NC PUNCH PRESS
OCTO-334

OPERATOR'S MANUAL

AMADA COMPANY, LTD.
200, Ishida, Isehara , Kanagawa , JAPAN

OCT. 1983

FOREWORD

This manual has been prepared to acquaint you with the installation, operation and maintenance procedures of your Amada machine. We urge that you read this manual carefully for a thorough understanding of the equipment and for trouble-free operation of the machine. In addition to this manual, you may also refer to the Programming Manual.

CONTENTS

SECTION 1 – MACHINE DESCRIPTION

TABLE 1–2
CARRIAGE 1–2
CLAMPS 1–2
X-GAUGE BLOCK 1–2
WORK HOLDERS 1–3
TOOL HOLDER 1–3
STRIKER 1–3
PRESS MOTOR 1–4
CLUTCH AND BRAKE 1–4
SAFETY DEVICES 1–5

SECTION 2 – INSTALLATION

PLACEMENT 2–1
AIR SUPPLY 2–1
ELECTRICAL POWER CONNECTION 2–1

SECTION 3 – CONTROLS

NC UNIT CONTROL PANEL 3–1
CARRIAGE CONTROL PANEL 3–12
ELECTRICAL ENCLOSURE 3–13
OTHER CONTROLS 3–14

CRT DISPLAY
Status characters 3–15
Input data 3–16
Program and sequence numbers 3–17
Alarm 3–17
Position data 3–18
Command data 3–20
Program data 3–22

SECTION 4 – OPERATION

PREPARATION 4–1

AUTOMATIC OPERATION
TAPE mode 4–2
MEMORY mode 4–4
MDI (Manual data input) mode 4–6

OPERATION INTERRUPTS 4–8

PROGRAM CHECK
Program tape 4–9
Programs stored in memory 4–9
Program errors 4–10
Program check end 4–10

PROGRAM REGISTRATION AND DELETION
Registering program tape data in memory 4–11
Adding tape program to existing programs in memory 4–12
Entering programs from NC control panel 4–12
Program deletion 4–14
Deletion of all programs 4–14

SEQUENCE NUMBER SEARCH 4–15
PROGRAM NUMBER SEARCH 4–16

PROGRAM EDITING
Editing procedures 4–17
Scan method 4–17
Word search method 4–18
Return to program start 4–19
Word insertion 4–20
Word alteration 4–21
Insertion/alteration of multiple words or blocks 4–22
Word deletion 4–23
Deleting words up to EOB (;) 4–23
Deleting multiple blocks 4–23
Memory rearrangement 4–24

INCH-METRIC SELECTION
Selection by setting data 4–25
Selection by G code 4–25

MACRO MEMORY SETTING 4–26
MULTIPLE PART PUNCHING PROGRAM SETTING 4–26
BENDING COMPENSATION (G94) DATA SETTING 4–26

DISPLAY/SETTING OF TOTAL NUMBER OF TOOL OPERATIONS
Display 4–28
Setting 4–28

ALARM MESSAGES 4–29
Program and operation errors 4–30
Overtravel 4–37
Errors in servo system 4–39
Faulty PC boards, cables, etc. 4–42
Control system and motor overheat 4–42
Memory errors 4–43

NC STATUS DISPLAY 4–44

DISPLAY/SETTING OF RUNNING TIME
Display 4–46
Setting 4–47

SECTION 5 – MAINTENANCE

MECHANICAL MAINTENANCE
Daily maintenance 5–1
Monthly maintenance 5–3
Shear plate replacement 5–4

LUBRICATION
Daily lubrication 5–5
Periodic lubrication 5–6

ELECTRICAL MAINTENANCE 5–8

NC UNIT MAINTENANCE
Tape reader 5–9
Air filter 5–9

SELF-DIAGNOSTIC FUNCTION 5–10

ACCESSORIES

TAPE PUNCH INTERFACE 6–1
SAFETY MAT 6–5

SPECIFICATIONS 7–1

TOOLING

STATION ARRANGEMENT
H-type tool holder (9 stations) 8–1
L-type tool holder (8 stations) 8–2

TOOLS
Standard punch and die for H-type tool holder 8–3
Standard punch and die for L-type tool holder 8–5

TOOL REPLACEMENT
Installation 8–7
Removal 8–8

DISASSEMBLY AND ASSEMBLY OF PUNCHES
1/2" and 1-1/4" punches for H-type tool holder 8–9
1/2" and 1-1/4" punches for L-type tool holder 8–10
2" and 3-1/2" punches for H-type tool holder 8–11
3-1/2" punch for L-type tool holder 8–11

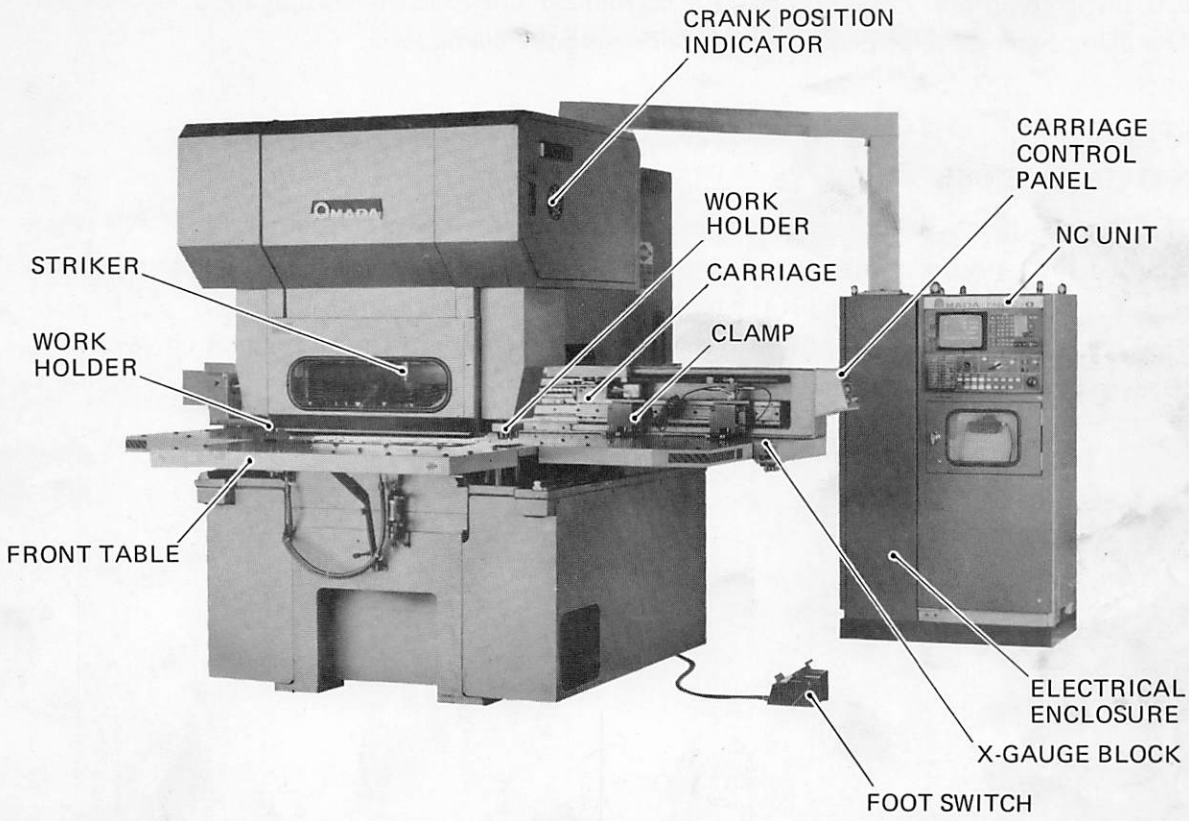
REGRINDING PUNCHES AND DIES 8–12

ADJUSTMENT OF PUNCH AND DIE HEIGHT
1/2" and 1-1/4" punches for H-type tool holder 8–12
1/2" and 1-1/4" punches for L-type tool holder 8–12
2" and 3-1/2" punches for H-type tool holder 8–13
3-1/2" punch for L-type tool holder 8–13
Dies 8–13

LUBRICATION 8–14
INSPECTING PUNCHES AND DIES 8–14
PUNCH-TO-DIE CLEARANCE 8–14
PUNCH CAPACITY 8–15
MINIMUM HOLE DIAMETER 8–16

SECTION 1 – MACHINE DESCRIPTION

The OCTO 334 is equipped with a Numerical Control (NC) system in which three driving axes are simultaneously controlled by three DC servo motors.
The NC system decodes the input command and the corresponding instruction is transmitted to DC servo motors which drive the table and the carriage to position the worksheet for punching. At the same time, the striker is driven by a DC servo motor to select the desired tool. Upon completion of these operations, punching is performed.



[Photo 1]

TABLE

The table, which consists of a center table, two side tables and a front table, supports the worksheet. The side tables are driven by a DC servo motor and slide smoothly along guide bars with the aid of linear motion bearings. Free-motion bearings have been placed on the table surfaces in order to ensure smooth movement of the worksheet.

CARRIAGE

The carriage is driven by a DC servo motor and moves the worksheet along the X-axis.

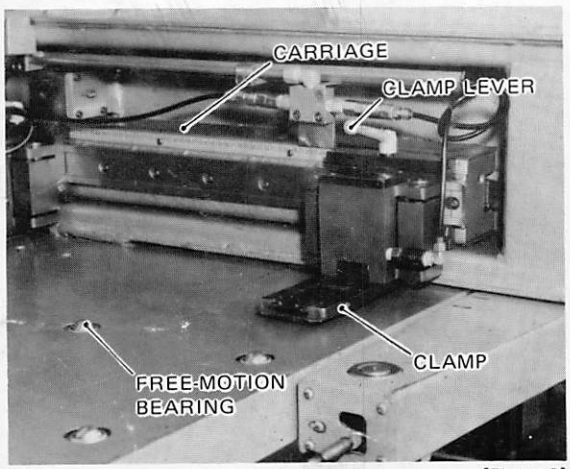
CLAMPS

The clamps are attached to the carriage, and hold the worksheet during punching. Clamping and unclamping are accomplished in a convenient one-touch operation by a foot switch. The clamps can be relocated by simply loosening the clamp lever.

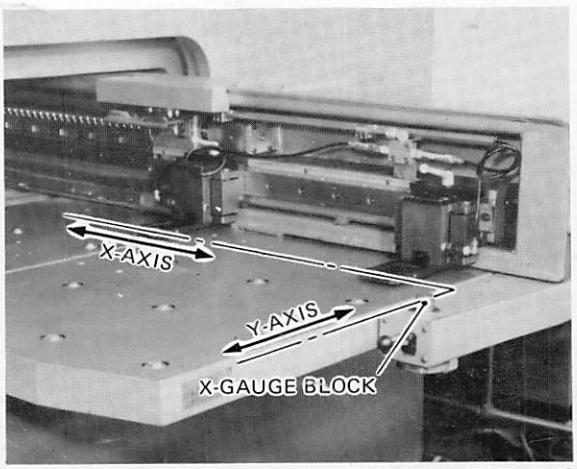
X-GAUGE BLOCK

The X-gauge block is used to determine the zero point (the origin) along the X-axis when securing the worksheet with the clamps. The zero point along the Y-axis is determined by pushing the worksheet up against the two clamps while they are open.

The X-gauge block is equipped with an interlock mechanism for safe operation. While the X-gauge block remains elevated, operation will not begin.

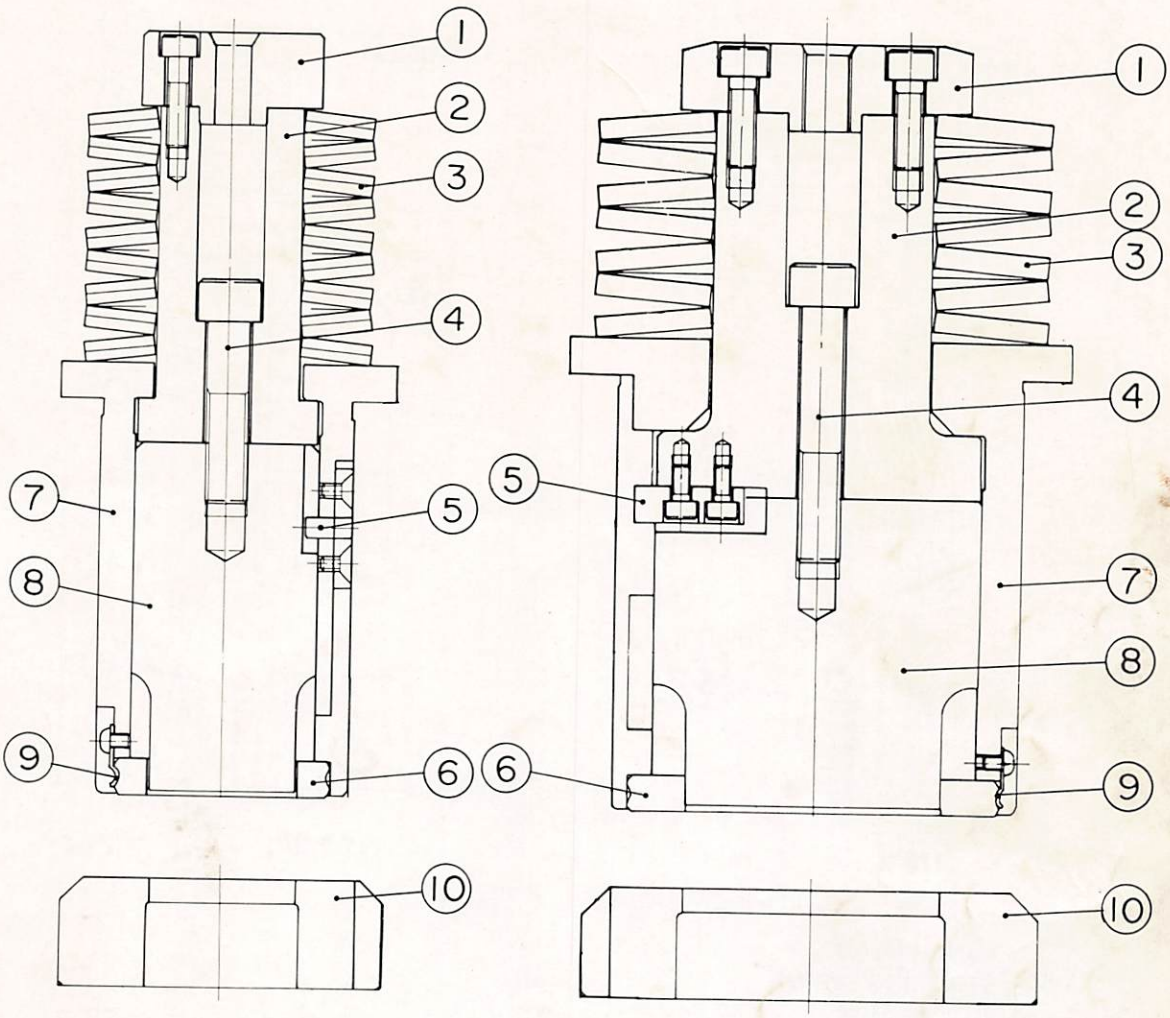


[Photo 2]



[Photo 3]

2" and 3-1/2" punches and dies



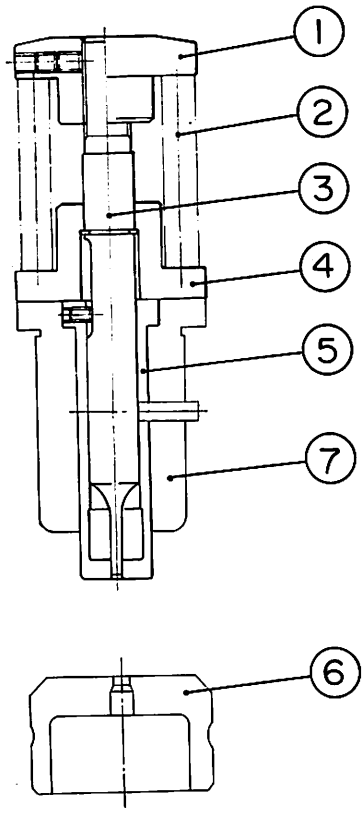
(2")

(3-1/2")

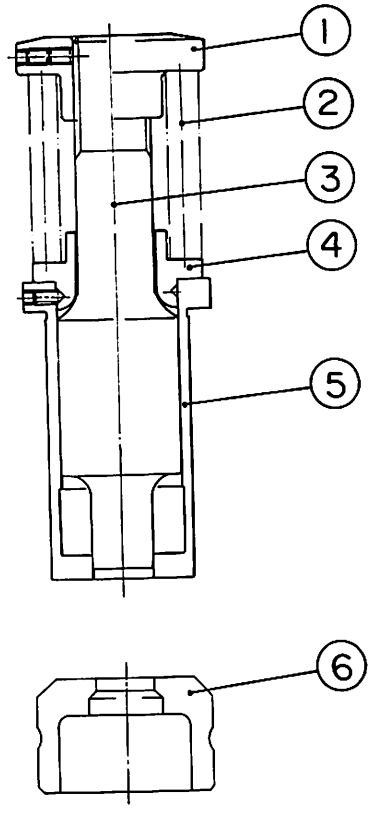
1. PUNCH HEAD
2. PUNCH DRIVER
3. STRIPPING SPRING
4. FIXING BOLT
5. PUNCH KEY
6. STRIPPER PLATE
7. PUNCH GUIDE
8. PUNCH TIP
9. STRIPPER PLATE SPRING
10. DIE

STANDARD PUNCH AND DIE FOR L-TYPE TOOL HOLDER

1/2" and 1-1/4" punches and dies



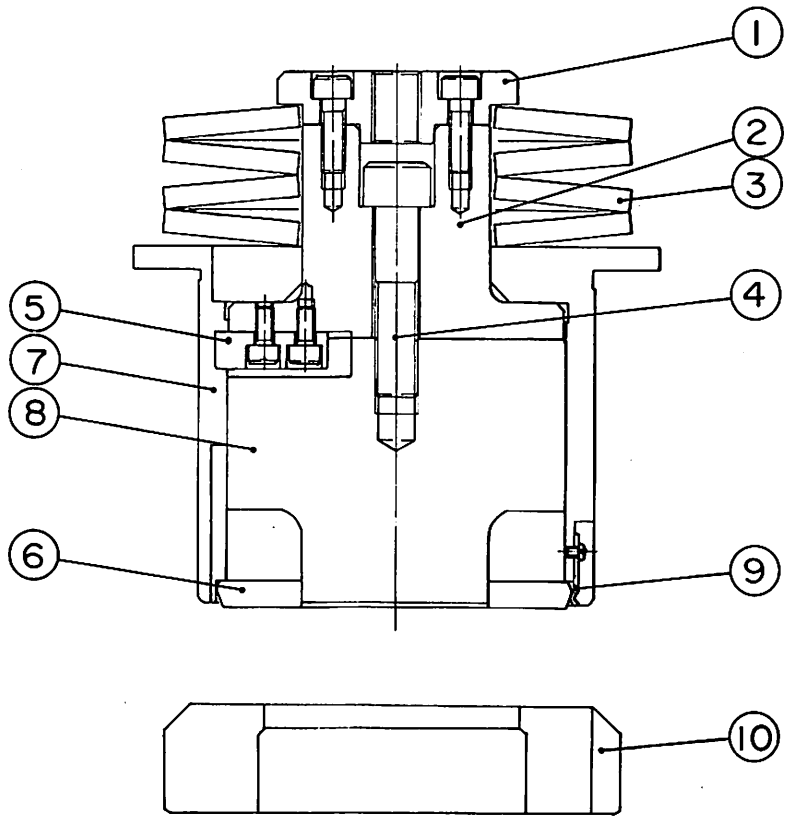
(1/2")



(1-1/4")

1. PUNCH HEAD
2. STRIPPING SPRING
3. PUNCH BODY
4. RETAINER COLLAR
5. PUNCH GUIDE
6. DIE
7. GUIDE SLEEVE

3-1/2" punches and dies



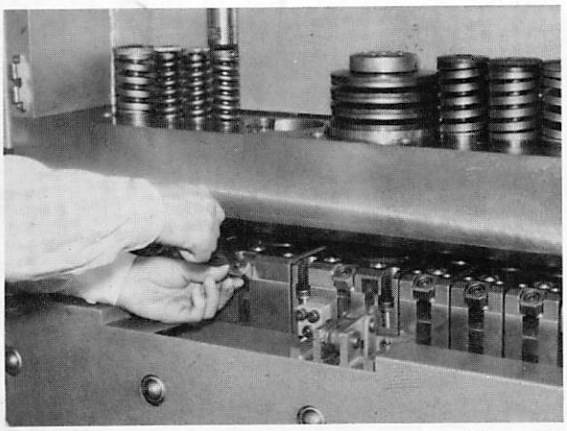
1. PUNCH HEAD
2. PUNCH DRIVER
3. STRIPPING SPRING
4. FIXING BOLT
5. PUNCH KEY
6. STRIPPER PLATE
7. PUNCH GUIDE
8. PUNCH TIP
9. STRIPPER PLATE SPRING
10. DIE

TOOL REPLACEMENT

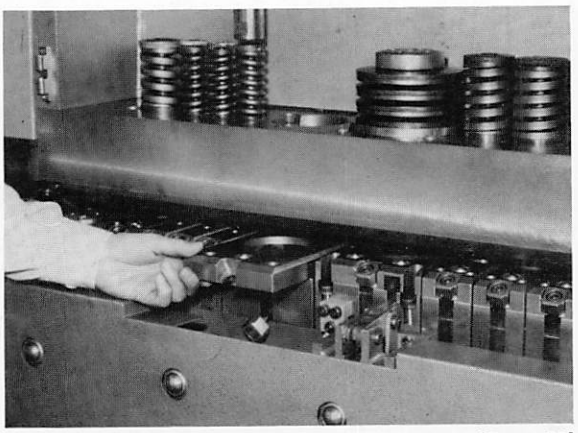
INSTALLATION

To install the punches and dies, proceed as follows:

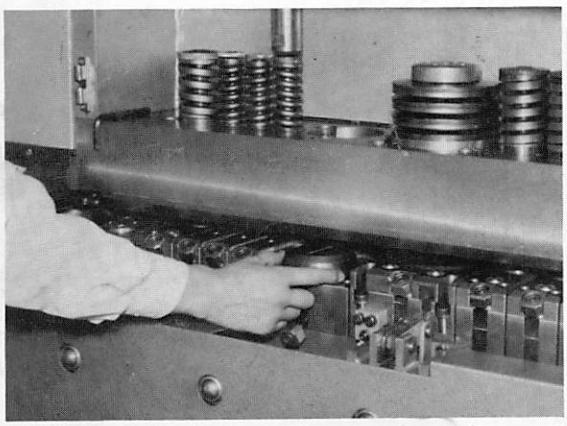
1. Turn the TOOL CHANGE switch (41) to the ON position.
2. Turn the MODE switch (40) to MANUAL.
3. Lower the front table.
4. Open the tool change door.
5. Loosen the corner piece fixing bolt with an Allen wrench (8 mm) and lower the corner piece [Photo 25].
6. Remove the die spacer from the lower tool holder [Photo 26].
7. Clean the die holder and insert the die into the die holder [Photo 27].
   NOTE: When inserting the die, align the die key (or keyway) with the keyway (or key) in the die holder so that the orientation of the die matches your punching requirements.
8. Attach the die spacer and make sure that it is properly positioned [Photo 28].
9. Lock the die spacer with the corner piece. Tighten the corner piece fixing bolt [Photo 29].



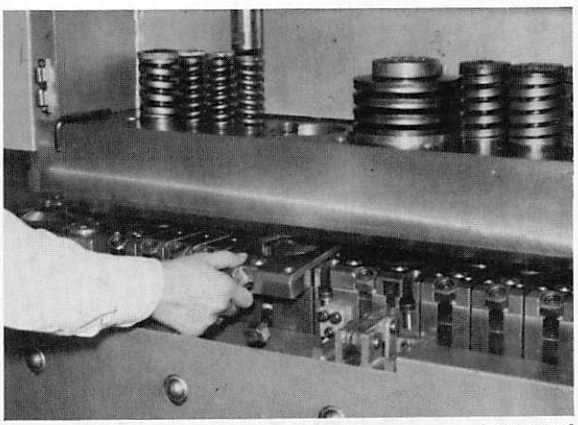
[Photo 25]



[Photo 26]



[Photo 27]



[Photo 28]

10. Clean the upper tool holder, apply machine oil to the punch, then insert the punch into the upper tool holder [Photo 30]. For lubrication points, see "LUBRICATION" on page 8–14.

NOTE: (a) If the striker is positioned above the station in which the punch is to be inserted, move the striker by using the STRIKER switch (69) while depressing the limit switch of the tool change door. See Photo 31.

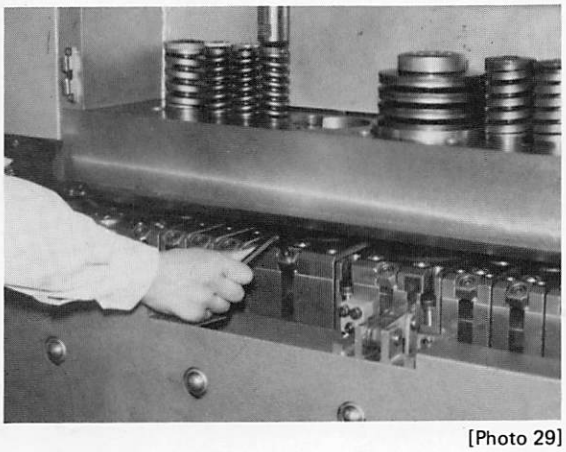
(b) When inserting 1/2" punches into the L-type tool holder, attach the guide sleeve to the punch guide.

(c) When inserting the punch, align the punch guide keyway with the key in the upper tool holder so that the orientation of the punch matches that of the die.

REMOVAL

To remove the punches and dies, proceed as follows:

1. Perform steps 1 thru 4 of "INSTALLATION."
2. Remove the punch from the upper tool holder.
   When removing the 3-1/2" punch, use the punch remover furnished as a standard accessory [Photo 32].
3. Loosen the corner piece fixing bolt, and remove the die spacer from the lower tool holder.
4. Remove the die from the die holder.



[Photo 29]

[Photo 30]

[Photo 31]

[Photo 32]

DISASSEMBLY AND ASSEMBLY OF PUNCHES

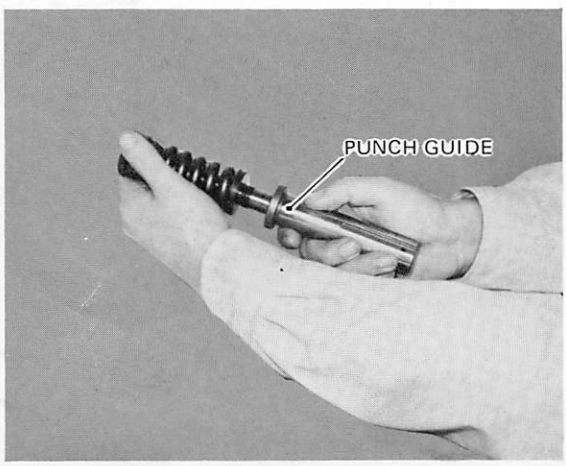
1/2" AND 1-1/4" PUNCHES FOR H-TYPE TOOL HOLDER

Disassembly

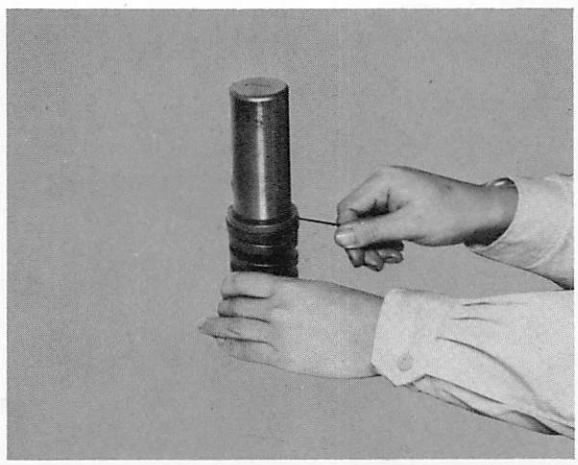
1. Remove the punch guide from the punch assembly as shown in Photo 33. On the 1-1/4" punch, loosen the setscrew which holds the punch guide and remove the guide [Photo 34].
2. Place the punch body in a vise with soft jaws.
3. Install the M5 bolts in the two bolt holes in the punch head, and tighten them equally until the clearance between the punch head and its collar is approximately 5 mm (0.2 in) [Photo 35].
4. Loosen the punch head with a pipe wrench and disassemble the punch assembly (Photo 36].

Assembly

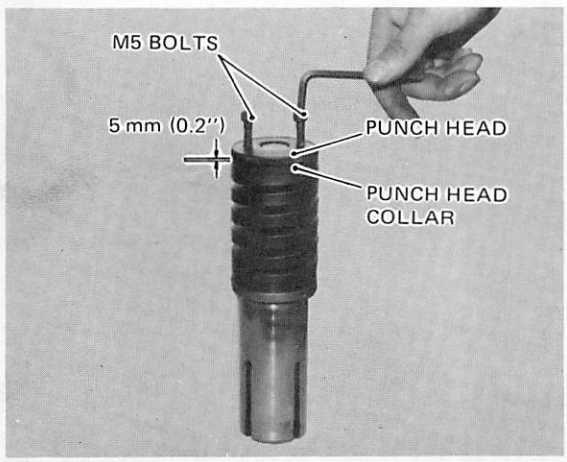
Assemble the retainer collar, stripping spring, punch head collar and the punch head to the punch body. Using a pipe wrench, tighten the punch head until the specified punch height is obtained. Apply a coat of machine oil to the frictional surface of the punch body and assemble the punch guide to the punch body.



[Photo 33]



[Photo 34]



[Photo 35]

[Photo 36]

1/2" AND 1-1/4" PUNCHES FOR L-TYPE TOOL HOLDER

Disassembly

To disassemble the punch assembly, remove the setscrews from the punch head and the punch guide.

Assembly

Assemble the retainer collar, stripping spring, punch head collar and the punch head to the punch body. Using a pipe wrench, tighten the punch head until the specified punch height is obtained. Apply a coat of machine oil to the frictional surface of the punch body and assemble the punch guide to the punch body.

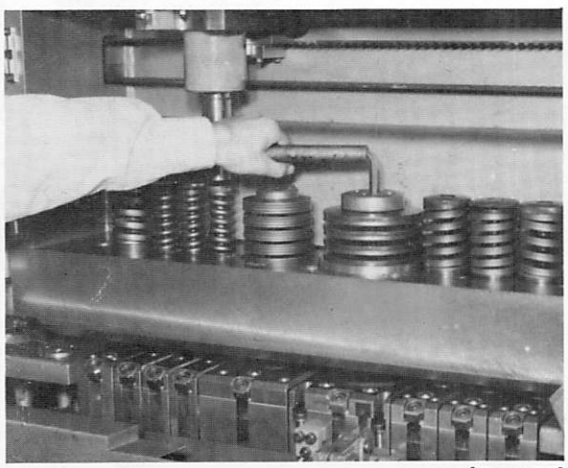
2" AND 3-1/2" PUNCHES FOR H-TYPE TOOL HOLDER
3-1/2" PUNCH FOR L-TYPE TOOL HOLDER

Disassembly

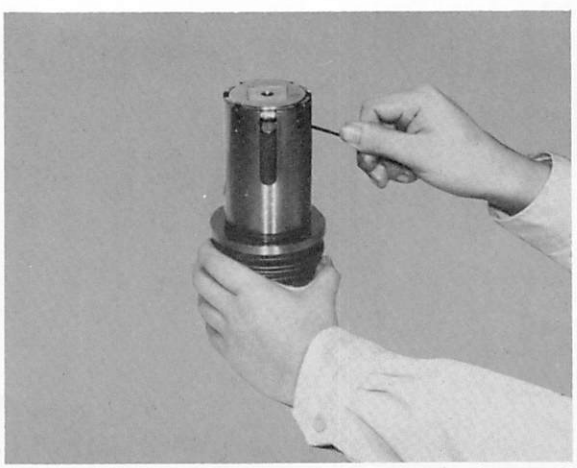
1. Using an Allen wrench (10 mm), slightly loosen the punch tip fixing bolt with the punch assembly in the upper tool holder [Photo 37].
2. Remove the punch assembly from the upper tool holder.
3. Loosen the punch tip fixing bolt just enough to free it from the punch tip.
4. Loosen the screws which retain the stripper plate springs, and remove the stripper plate [Photo 38].
5. Screw an M8 bolt into the thread hole of the punch tip, and pull the punch tip out [Photo 39].

Assembly

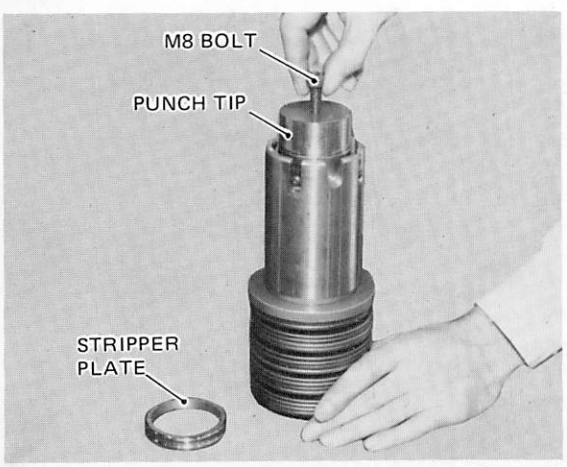
1. Apply a coat of machine oil to the punch tip, and then insert it into the punch guide.
2. Install the stripper plate and tighten screws which retain the stripper plate springs.
3. Temporarily tighten the punch tip fixing bolt.
4. Insert the punch assembly into the upper tool holder, and then tighten the punch tip fixing bolt securelv.



[Photo 37]



[Photo 38]



[Photo 39]

REGRINDING PUNCHES AND DIES

The punches and dies should be re-ground frequently to extend their service life. Observe the edges of the punch and die to be sure that they are sharp and lustrous. If the edges are rounded or have a frosted appearance, the punch and die should be re-ground. If grinding is not done frequently, at the correct stage of wear, the extra force required by the already frosted edge causes increasingly rapid and intense wear. Proper grinding for one time would be 0.2 mm (0.008 in) for the punch and 0.1 mm (0.004 in) for the die. The punch can be ground a maximum of 2 mm (0.08 in) during its service life, and the die a maximum of 1 mm (0.04 in). After the punch and die have been ground, their edges should be finished with an oil stone.

ADJUSTMENT OF PUNCH AND DIE HEIGHT

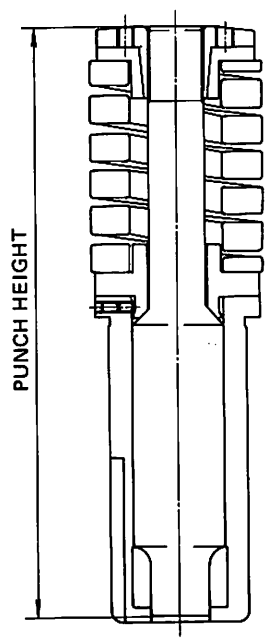
After grinding, the punch and die must be adjusted to their specified height. When adjusting the punch and die height, observe the following:

1/2" and 1-1/4" punches for H-type tool holder

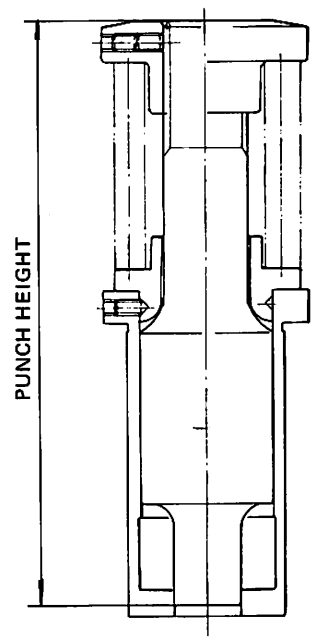
1. Perform steps 1 thru 3 of "Disassembly" on Page 8–9.
2. Turn the punch head with a pipe wrench until the specified punch height is obtained.
   Punch height: 207 mm (8.15")

1/2" and 1-1/4" punches for L-type tool holder

1. Loosen the setscrew which secures the punch head.
2. Turn the punch head until the specified punch height is obtained.
   Punch height: 139 mm (5.47")



(1-1/4" punch for H-type tool holder)



(1-1/4" punch for L-type tool holder)

2" and 3-1/2" punches for H-type tool holder
3-1/2" punch for L-type tool holder

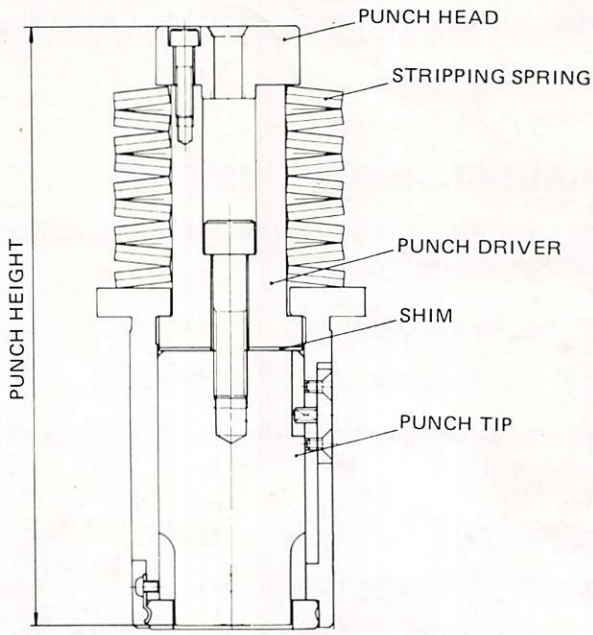
Insert a shim (proportionate to the amount of grinding done) between the punch driver and the punch tip to adjust the punch height to specifications.

Punch height:

2" punch for H-type tool holder: 207 mm (8.15")

3-1/2" punch for H-type tool holder: 209 mm (8.23")

3-1/2" punch for L-type tool holder: 140.5 mm (5.53")



(2" punch for H-type tool holder)

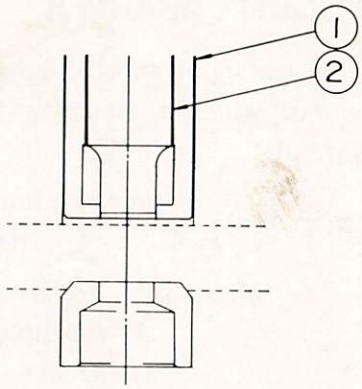
Dies

Insert a shim (proportionate to the amount of grinding done) between the die holder and the die to adjust the die height to specifications.

Die height: 30 mm (1.18")

CATION

loading the punch on the tool holder, apply machine
› their lubrication points.



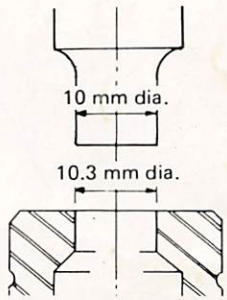
INSPECTING PUNCHES AND DIES

1. Disassemble the punch and remove any accumulated scales.
2. If the edges of the punch and die are rounded or have a frosted appearance, regrind them.
3. If the stripping spring is fatigued, replace it with a new one.

PUNCH-TO-DIE CLEARANCE

The punch-to-die clearance is indicated by the difference between the punch and die diameters. For example, when a 10 mm diameter punch and a 10.3 mm diameter die are used, the clearance is 0.3 mm.

10.3 – 10 = 0.3 = Punch-to-die clearance



The punch-to-die clearance must be determined according to the thickness and material of worksheet, as shown in the table below.

Punch-to-die clearance (mm) / Thickness (mm)	Material		
	Mild steel	Aluminum	Stainless steel
0.8 – 1.6	0.15 – 0.3	0.15 – 0.2	0.20 – 0.35
1.6 – 2.3	0.3 – 0.4	0.2 – 0.3	0.4 – 0.5
2.3 – 3.2	0.4 – 0.5	0.3 – 0.5	0.5 – 0.7
3.2 – 4.5	0.5 – 0.9	0.5 – 0.7	0.7 – 1.2
4.5 – 6.0	0.9 – 1.2	0.7 – 0.9	——

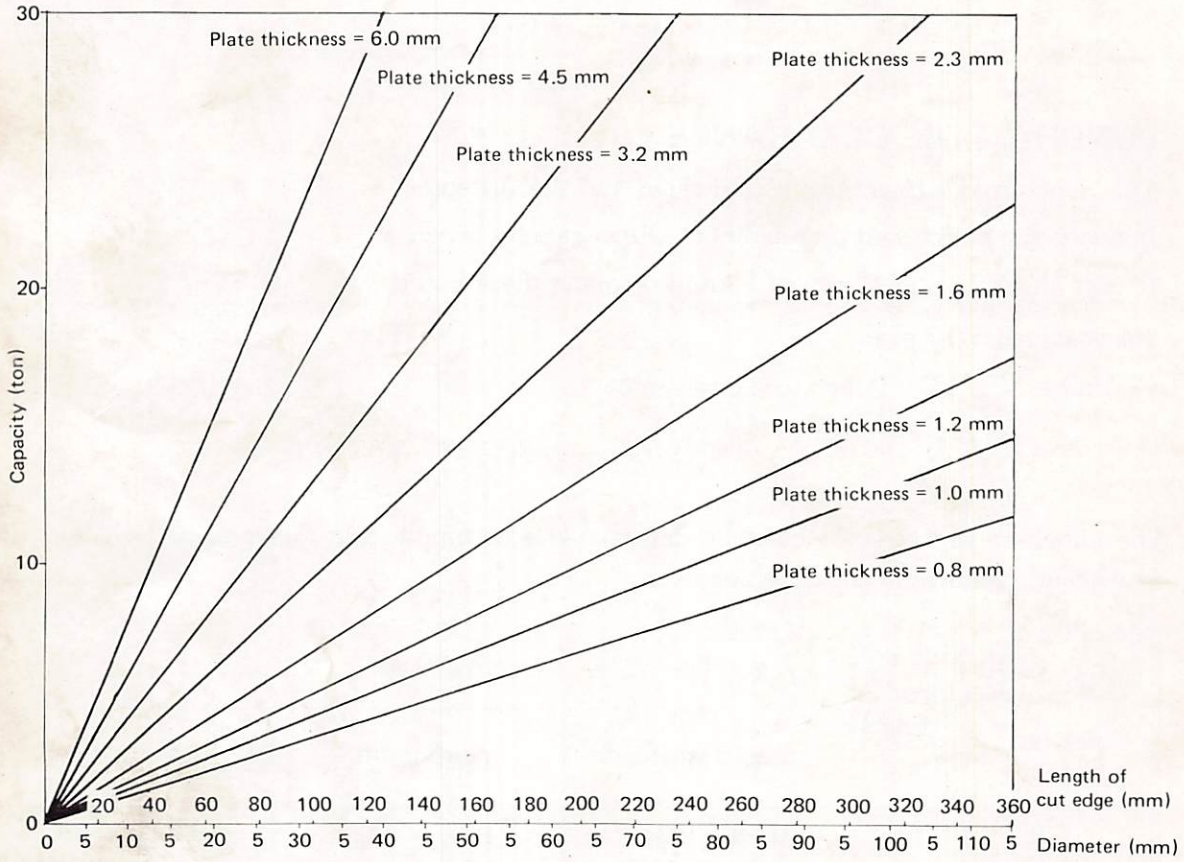
PUNCH CAPACITY

The maximum punchable hole diameter is determined by the worksheet. The punching force required is generally cal formula:

$$P\ (\text{ton}) = \frac{A\ (\text{mm}) \times t\ (\text{mm}) \times \tau\ (\text{kg/mm}^2)}{1000}$$

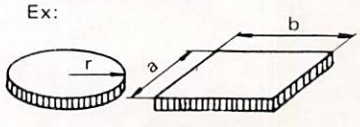
where, P: Force required
A: Length of cut edge
t: Thickness of worksheet
τ: Shearing strength of worksheet

If P does not exceed the machine capacity (30 tons), the worksheet is punchable. The calculation shows that 39.8 mm is the maximum punchable hole diameter when the worksheet thickness is 6 mm and the shearing strength is 40 kg/mm^2.
The following graph shows the maximum punchable hole diameters for a variety of plate thicknesses. The graph is based on calculations using a mild steel having a shearing strength of 40 kg/mm^2.



This graph is based on calculations using a mild steel having a shearing strength of 40 kg/mm^2.

Length of Cut Edge (L)
Ex:



$L = 2\pi r$ $L = 2\ (a + b)$