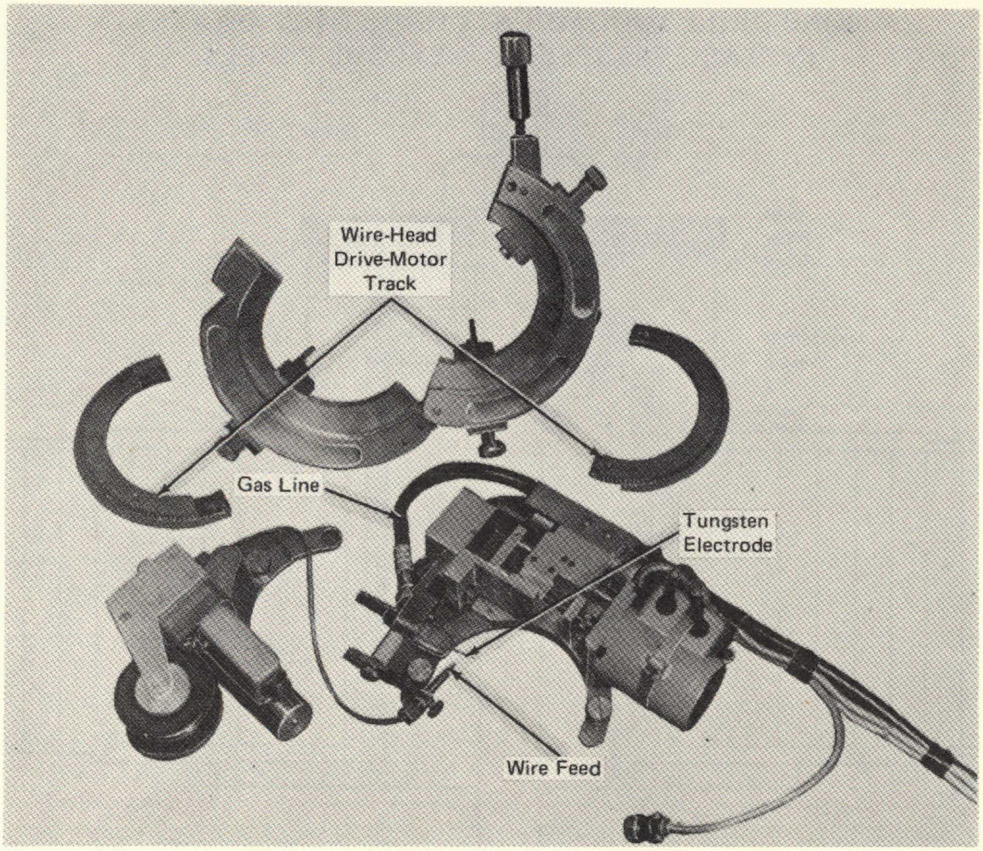


Figure 2. Weld-Head Drive Mechanism

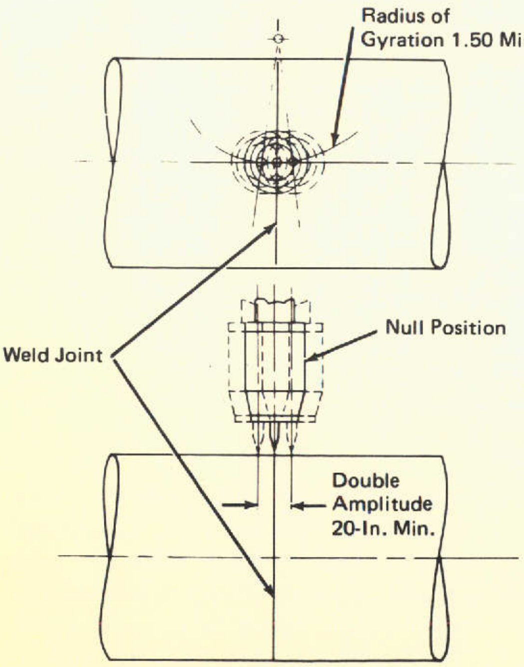


Figure 3. Electrode Oscillation

engages the drive-motor track (Figure 2). The drive-motor track is stationary and drives the weld head and electrode (as commanded by the weld programmer), at any of five available ranges of fixture speed: 0.1 to 0.3 rpm; 0.1 to 0.5 rpm; 0.1 to 0.9 rpm; 0.1 to 1.7 rpm; and 0.1 to 3.3 rpm. The duct-contour sensors (Figure 1) send impulses to an electrode oscillator. The impulses cause the electrode to oscillate through a plane normal to the direction of weld travel and through a radius of gyration of 1.5 arc minutes at a double amplitude of 50.8 cm/min. (20 in./min.) (Figure 3). The wire-feed controller delivers the filler wire at a rate matching the selected fixture speed.

Source: L. W. Spiro of
Rockwell International Corp.
under contract to
Marshall Space Flight Center
(MFS-19095)

Circle 3 on Reader Service Card.

BOND-DRILL TOOL FOR ATTACHMENT FLANGES IN STAINLESS-STEEL HONEYCOMB PANELS

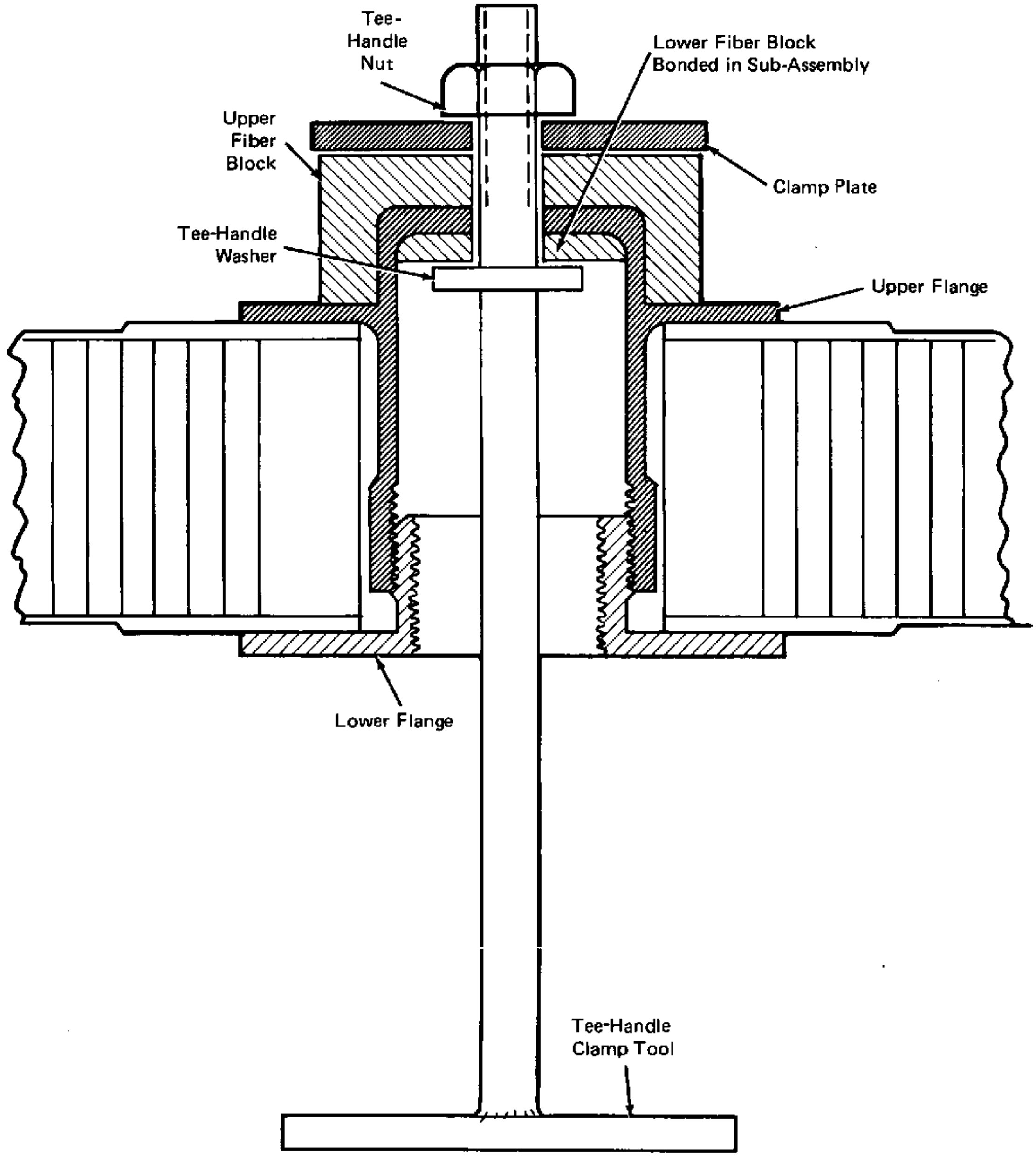


Figure 1. Conventional Tee-Handle Clamp

In many applications, stainless-steel honeycomb panels require impact-load-carrying attachment flanges for mounting related components. A combined clamp and drill support serves as a stable, stress-free means of supporting the flanges in place while adhesives are applied and drilling is accomplished.

Figure 1 shows a conventional Tee-handle clamp previously used to secure the upper fiber blocks and shim plates for bonding. In many cases the lower fiber block has broken loose during removal of this clamp. Since the flanges cannot be removed at this point, a difficult rework operation is required to

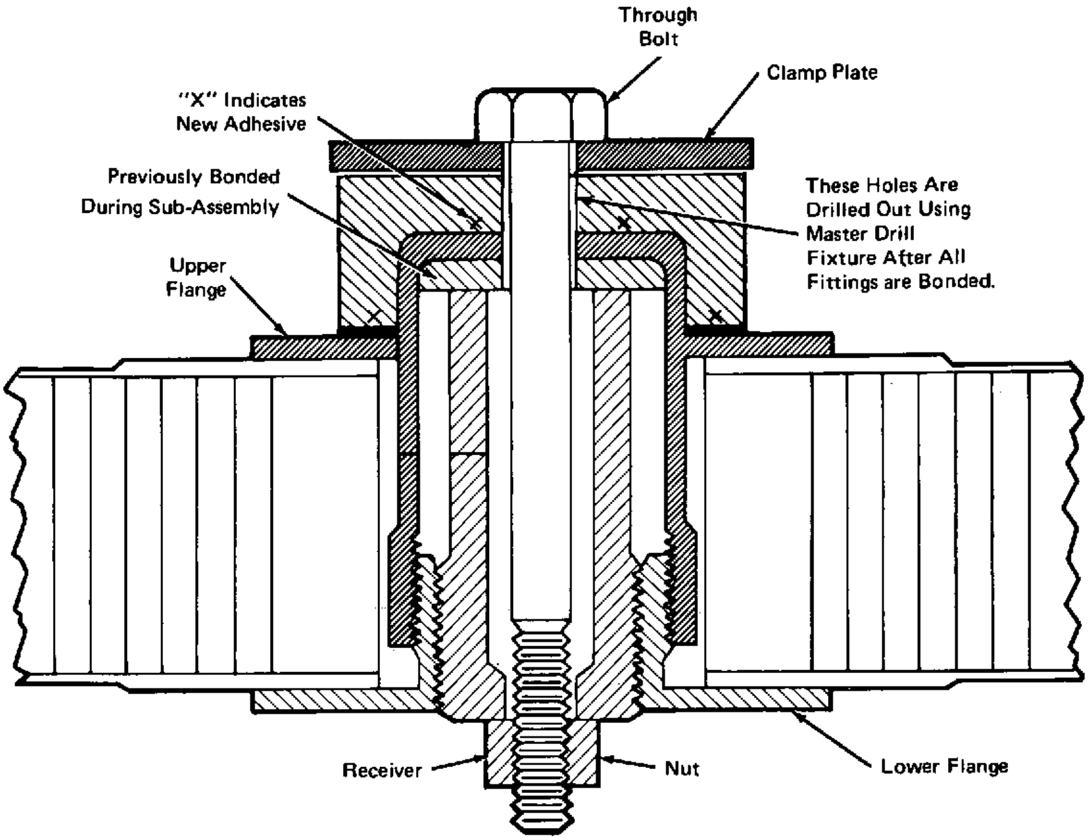


Figure 2. Combined Clamp and Drill Support

bond these blocks back in place. Additionally, the fit of the fiber block to the Tee-handle washer frequently permits adhesive to drip onto the lower flange threads. Removal of this adhesive, in order to install the original drill-support tool, requires further rework. Furthermore a drill-support tool is needed to retain the lower fiber block when the bolt-attach hole is drilled out for final precision alignment with a master drill template.

The entire bonding and drilling operation sequence has been simplified by combining the clamp and drill-support tooling as shown in Figure 2. The combination drill-support and bond-clamp tool is now installed before bonding and remains in place until the bolt-attach hole is drilled. Adhesive flow during cure now drops inside the tool, where it is easily removed. Loosening of the lower block has been eliminated and tooling setup time has been reduced.

Source: O. E. Harris and C. Cane of
Rockwell International Corp.
under contract to
Johnson Space Center
(MSC-15767)

No further documentation is available.

IMPROVED DESIGN FOR OIL-FILM DYNAMIC-SLIP TABLE

An oil-film dynamic-slip table has been constructed for use in a large vibration-test laboratory. Its unique design eliminates a great deal of machining and reduces the amount of hydraulic tubing required. Instead of many long holes for the oil feed, grooves are machined into the table top which is then covered with relatively thin plates (Figure 1) which have holes drilled on equidistant centers to index with the grooves. The covered grooves are drilled, tapped, and plugged at one end and are drilled and tapped to receive tube fittings at the other end. Hydraulic lines (Figure 2) are attached to the tube

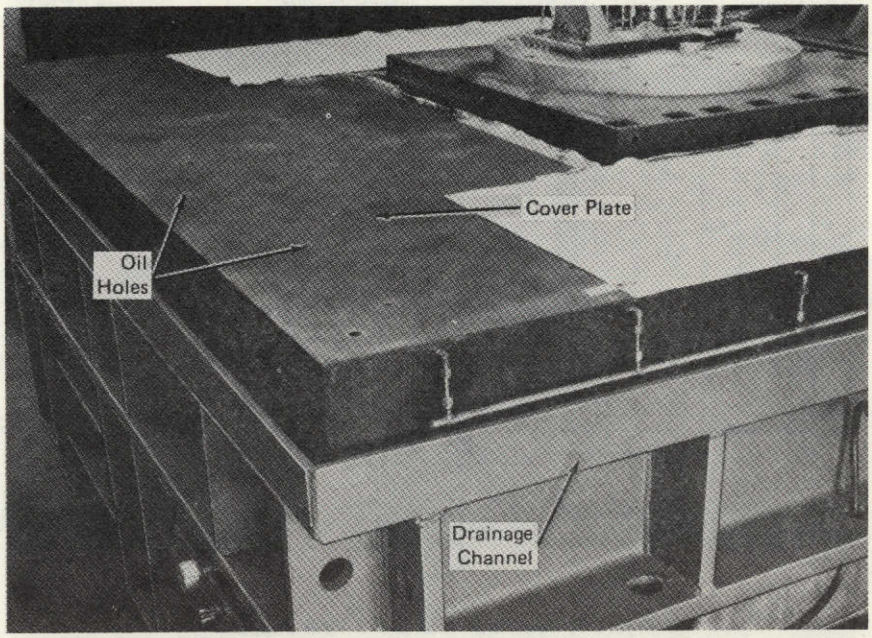


Figure 1. Improved Slip Table

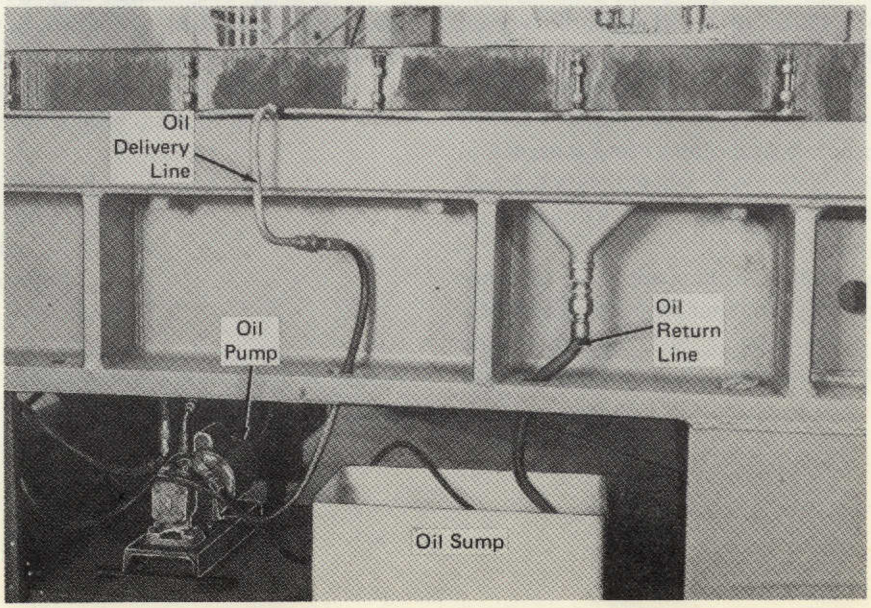


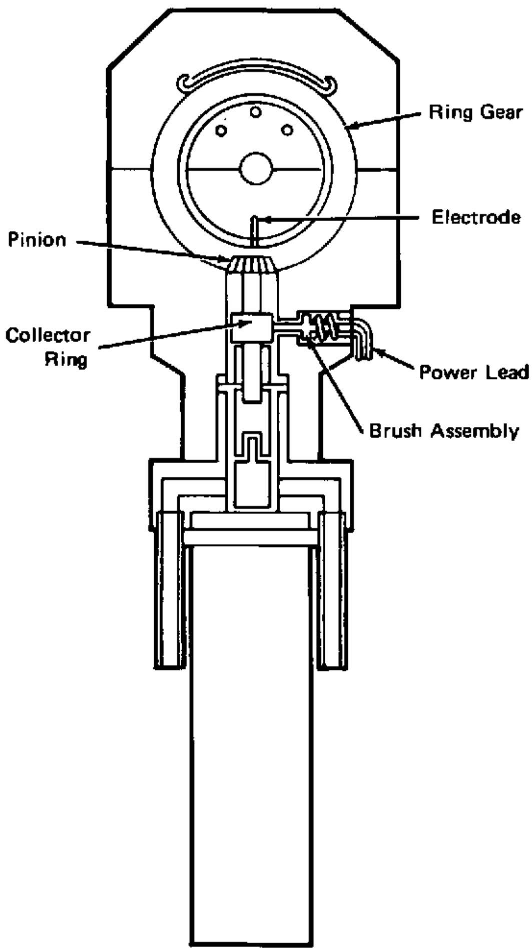
Figure 2. Hydraulic Lines for Slip Table

fittings and supply oil to the holes in the top plate from a pump and sump beneath the table. Excess oil flows over the edges of the table and into a drainage channel that directs it back into the sump. The table is easily cleaned by removing the cover plates and flushing out the grooves.

Source: J. A. Gustafson and
E. C. Reinhardt of
Rockwell International Corp.
under contract to
Johnson Space Center
(MSC-17839)

No further documentation is available.

IN-PLACE WELDING-HEAD POWER TRANSMISSION



Weld Head With Modified Power Transmission

Transmission of electrical power within the welding head of an orbiting welder by the modified arrangement is shown in the figure.

The present method for transmitting electrical power to the welding-head electrode is through a spring-loaded pin or shoe pressing against the outside of the ring gear which carries the electrode. This arrangement results in scuffing of the surface of the ring gear, causing the following to occur:

1. Arcing between the pin or shoe and the ring gear causes the current to the electrode to fluctuate.
2. Wearing of the outside diameter of the ring gear changes the arc gap between the electrode and the work piece.
3. Increasing the friction between the ring gear and pin or shoe and bearing causes the speed of the ring gear to fluctuate.

Experiments showed that these difficulties are eliminated by transmitting the electrical power through a brush-and-collector ring arrangement on the pinion that drives the ring gear. This method provides a positive direct path for electrical power to the electrode, since the two gears are always in intimate contact. Thus, consistent, high quality weldments can be made.

Source: E. J. Lang of
Rockwell International Corp.
under contract to
Marshall Space Flight Center
(MFS-19098)

Circle 4 on Reader Service Card.

ADJUSTABLE DRILL BAR REPLACES COMPLEX JIGS

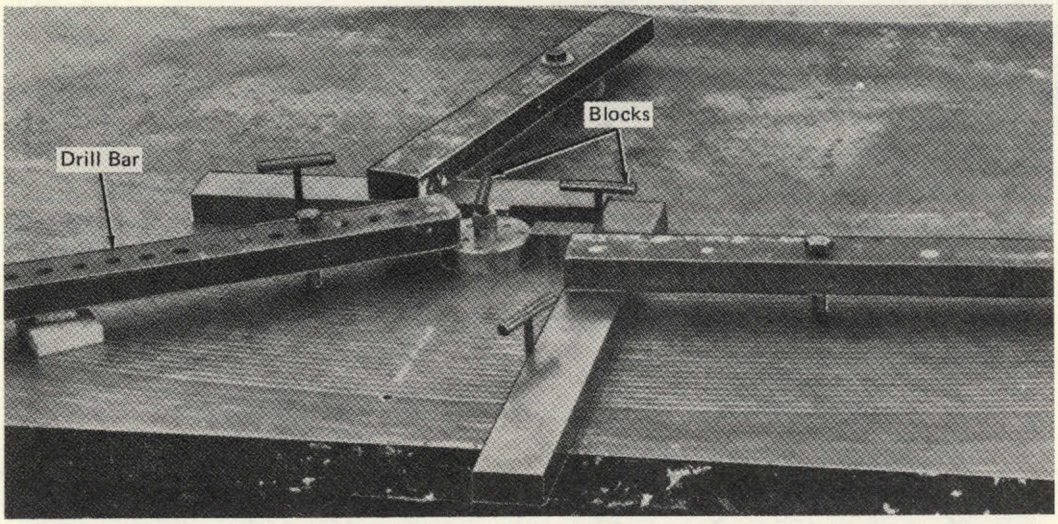


Figure 1. Previous Method

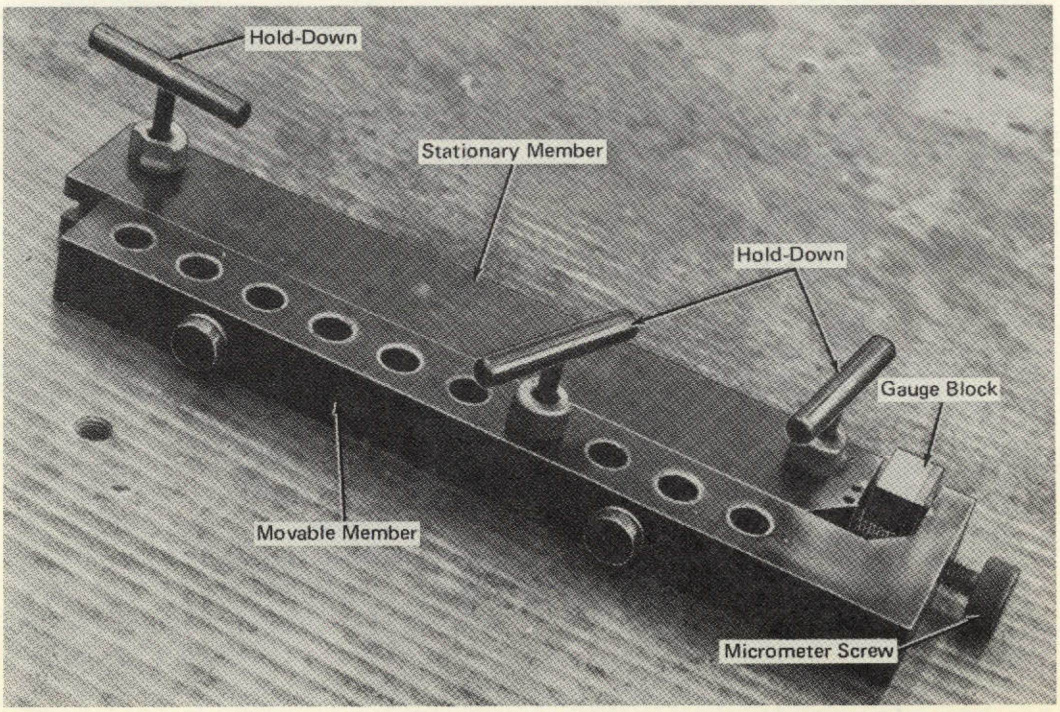


Figure 2. Adjustable Drill Bar

The complex jigs (see Figure 1) used in the past for precision drilling on large surfaces took appreciable time and put a premium on the skill of the setup man. The adjustable drill bar shown in Figure 2 incorporates a micrometer screw which, when used in conjunction with standard gauge blocks, provides a rapid method of drill hole location.

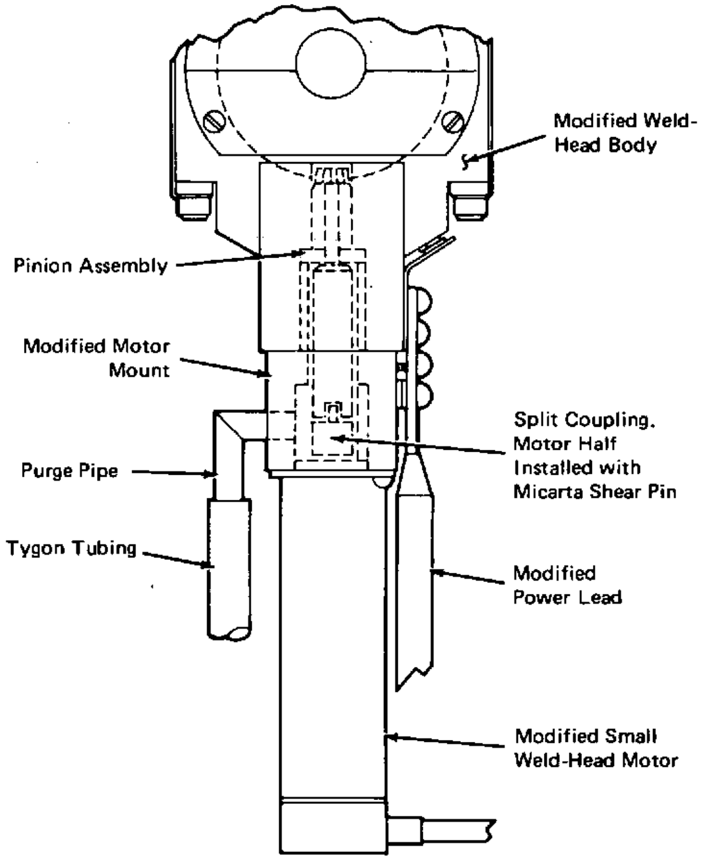
The desired hole pattern is obtained by making a drill plate from an engineering drawing. A three-hole, 90° 25.4-cm (10-in.) increment grid is made, and the stationary member is fastened to one side of this grid and held in place by the two hold-downs. The machined ways permit the movable member of the assembly to slide to any position within its range. By using an appropriate gauge block, the selected drill hole in the movable member can be placed precisely on the workpiece with the micrometer screw.

This versatile device picks up oddly dimensioned tool hole points and acts as a sine drill bar.

Source: J. H. Coventry of
Rockwell International Corp.
under contract to
Johnson Space Center
(MSC-15624)

No further documentation is available.

IN-PLACE WELDING-HEAD SIMPLIFICATION



Modified Pipe Welder

A modification to an orbital-head pipe-welder reduces the number of motors necessary to operate the equipment for various sizes and diameters of pipe. Changes on the welding-head motor mount and the motor-mounting flange permit a single motor to be used with both small and large in-place welding heads.

The modified welding head is shown in the figure. The primary modifications are the weld-head body, the motor mount, and the small weld-head motor.

Source: E. J. Lang of
Rockwell International Corp.
under contract to
Marshall Space Flight Center
(MFS-19097)

Circle 5 on Reader Service Card.

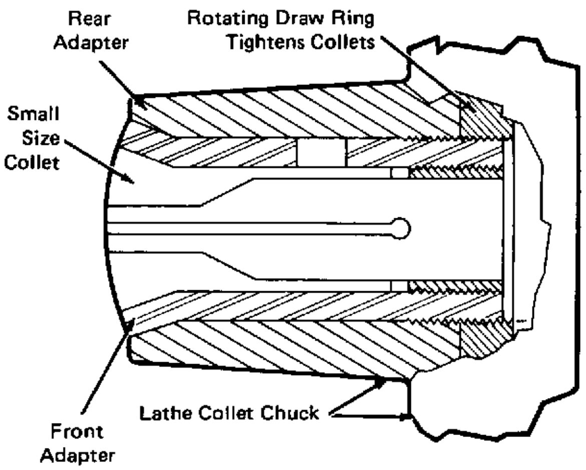
LATHE COLLET ADAPTERS

Different makes of lathes require unalike methods of attaching the collet chuck holder to the spindle. A large number of collet chuck holders and collet chucks are required to maintain a complete selection of chucks for each machine.

By using front-and-rear adapters (see figure) collet chucks of different sizes (5c, 3c, etc.) may be used in a single collet holder. The steel adapters permit the operator to change different lathe setups quickly.

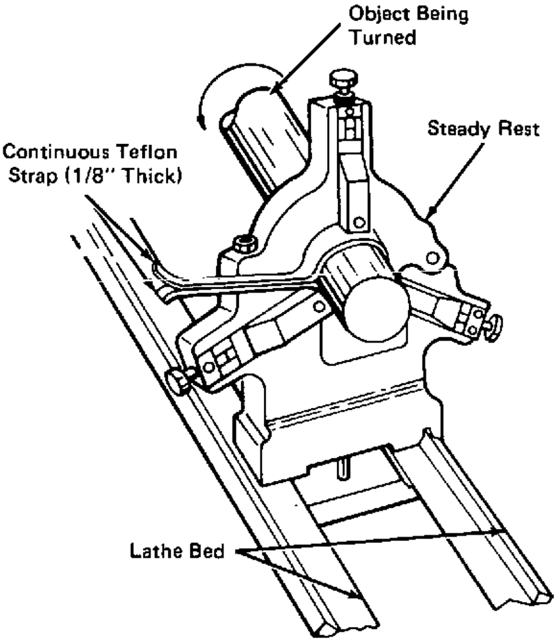
Source: R. Marotte of
Rockwell International Corp.
under contract to
Johnson Space Center
(MSC-17509)

No further documentation is available.



Adapters Used With a Small Collet

LUBRICATING STRAP FOR LATHE STEADY REST



Lubricating Strap for Lathe Steady Rest

A Teflon strip, used as a lubricating strap on a lathe steady rest, has been found to be effective, efficient, and durable. This material is practically friction free, heat resistant, and requires no other lubricant. Due to its characteristics, it automatically flows and retracts to maintain a stable bearing. In addition, it self-adjusts to the desired radius.

As shown in the figure, the Teflon strap is wrapped around the object being turned. Tests have shown this dry-lubrication system to be efficient and trouble free, even under severe conditions.

Source: George M. Dudley
Langley Research Center
(LAR-10741)

No further documentation is available.

IMPROVED PORTABLE MILLING TOOL

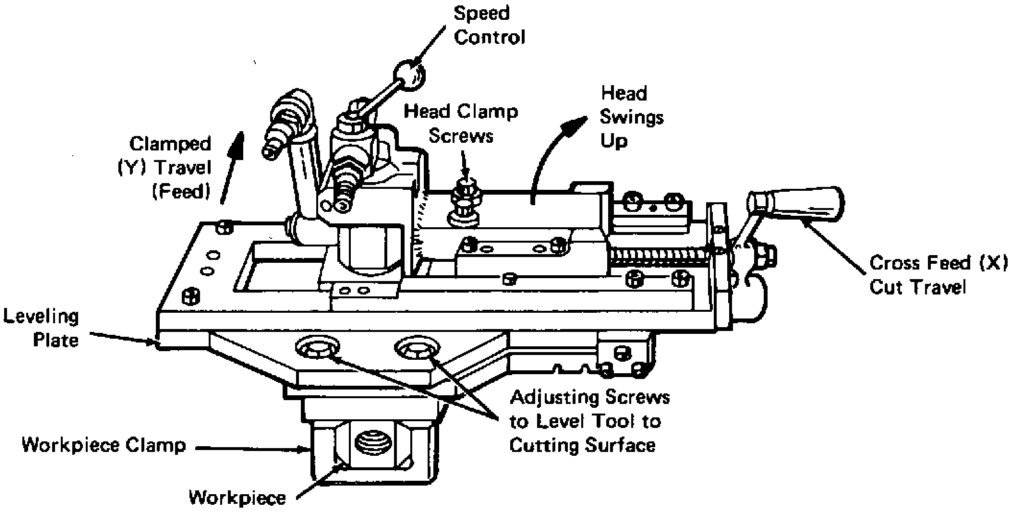


Figure 1 Head in Down Position

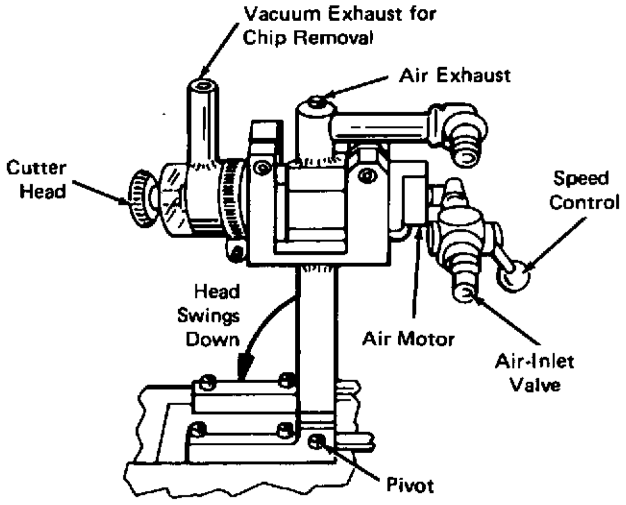


Figure 2 Head in Up Position

A leveling X-Y table and a swing-access milling head have been added to a standard portable milling unit. The tool is shown in Figure 1 with the new milling head in the down position, and in Figure 2 with the head in the up position.

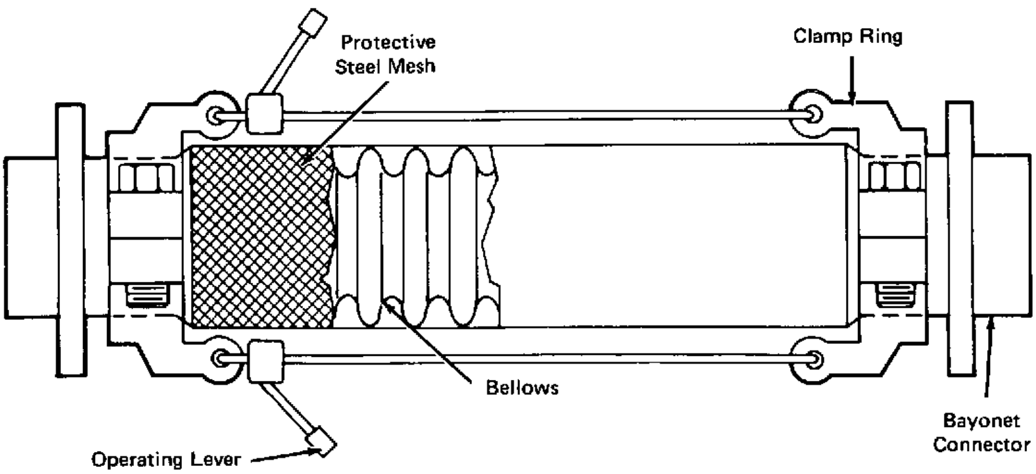
This tool is particularly useful for reworking components in the field, when removal to the shop is not feasible. The swing feature in the milling head, in conjunction with the X-Y bed-travel and the adjusting screws (to level the milling head to the cutting surface) give this tool the necessary versatility for precision work.

Source: J. M. Dimino of
Rockwell International Corp.
under contract to
Johnson Space Center
(MSC-15723)

No further documentation is available.

Section 3. Jigs and Fixtures

FLEXIBLE-LINE COMPRESSION TOOL



Flexible-Line Compression Tool

Flexible (bellows-type) ducts used to transfer cryogenic liquids within a spacecraft launch vehicle are large and heavy. Installation or removal of these ducts is virtually impossible without some sort of mechanical assists. The ducts are approximately 30.5 cm (12 in.) in diameter, 1.8 to 3.7 m (6 to 12 ft) in length and weigh approximately 230 to 270 kg (500 to 600 lbs). In order to provide adequate clearance of the bayonet connector which is attached to the end of the flexible duct, the bellows section must be compressed from 7.6 to 20 cm (3 to 8 in.) during installation and removal of the duct.

A flexible-line compression tool (see figure) has been designed to compress the bellows adequately and to assist in guiding the duct as tension is applied by either of the "come alongs", (ratchet and pawl devices which advance a cable or chain in discrete steps by operation of a lever). A clamp ring is placed at each end of the flexible duct assembly near the flange. The clamp rings have eyelets to accommodate installation of the "come alongs" on either side of the assembly. As the "come along" operating levers are manipulated, the bellows are compressed, allowing the operator to complete the installation or removal operation easily and safely.

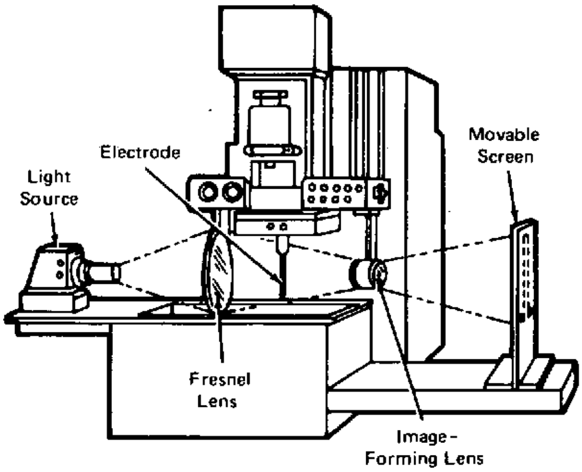
Source: Donald J. Ritchie of
The Boeing Company
under contract to
Kennedy Space Center
(KSC-06788)

No further documentation is available.

OPTICAL ALIGNMENT OF ELECTRODES ON ELECTRICAL DISCHARGE MACHINES

The small electrodes mounted on electrical discharge machines must be aligned and true before starting the machining operation. Electrodes that are not exactly in alignment with the machine axis or that are slightly bent will generate cavities that are too large or incorrectly shaped.

Electrode alignment can be assured with a shadowgraph system (see figure) that projects a magnified image on a screen so that the alignment of the electrode can be corrected and verified.



Shadowgraph System

The system uses a conventional 500-watt slide projector as a light source. A Fresnel lens is positioned between the light source and the electrode to collect the light into an image-forming lens, or a projecting lens system which forms an image of the electrode on a movable screen. The screen is placed at the position which provides the desired magnification, but it is usually located fairly close to the machine where it can provide a magnification of about two. If a flat screen is placed at an oblique angle to the optical axis of the system, one dimension of the image can be effectively magnified more than the other; for example, the width of an electrode can be magnified by a factor of 6 to 8 while the magnification of the length remains fixed.

The path of motion of the center of the tool holder can be established on the screen as the tool holder is raised and lowered, and a fiducial line can be scribed on the screen to provide a reference for alignment of the electrode. Since the fiducial line and the electrode are constantly in view, the process of positioning and straightening the electrode can continue until the operator achieves the requisite accuracy of alignment. An electrode 12 to 15 cm in length and 1 mm in diameter can be easily straightened to a runout well within 0.050 to 0.075 mm.

The optical system makes it possible to machine, in hard materials, very small straight holes to depths that are limited only by the length of the electrode. Moreover, adjustments and corrections of the electrode can be made while work is in place, and the shape of the electrode can be readily monitored as machining progresses.

This technique may be adapted to other machine-tool equipment where physical contact with the tool cannot be made during inspection and where access to the tool is so limited that conventional runout checking procedures (such as dial indicators) cannot be used.

An erecting lens can be placed between the projecting lens system and the screen to cast an upright image. Sharp images of the electrodes will be obtained only if the projecting lens system is properly constructed and corrected for aberrations. The screen can be curved to keep all portions of the image in focus; the curved screen compensates for optical aberrations due to finite depth of field of the imaging lens.

Source: A. G. Boissevain and
B. W. Nelson
Ames Research Center
(XAC-09489)

Circle 6 on Reader Service Card.

WEIGHT DISTRIBUTING BASE FOR LEVEL MACHINE-TOOL SUPPORT: A CONCEPT

A unique weight distributing base for a machine-tool support member, such as the leg of a lathe, could be fabricated in situ by the use of a new variety of concrete that expands, rather than contracts, on setting. Expansion slightly raises the ends of the leveling screws of the machine from the floor, thereby alleviating loss of level and damage to the floor from machine vibration.

Figure 1 shows a portion of a typical lathe leg, with a hex-headed leveling screw threaded through the foot and a locking nut mounted on the screw.

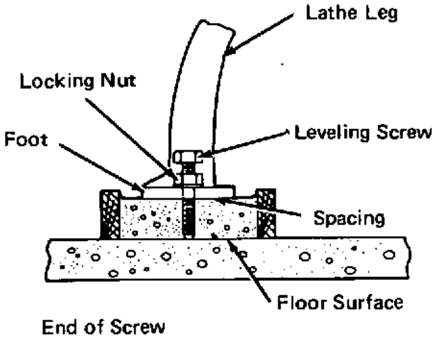


Figure 1. Typical Lathe Leg

The end of the screw is in contact with the surface of the floor.

After the leveling screws have been adjusted and the locking nuts tightened to prevent the screws from changing the initial level setting, a layer of grout (from an expanding concrete) is forced under the sole of the foot and retained there by means of a suitable form until the concrete has set.

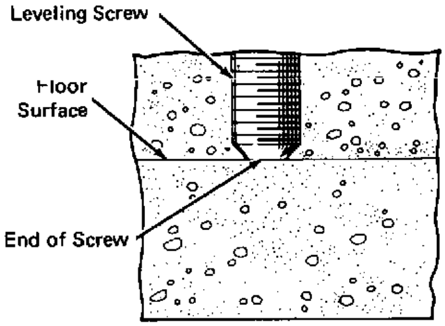


Figure 2. Spacing Before Set

Figure 2 shows the end of the leveling screw as it bears upon the floor surface before the concrete base has set. The spacing relationship after the concrete has set is indicated in Figure 3.

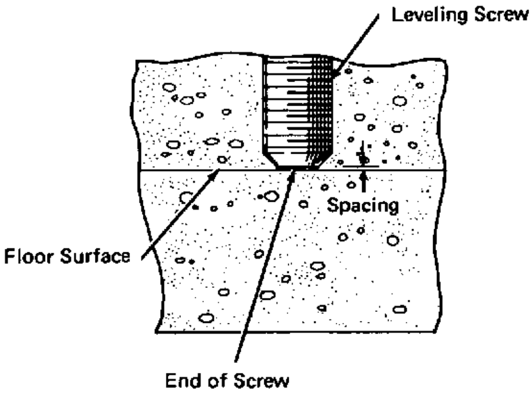


Figure 3. Spacing After Set

Source: Wallis M. Tener of
Caltech/JPL
under contract to
NASA Pasadena Office
(NPO-10727)

Circle 7 on Reader Service Card.

CIRCULAR HOLDER FOR SWIVEL BASE

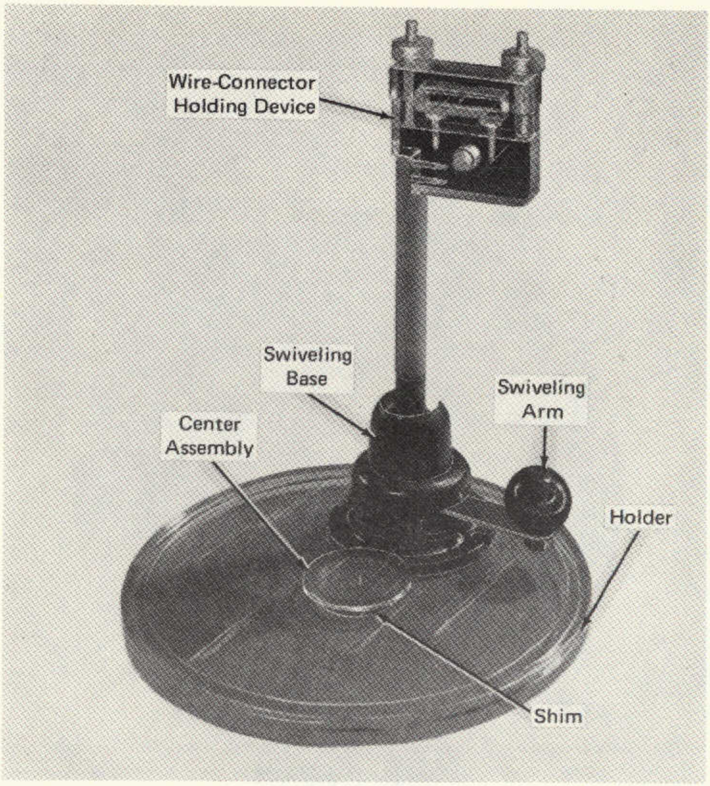


Figure 1. Holder Assembly

This novel circular holder has been installed on the plywood shelf of a large wiring-assembly fixture for assembling complex and extensive wiring harnesses. The holder permits rapid multiple positioning of a standard swivel-base extension arm tool, used to hold connectors during their wiring and assembly into the harness.

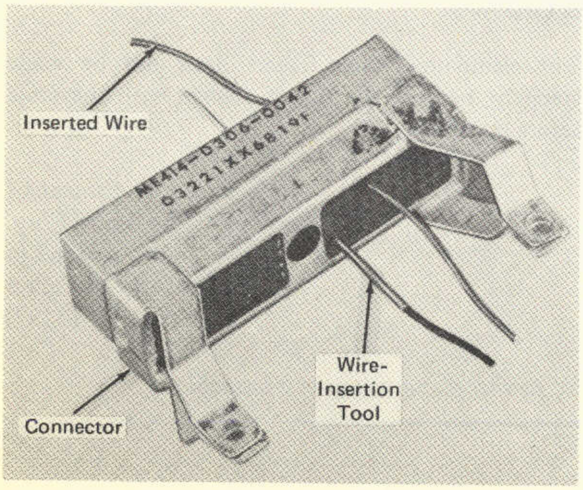


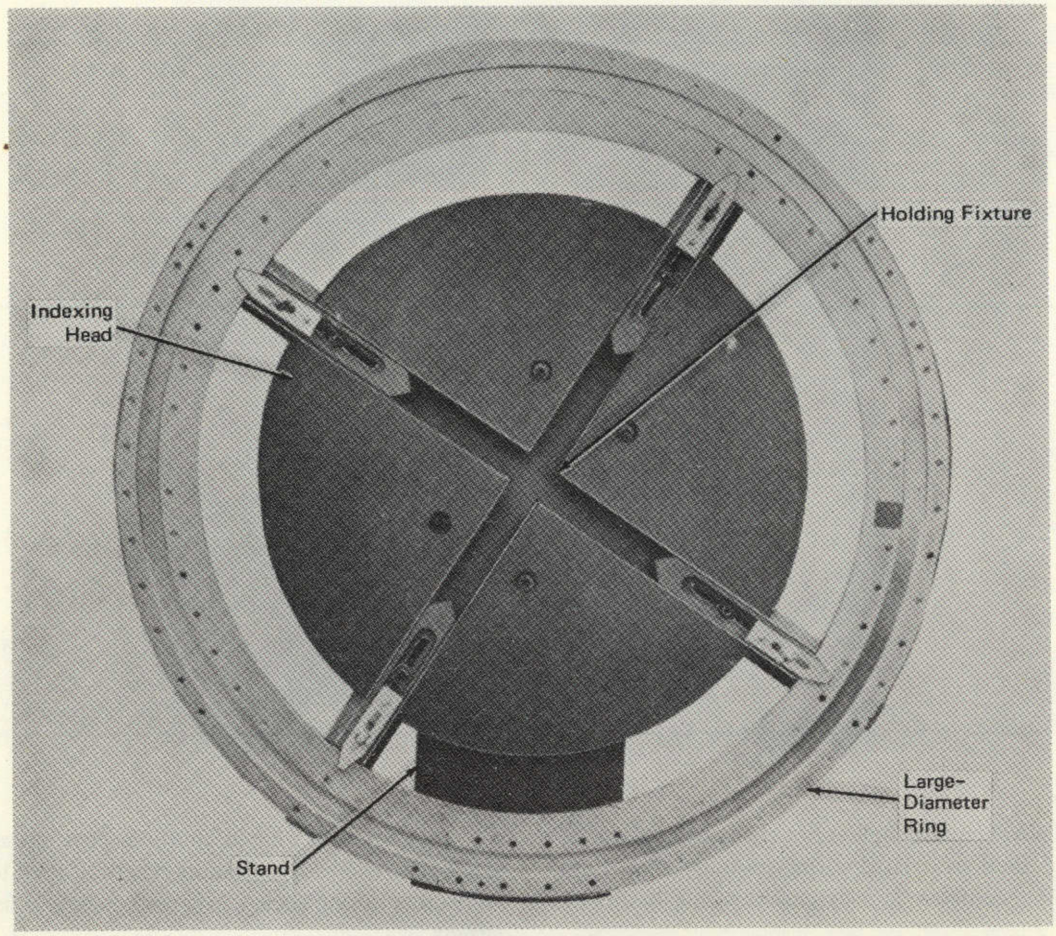
Figure 2. Connector and Wire-Insertion Tool

Figure 1 shows the holder assembly as it appears when not in use (no connector installed). Figure 2 shows the connector and its wire-insertion tool as it is used to assemble individual leads into the connector. The holder is fastened to the plywood shelf with wood screws. When a connector is placed in the holding device, the holder can be swiveled 360 degrees. This allows the insertion tool to be used to place wires from all directions.

Source: M. E. Ingles and W. Busser of
Rockwell International Corp.
under contract to
Johnson Space Center
(MSC-15879)

No further documentation is available.

FIXTURE EXTENDS RANGE OF SMALL INDEXING HEAD



Fixture Used to Place Large Ring

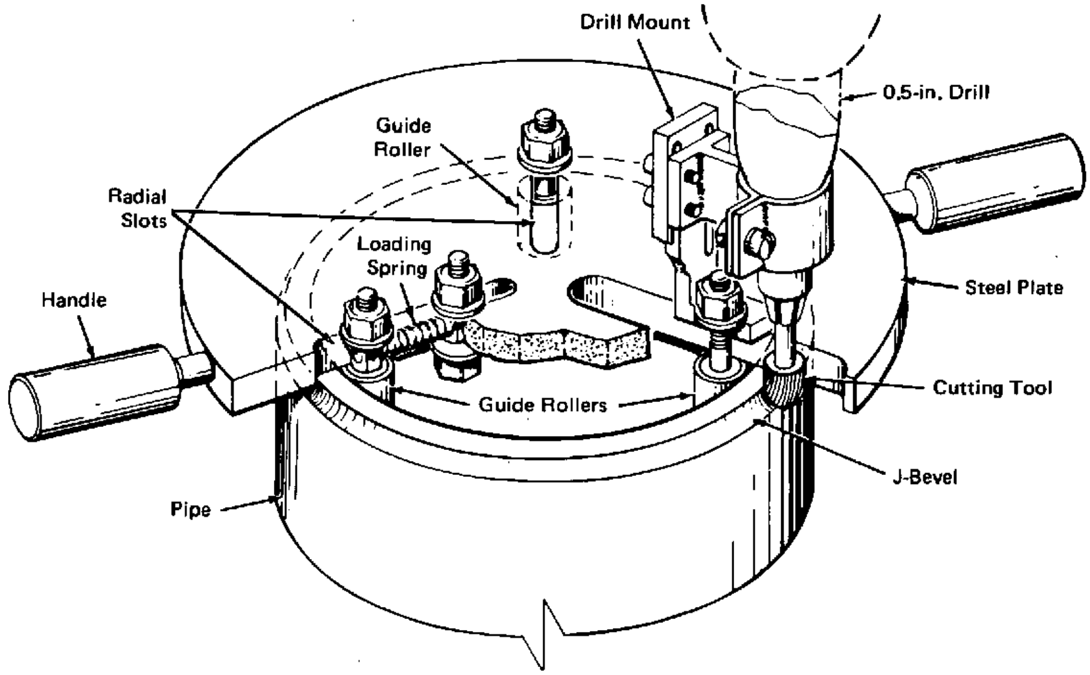
Many machine shops are faced with the problem of occasionally inspecting or laying out rings larger than the capacity of their indexing heads. This relatively inexpensive work-holding fixture extends the range of a small indexing head and permits the layout or inspection of angular spacings around large-diameter rings (see figure).

High-precision extension face plates are available for indexing heads and rotary tables, but these are expensive and difficult to acquire. The shop aid shown is less expensive and easily fabricated. The four clamp-on sliding fingers need not be made precisely, because the ring is aligned with the table before clamping.

Source: J. D. Froman of
Rockwell International Corp.
under contract to
Johnson Space Center
(MSC-17237)

No further documentation is available.

WELD BEVELING OF LARGE-DIAMETER PIPES



Jig Used To Bevel A Pipe

The ends of pipes measuring between 15 and 46 cm (6 and 18 in.) in diameter can be J-beveled in the field, in preparation for welding, with a 0.13-cm (0.5-in.) electric drill (driving a cutting tool) and a newly developed special jig. The technique is much faster and accurate than earlier methods.

The jig consists of a circular steel plate, of about 46 cm (18 in.) in diameter, in which three equidistant slots are radially cut (see figure). A guide roller is mounted through each slot; one roller is spring-loaded to allow for out-of-round pipes.

With the jig centered over the end of the pipe, the rollers are set to fit the pipe's inner surface. The drill is mounted over the widest of the slots, and a J-beveling cutter is mounted in the chuck. The drill is so mounted that the cutter bevels the end of the outer surface of the pipe.

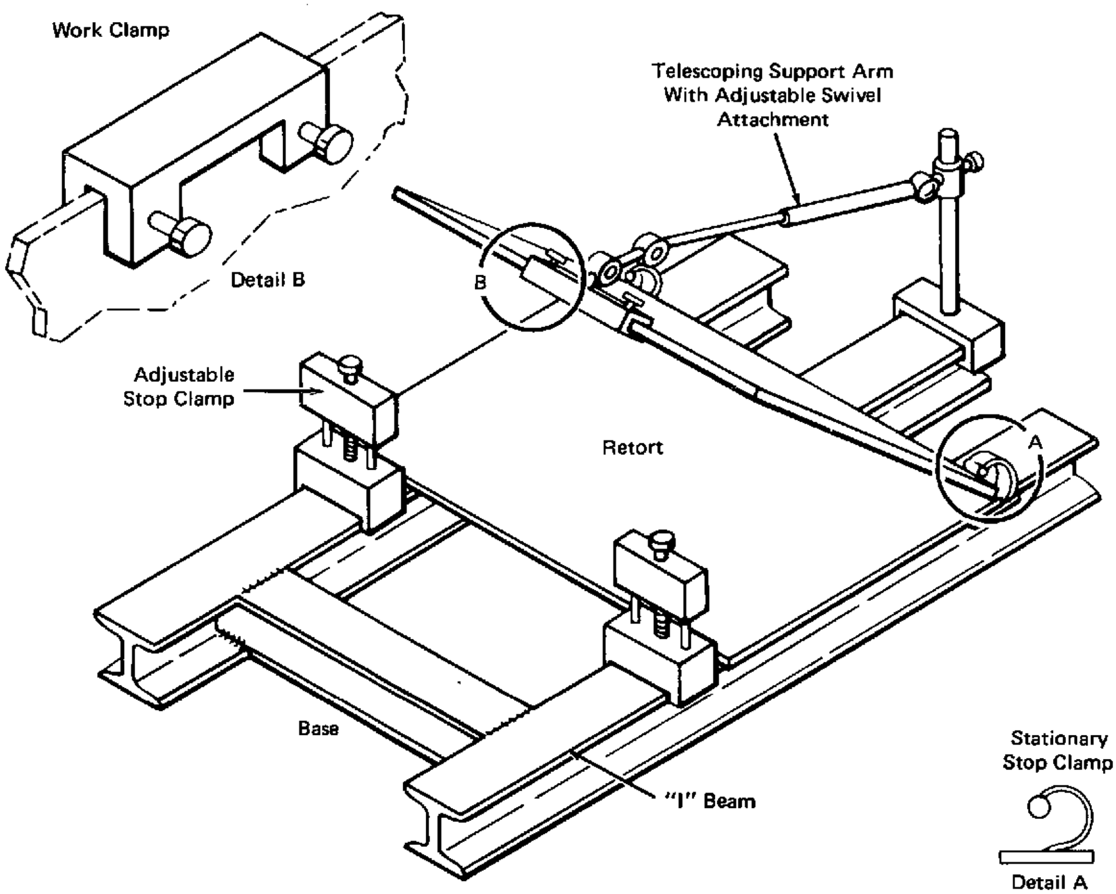
During operation, the drill is pressed inward to the proper depth for a rough cut, and is then locked into position. The jig is slowly rotated until the rough cut is complete. The drill is then adjusted for the finish cut and the jig is rotated again.

Comparable pipe-beveling tools are described in Tech Briefs 68-10551, 69-10229, and 69-10231.

Source: R. Liebenstien of
Bendix Corp.
under contract to
Kennedy Space Center
(KSC-10550)

No further documentation is available.

BONDING RETORT HOLDERS FOR COLD PLATING



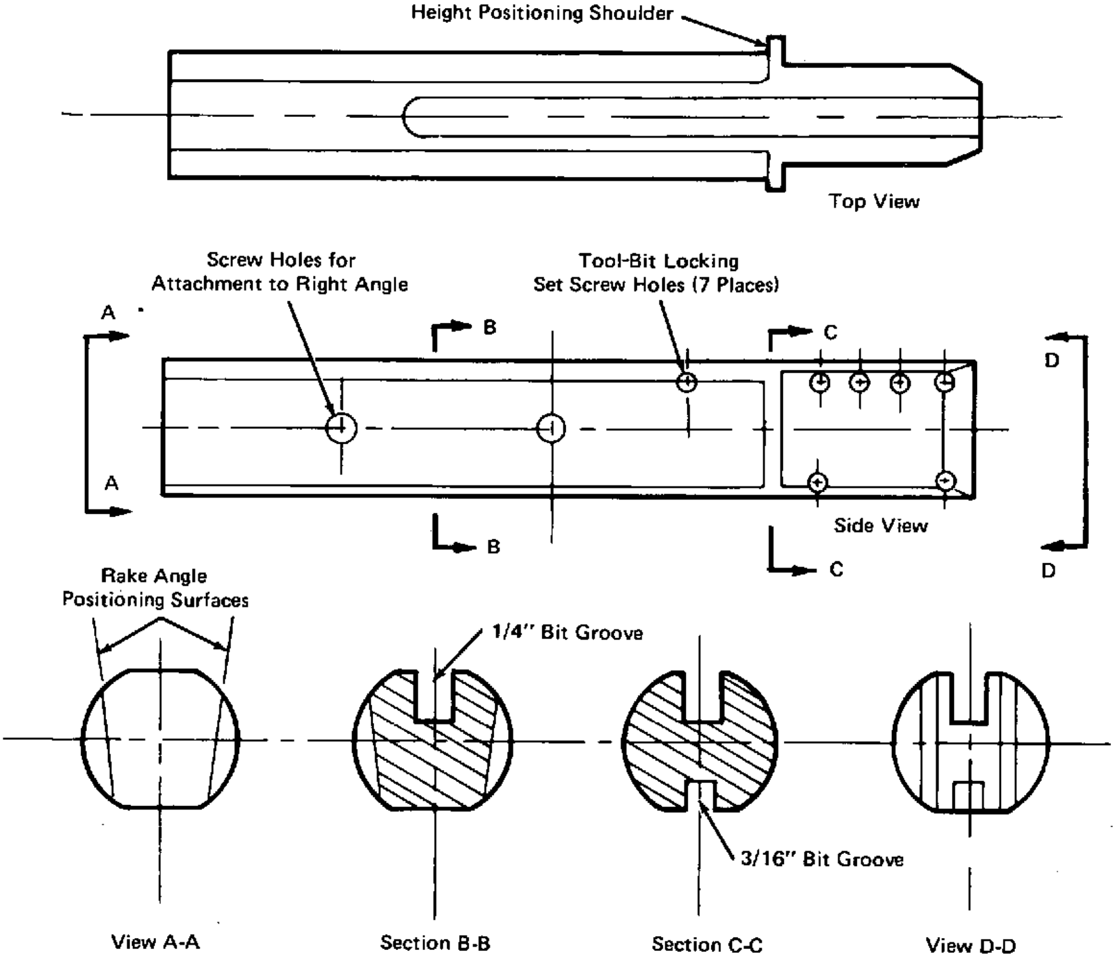
Retort Holder

A new fixture has been designed to assist in cold plating with silver. It protects the cold plate and retort from damage by excessive handling. Because the fixture is adjustable (see figure), variously sized retorts may be used and held in a stationary position, reducing the possibility of damage to the plate after bonding.

E. Kostyshak and
T. Costanzo of
Rockwell International Corp.
under contract to
Johnson Space Center
(MSC-00658)

No further documentation is available.

THREADING-TOOL HOLDER



Tool-Holder Adapter

A standard milling machine can be used to grind tool bits to a high precision. A simple fixture permits the tool point to be ground to within ± 0.025 mm (.001 in.) of the center line of the tool.

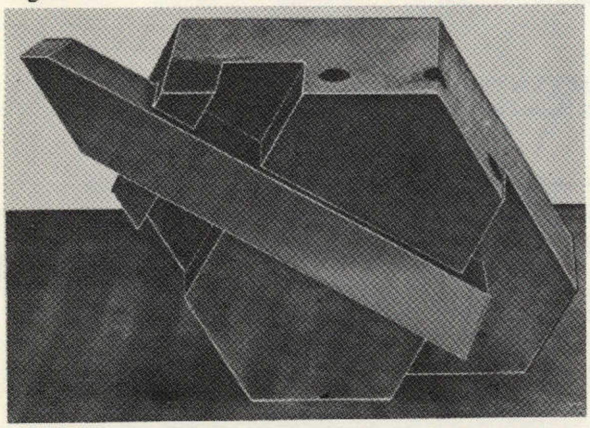
To use the tool-holder adapter (shown in the illustration), install the tool bit in the adapter, and attach the adapter to a right angle. Position the milling machine to the desired angle and grind the tool-bit tip. Rotate the adapter and repeat the operation.

Source: A. C. Wiegers of
McDonnell Douglas Corp.
under contract to
Johnson Space Center
(MSC-11870)

Circle 8 on Reader Service Card.

THREADING-TOOL GRINDER FIXTURE

A fixture has been designed and fabricated to hold a thread-cutting tool in the correct position while it is being ground or resharpened. By selecting the proper chucking surface, any cutting tool can be accurately ground or resharpened to any standard angle.



Tool-Grinding Fixture

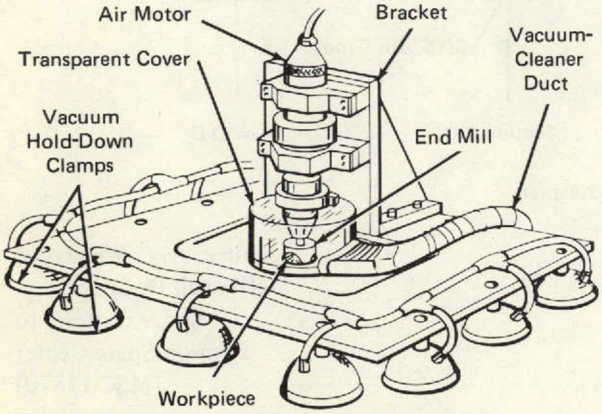
The tool is securely held at the proper angle by the tool-grinding fixture (see figure). First, one surface of the cutting edge is ground. Then, without removing the tool from the fixture, the entire assembly is rotated and set in place and the other surface of the cutting edge is ground.

This fixture eliminates guesswork, produces a precise, high quality cutting edge, and reduces grinding time. It should be of interest to any machine shop.

Source: N. W. Blake and
M. A. Anderson of
Rockwell International Corp.
under contract to
Johnson Space Center
(MSC-15052)

Circle 9 on Reader Service Card.

BULKHEAD MACHINING FIXTURE: A CONCEPT



Portable Aft Bulkhead Machine Fixture

Items bonded onto panel surfaces were previously removed by using a mini-grinder with a sanding disk in a plastic bag. The plastic bag was taped to the bulkhead and around the operator's arms. The grinding and sanding created excessive debris, and the plastic bag had to be replaced repeatedly.

These drawbacks are eliminated by an air motor, mounted on a bracket with a spherical base. The motor drives an end mill that efficiently removes the bonded-on items. The base of the unit is held firmly in place by vacuum hold-down clamps (suction cups). A transparent cover encloses the end mill and workpiece so that the machining may be constantly observed. A vacuum-cleaning duct is connected to an aperture in the transparent cover to remove debris.

Source: J. R. Lewis of
Rockwell International Corp.
under contract to
Johnson Space Center
(MSC-15840)

No further documentation is available.

Patent Information

The following innovations, described in this Compilation, have been patented or are being considered for patent action as indicated below:

Vee-Notch Tool Cuts Specimens (Page 2) MFS-20730

This invention is owned by NASA, and a patent application has been filed. Inquiries concerning nonexclusive or exclusive license for its commercial development should be addressed to:

Patent Counsel
NASA Headquarters
Code GP
Washington, D. C. 20546

Core Drill's Bit is Replaceable Without Withdrawal of Drill Stem: A Concept (Page 4) MFS-20819

Title to this invention has been waived under the provisions of the National Aeronautics and Space Act [42 U.S.C. 2457 (f)], to the Westinghouse Electric Corp., Friendship International Airport, P.O. Box 746, Baltimore, Md. 21203

Optical Alignment of Electrodes on Electrical Discharge Machines (Page 17) XAC-09489

This is the invention of a NASA employee, and U.S. Patent No. 3,565,530 has been issued to him. Inquiries concerning license for its commercial development may be addressed to the inventors: Mr. A. G. Boissevain and Mr. B. W. Nelson, Ames Research Center, Mail Stop FQ 277-9, NASA, Moffett Field, California 94035.