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UNBEATABLE VALUE ENGINEERING PRODUCTS

X3 Small Mill

Dismantling and Reassembly Guide

A picture story book to help you dismantle and reassemble your Sieg X3 Small Mill

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PLEASE READ THIS FIRST

There is no doubt that the Sieg X3 is currently one of the most popular small milling/drilling machines available to model engineers today. It has a well proportioned dovetailed cast iron column and head, a decent sized table with T-slots and coolant trough. With it's variable speed DC motor + 2 speed gearbox, the X3 is available in both metric and imperial options and a choice of either an MT3 or R8 spindle.

This picture story guide is designed to help you dismantle, reassemble, lubricate and make the proper adjustments to your Mill.

Before dismantling your X3 Small Mill, you should read through the entire guide and assess that you have the required equipment and skills to complete the task.

Although not expressly stated at each stage in this guide, every part is thoroughly cleaned in a paraffin type degreaser before reassembly.

For lubrication, we recommend Molyslip HSB grease, and a good quality lubricating oil such as Rock Oil HLP 32 Hydraulic Oil (ARC code: 170-150-00400). We do not recommend using automotive engine oil or 3-in-1 oil.

Update:
Please use Molyslip HSB grease (or similar) for lubrication wherever the guide shows the use of Copperslip grease.



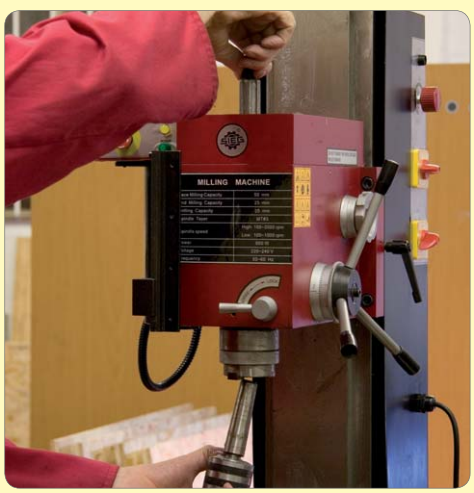
1: Presenting the case for the defence today is our engineer Geoff Watson. Geoff has worked on many X3 mills and by now, knows most of the wrinkles.

2: The mill - out of the box and all ready to start work on.

3: Remove the polycarbonate front guard

4: Loosen the drawbar...

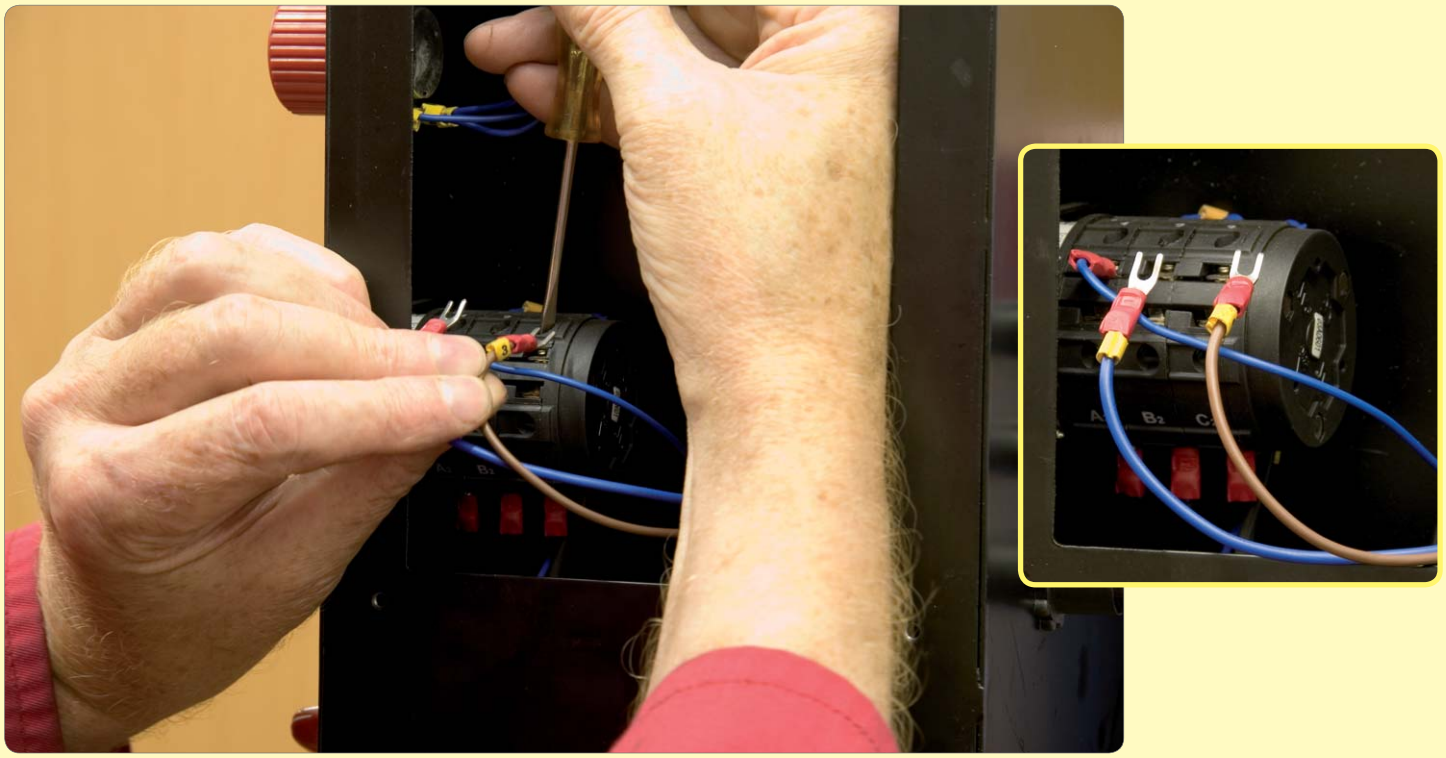
5: ...and give it a tap to release the taper...



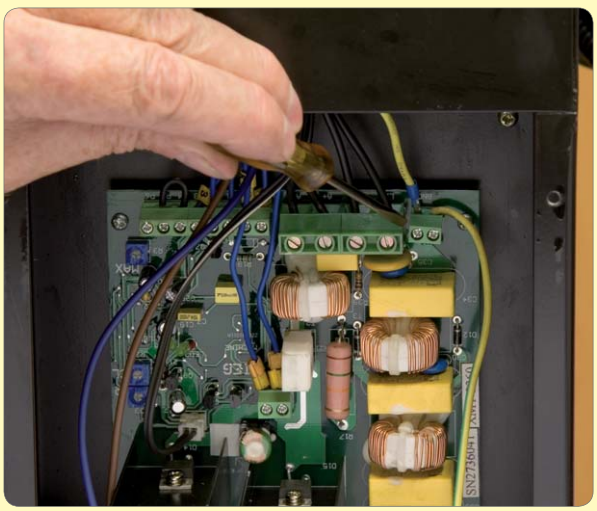
6: ...then remove the drawbar and drill chuck

7: Remove rear control panel covers

8: Remove earth terminals at base of column

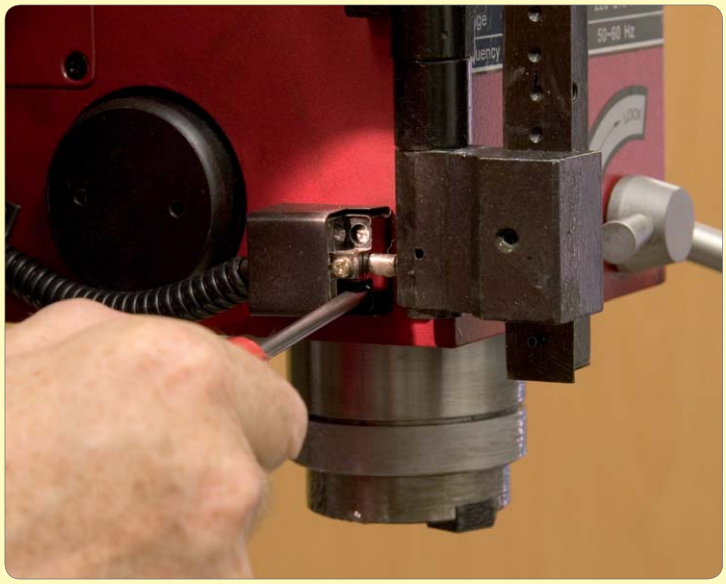


9: Remove #2 & #3 motor wires noting positions



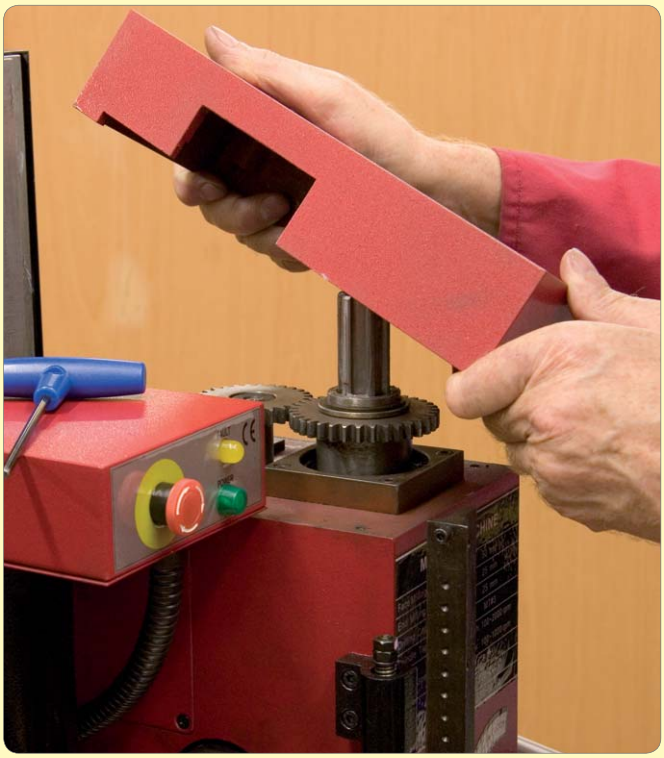
10: Remove motor earth lead from board

11: Remove 2 cap heads at top & 2 cap heads at bottom of control panel



12: Remove guard switch

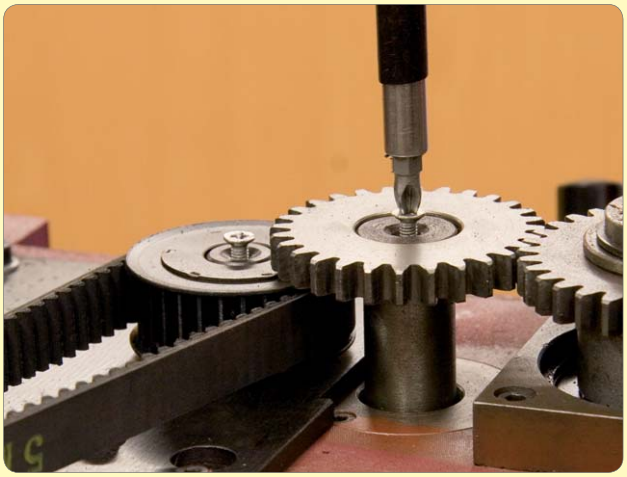
13: Remove 4 cap heads...



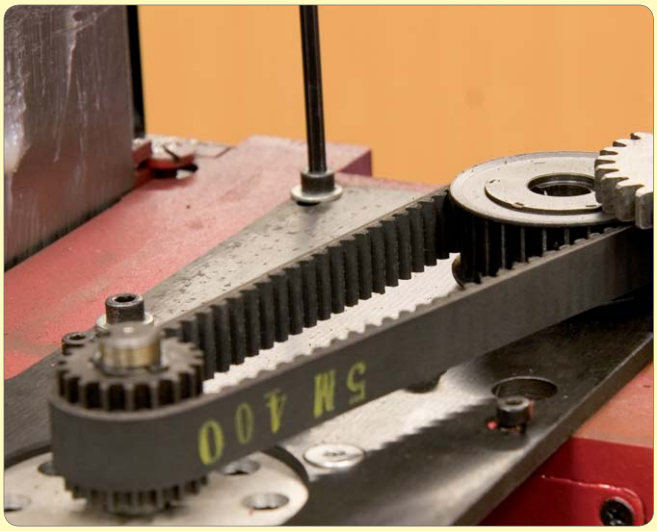
14: ...and lift off the top cover

15: Undo emergency stop cover screws 1 turn

16: Cover slides off to the left of machine



17: Remove screws and washers from motor driven pulley and reduction box output gear



18: Slacken motor plate screws

19 : Remove Pulley and gear

20 : Remove motor and plate

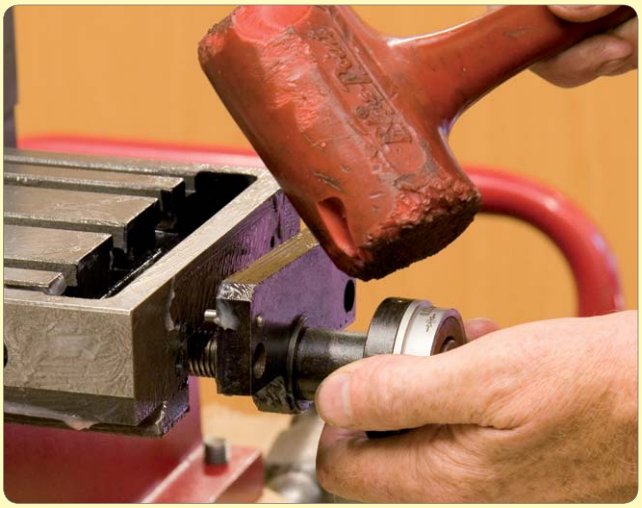
21 : Remove rear control box complete

22: Remove X-Axis handwheel...

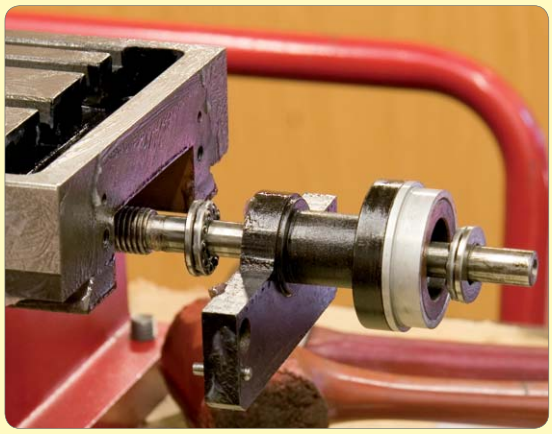
23: Drive out taper pin through micrometer dial sleeve...

24: ...and remove the dial

25: Remove leadscrew bracket screws



26: Tap bracket with mallet...

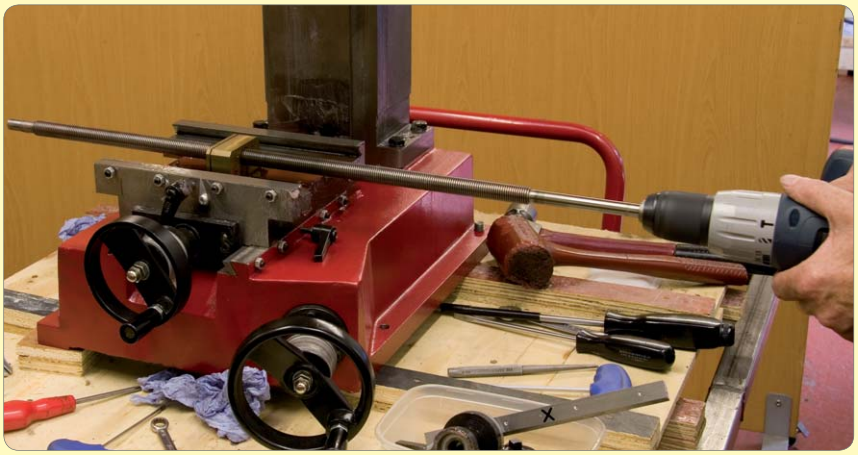


27: ...to remove with thrust bearings

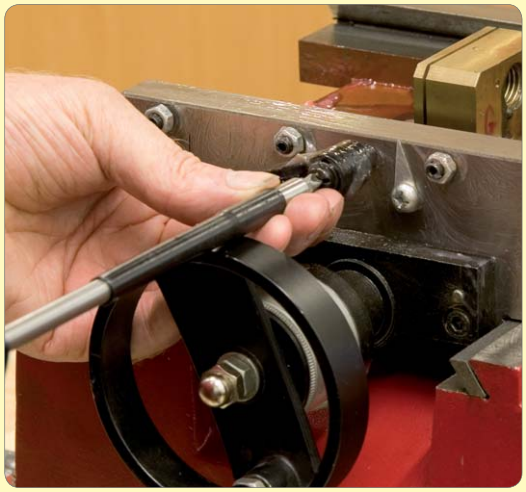
28: Slacken gib strip screws

29: Slide off table

30: Mark gib strip X-Axis



31: Remove leadscrew



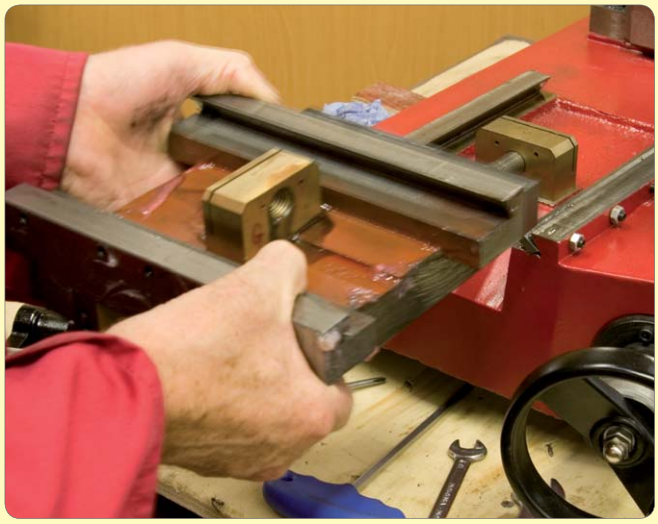
32: Remove table lock, gib adjusting screws and pointer

33: Remove Y-Axis handle assembly

34: Remove bracket assembly screws

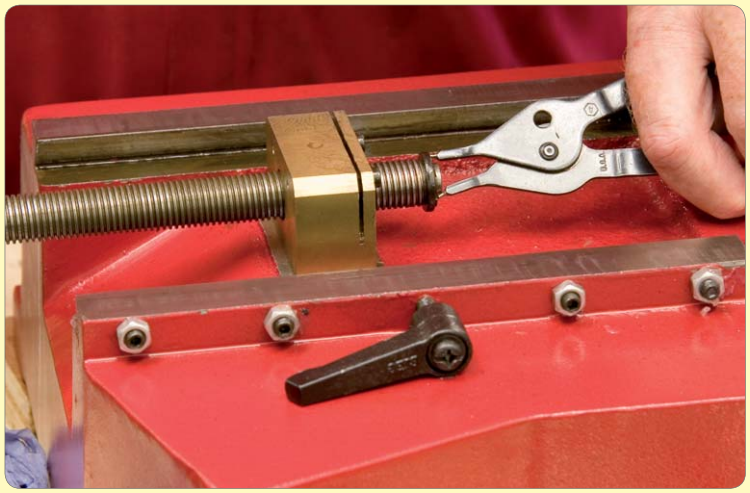
35: Remove key

36: Tap off bracket and thrust assembly



37: Remove cross slide

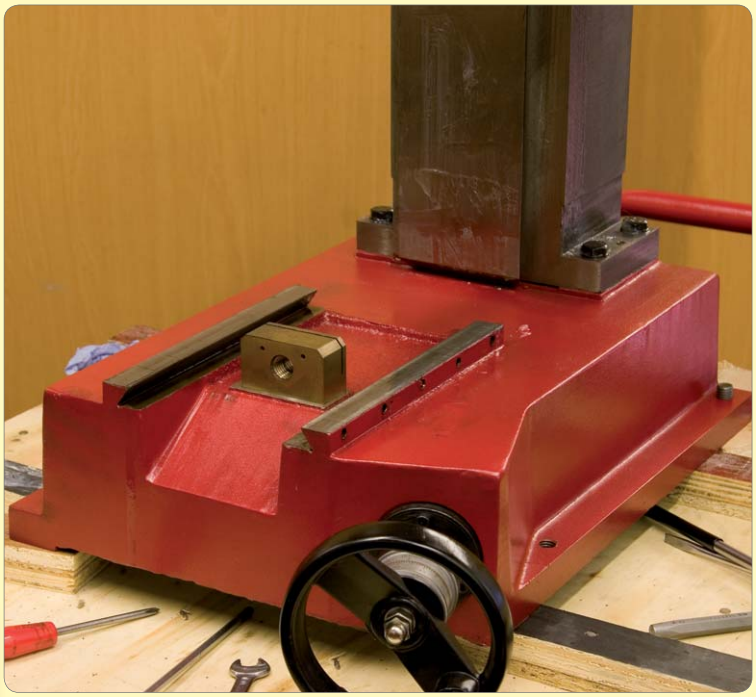
38: Remove and mark Y-Axis gib strip



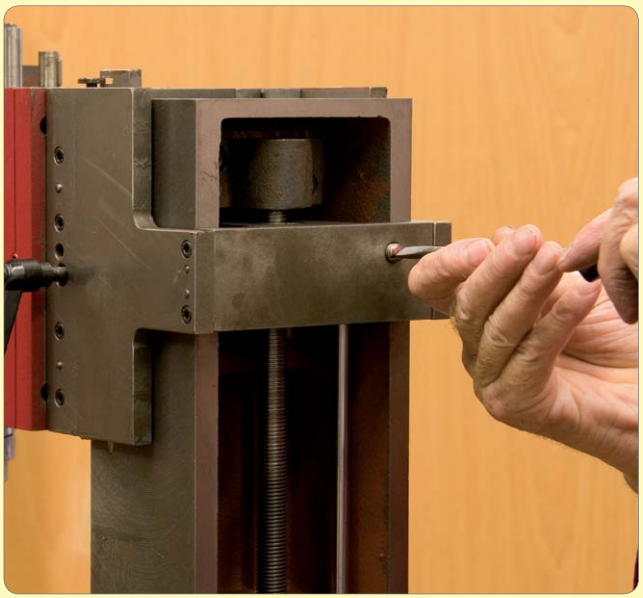
39: Remove circlip and washer from end of leadscrew

40: Remove leadscrew

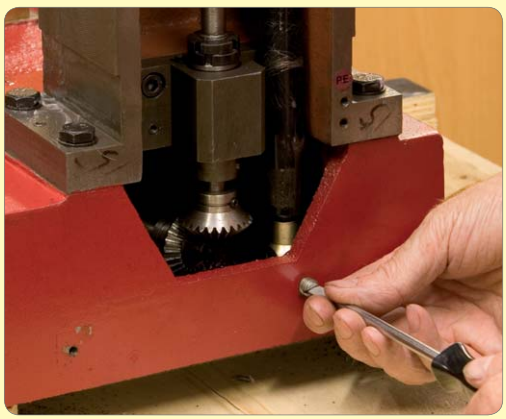
41: Remove locking handle assembly and gib screws



42: Table and cross slide assembly removed



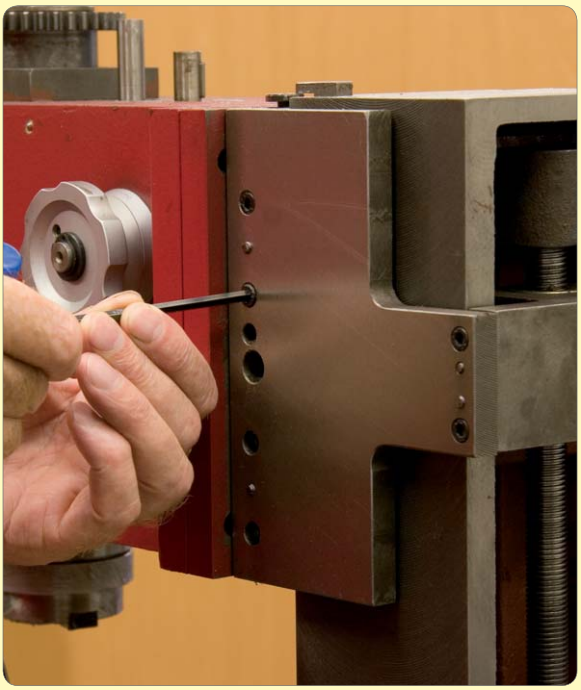
43: Wind head up to end of travel to remove gas strut screws - upper screw...



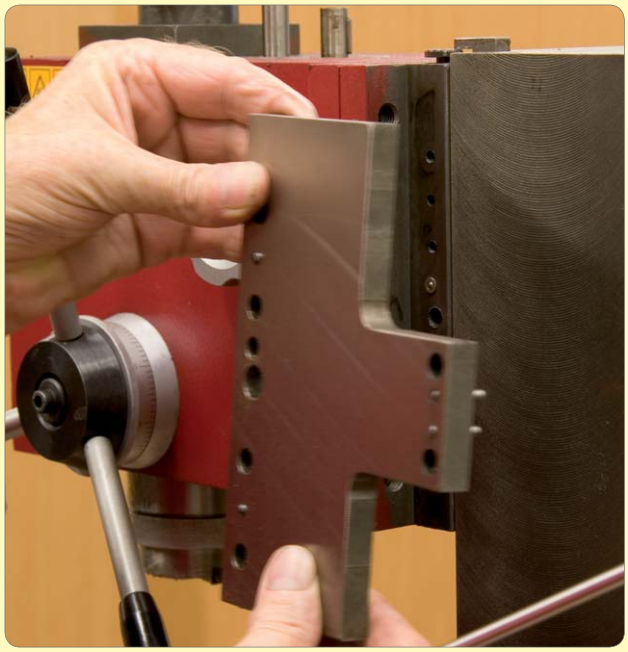
44: ...and lower screw

45: Remove gas strut

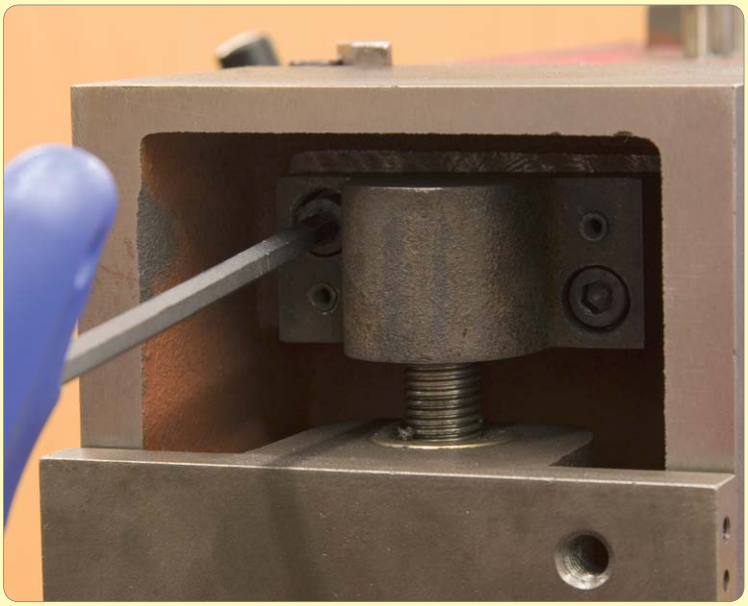
46: Place prop under head and wind down until the head just touches



47: Remove locking lever and cap heads from both side plates



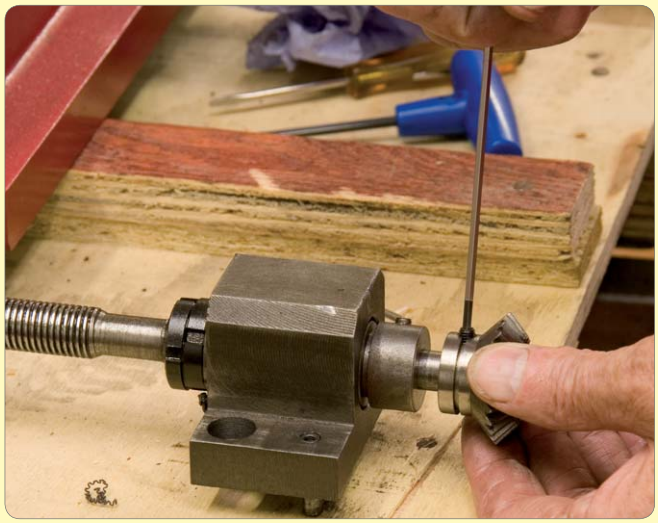
48: Remove side plates



49: Remove screws from Z-Axis leadscrew brackets - upper...

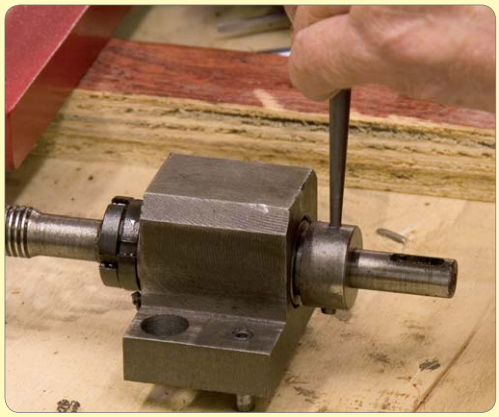
50: ...and lower

51: Remove leadscrew assembly



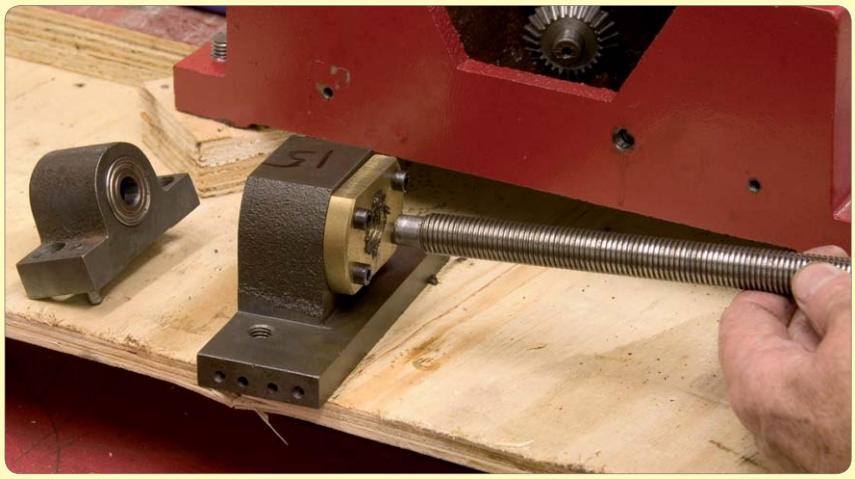
52: Undo bevel gear screw and remove gear

53: Remove key

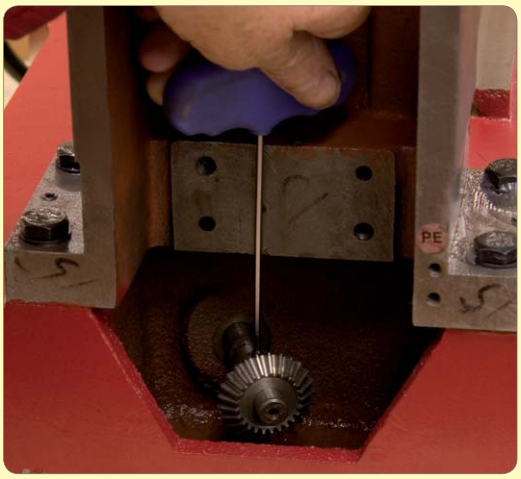


54: Remove taper pin

55: Remove lower thrust bearing block assembly noting orientation



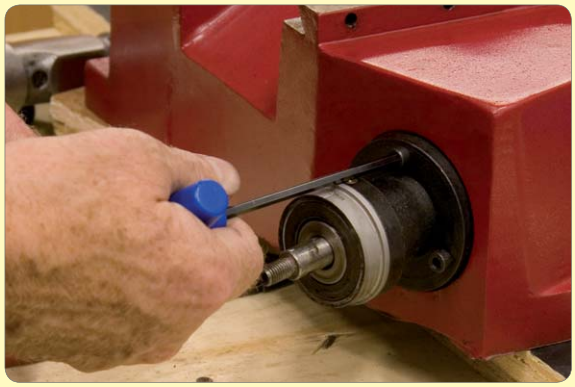
56: Remove leadscrew from nut, pulling off top bearing bracket at the same time



57: Losen grub screw in bevel gear

58: Undo adjusting nuts and remove handwheel assembly

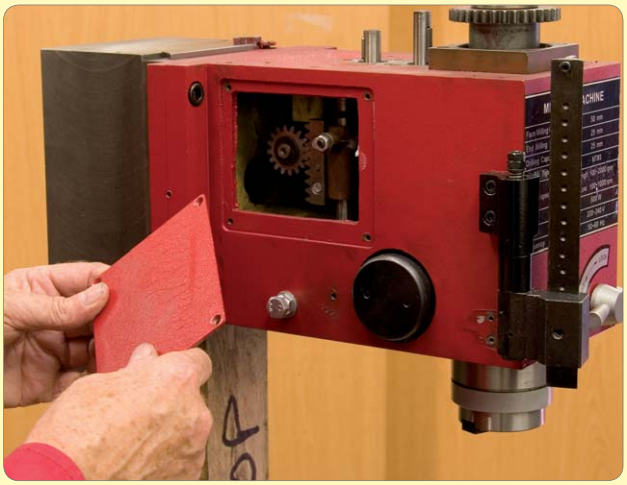
59: Remove key



60: Remove screws from bracket

61: Remove carrier bracket and thrust bearings

62: Remove shaft and gear at other end



63: Remove gearbox cover

64: Lock spindle in UP position

65: Remove return spring assembly carefully (see fig. 108 page 16)

66: Remove circlip and spacer

67: Remove first the locking screw...

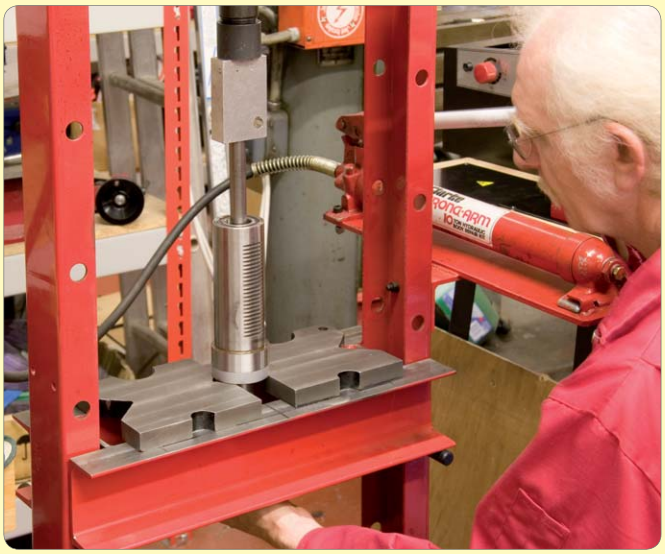
68: ...and second the spindle anti rotation guide pin beneath

69: Holding spindle firmly, remove handle and slide spindle from bottom of housing

70: Remove spindle lock assembly

71: Drift out spindle drive gear assembly marking position for later re-assembly

72: Hold spindle assembly in vice and remove C-Nuts and spacer

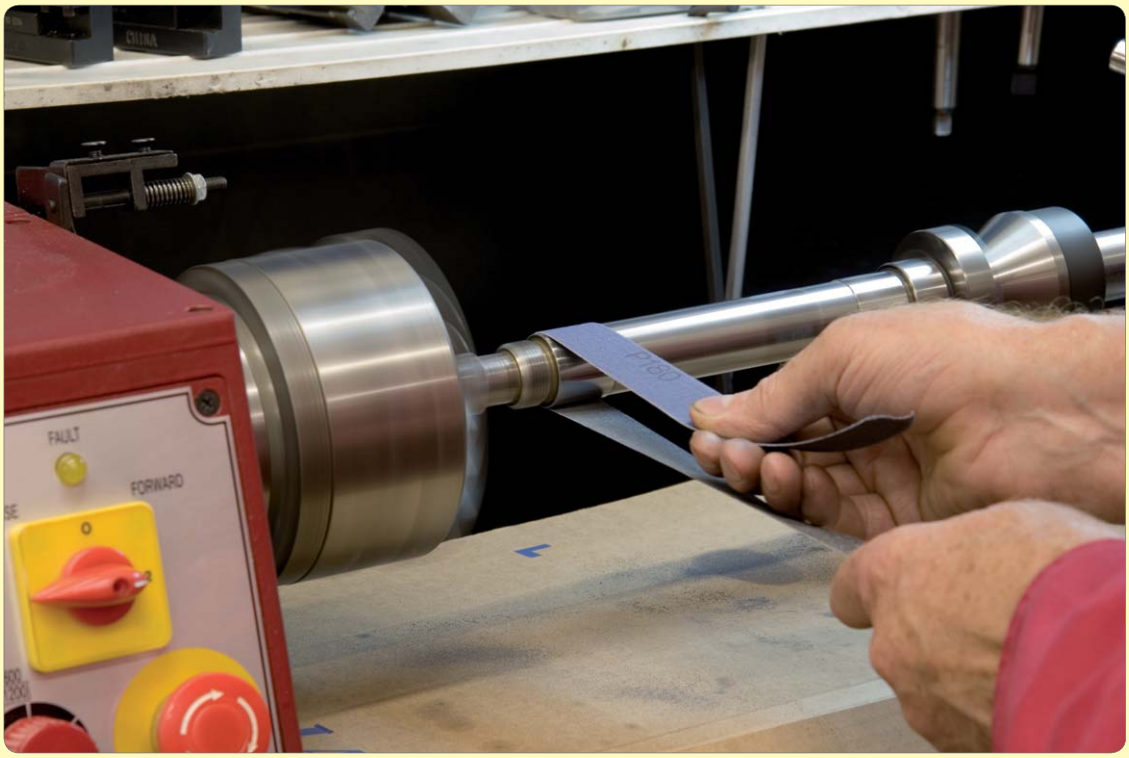


73: Press out inner spindle noting bearing fit as some bearings may be too tight on spindle - this can be adjusted later

74: Using blind bearing puller, remove taper roller bearing and bearing cover

75: Using blind bearing puller, remove top ball race remove ball thrust bearing and spacer

76: Wash all parts thoroughly in parafin to remove any trace of contamination



77: If spindle bearing fit feels overly tight, polish journals to suit.
Reason:
If the top ball race is too tight on the spindle, it will be difficult to obtain the correct bearing preload.

78: Spindle assembly parts

79: Press flange onto spindle

80: Grease taper roller and fit to spindle sleeve

81: Fit Under oil seal

82: Coat bearing journals before assembly with Copperslip grease etc

83: Press spindle into spindle sleeve

84: Grease and assemble thrust bearing

85: Fit Spacer

86: Fit top ball race and press in

88: Fit top spacer

89: Grease threads with Copperslip

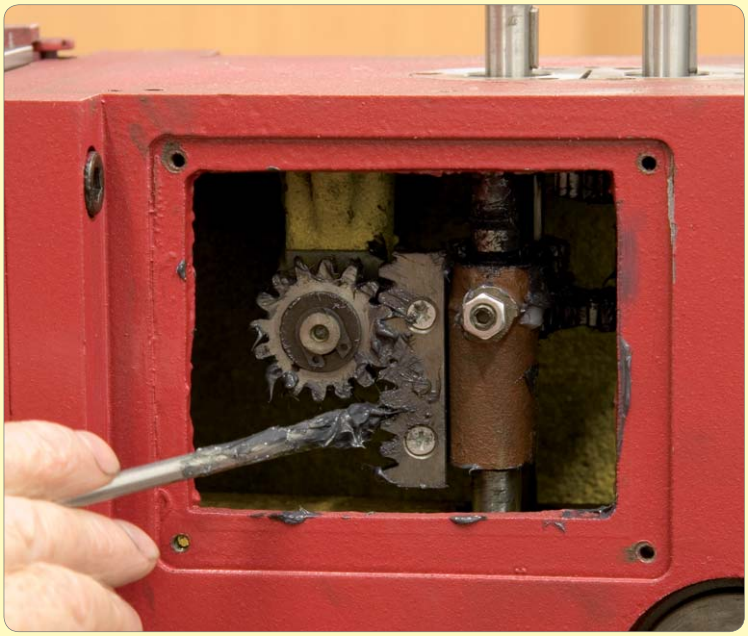
90: Fit C-Nuts

91: Tighten C-Nut to adjust preload - over tighten than back off

92: Tighten locking C-Nut and check preload - re-adjust as necessary

93: The spindle fully assembled

94: X3 Mill stripped, cleaned and ready to assemble



95: Grease all gears and shafts in range change box and refit cover

96: Grease and fit micrometer dial and friction spring to handwheel assembly

97: Grease splines and shaft on handwheel assembly

98: Assemble and grease spindle lock assembly

99: Grease bores for handwheel and spindle lock

100: Lightly oil bottom of spindle bore

101: Fit spindle lock assembly noting cut-outs for spindle sleeve

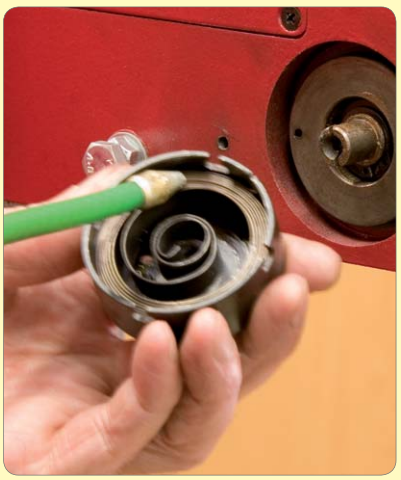
102: Fit spindle aligning guide slot

103: ...Temporarily lock in position

104: Fit handwheel assembly and rotate to desired position

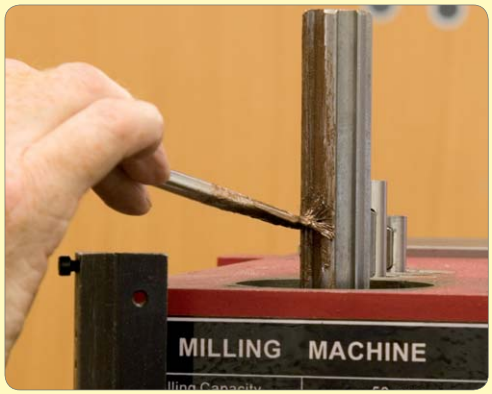

105: Fit anti-rotation grub screw and locking screw


106: Fit spacer and circlip

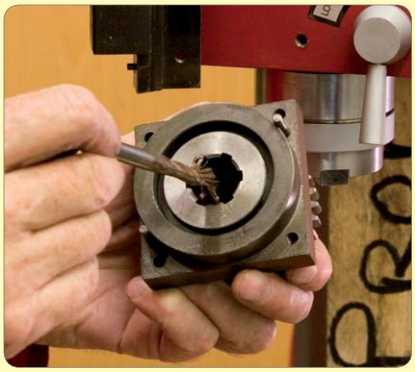

107: Oil return spring


108: Note how end of spring locates in slot and T-slot locates on pin


109: Fit return spring housing and turn anticlockwise to adjust tension to preference.



110: Grease spindle splines



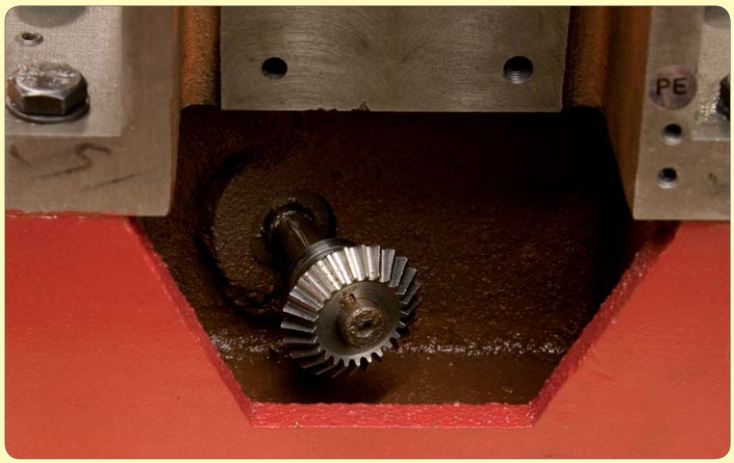
111: Grease drive bearings and gear carrier splines

112: Assemble unit noting position previously marked

113: Grease handle shaft bore in rear of column

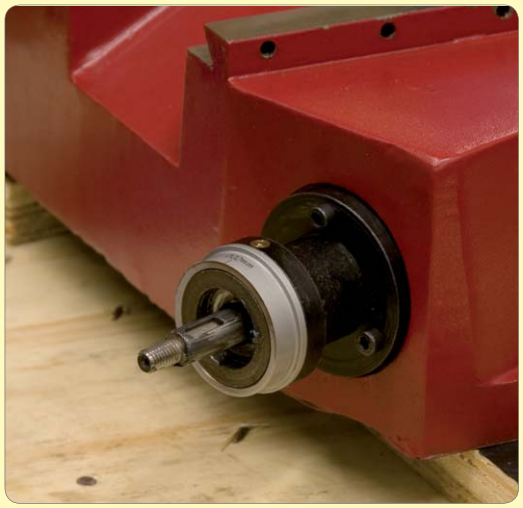
114: Grease Z-axis handle shaft

115: Assemble shaft



116: Fit bevel gear leaving free to move

117: Grease and fit thrust race and bearing and grease inner bearing races



118: Fit housing

119: Grease and assemble outer thrust bearing and race

120: Grease and assemble handwheel and micrometer dial with friction spring

121: Fit handwheel assembly and adjust out backlash

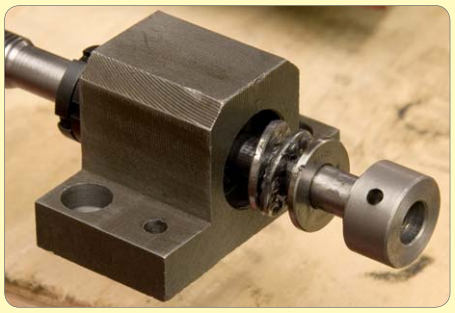
122: Grease Z-Axis nut

123: Grease Z-Axis leadscrew

124: Assemble nut noting orientation

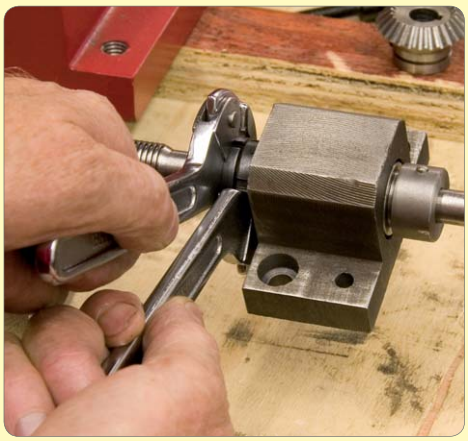
125: Press on Z-Axis top bearing assembly

126: Grease and assemble lower block thrust bearing

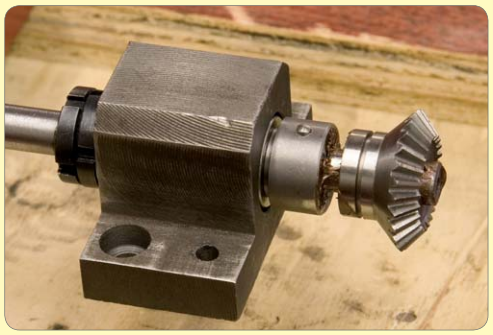


127: Assemble bearing block, thrust bearings and spacer onto leadscrew noting orientation

128: Tap in taper pin



129: Adjust out backlash



130: Slide on bevel gear leaving free to move

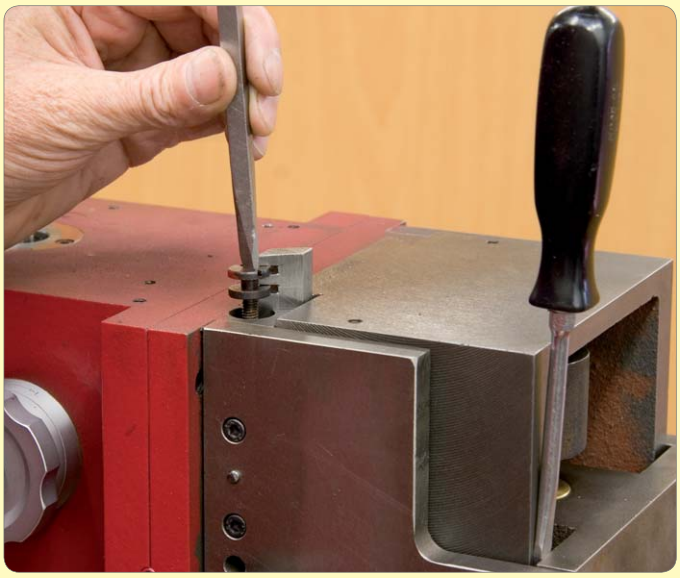
131: Finished Z-Axis leadscrew assembly

132: Fit Z-Axis assembly to rear of column

133: Adjust bevel gear mesh and backlash, lock and grease

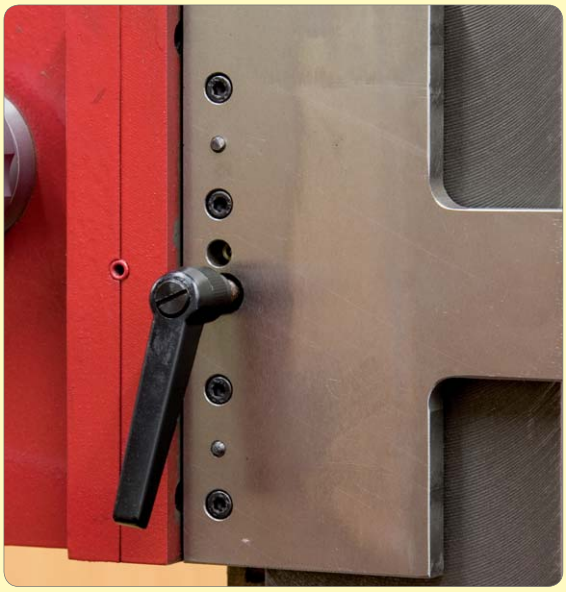
134: Check oilers work

135: Align Z-axis nut with head and temporarily fit sideplates and cap head screws - do not tighten yet. Remove head prop.
Tighten head gib strip to lock head position and finally tighten side plate cap screws



136: Wedge Z-axis nut to hold head in position and remove head gib strip

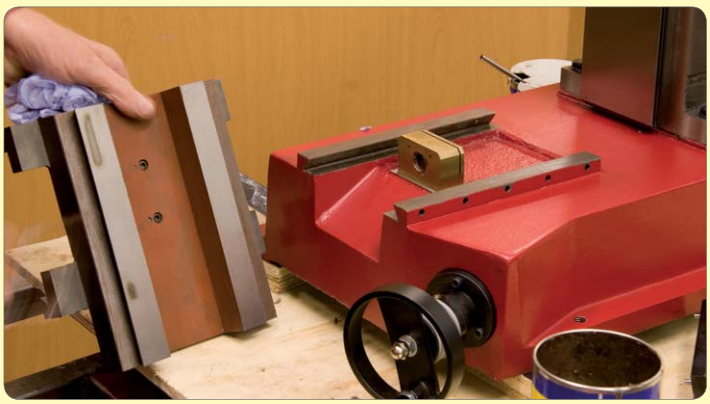
137: Check gib strip is straight and flat, lubricate and re-fit



138: Fit Head locking lever

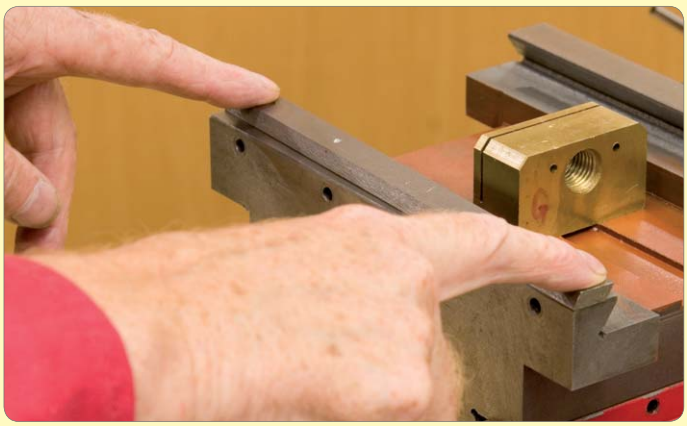
139: Fit gas strut and final adjust head gib strip

140: Finished assembly

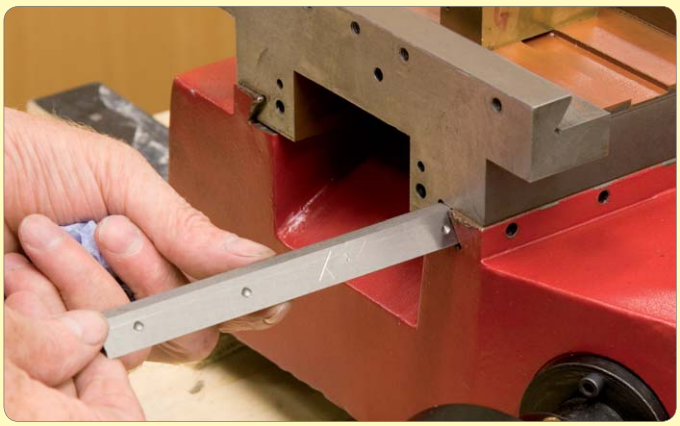


141: Grease saddle and base dovetails and leadscrew nut

142: Fit saddle



143: Check gib strip is straight and flat



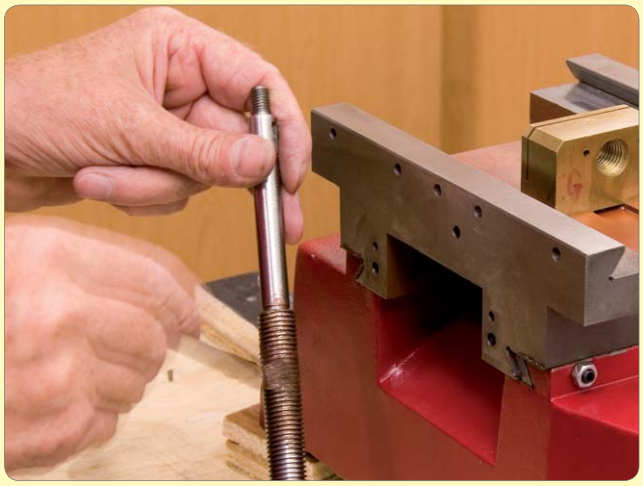
144: Fit Y-Axis gib strip

145: Check tips of gib adjusting screws for concentricity

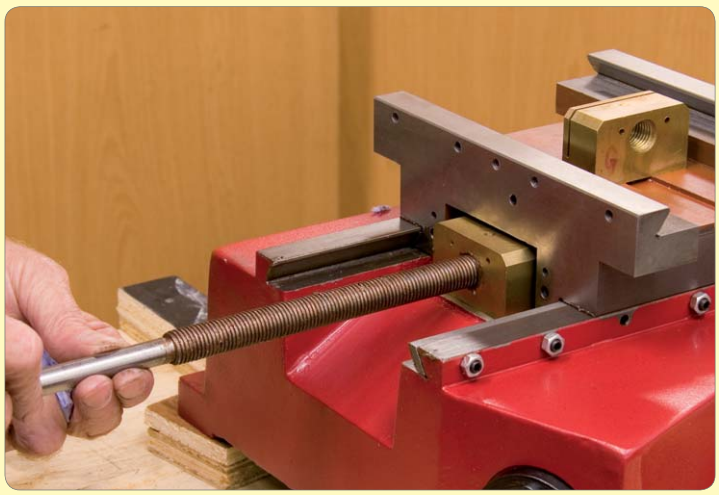
146: Grease and fit adjusting screws

147: Adjust gib strip

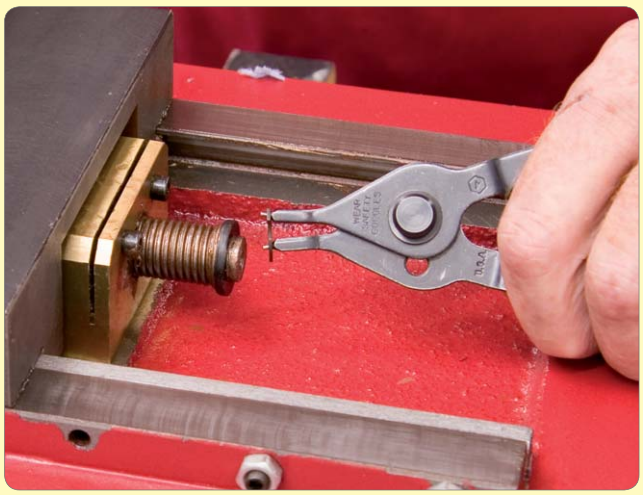
148: Check for free movement



149: Grease Y-Axis leadscrew



150: Fit leadscrew



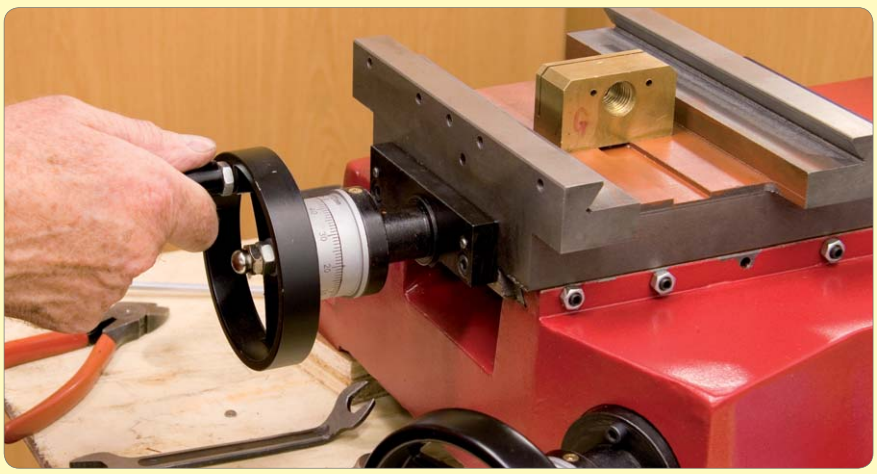
151: Fit washer and circlip at rear of leadscrew

152: Grease and fit thrust bearings and bearing housing

153: Fit outer thrust bearing

154: Grease and fit micrometer dial to handwheel with friction spring

155: Fit handwheel assembly and adjust backlash



156: Wind saddle in and out to check for smooth and consistent travel making final adjustment to gib strip as required

157: Grease table leadscrew nut and dovetails

158: Grease table dovetails and leadscrew bush

159: Slide table onto saddle

160: Check X-Axis gib strip is straight and flat

161: Fit gib strip

162: Check tips of gib adjusting screws for concentricity

163: Grease and fit adjusting screws

164: Working from the middle outwards, adjust and lock each in turn

165: Check table movement after each adjustment

166: Grease table leadscrew

167: Fit X-Axis leadscrew

168: Grease and fit inner thrust bearing and bearing housing

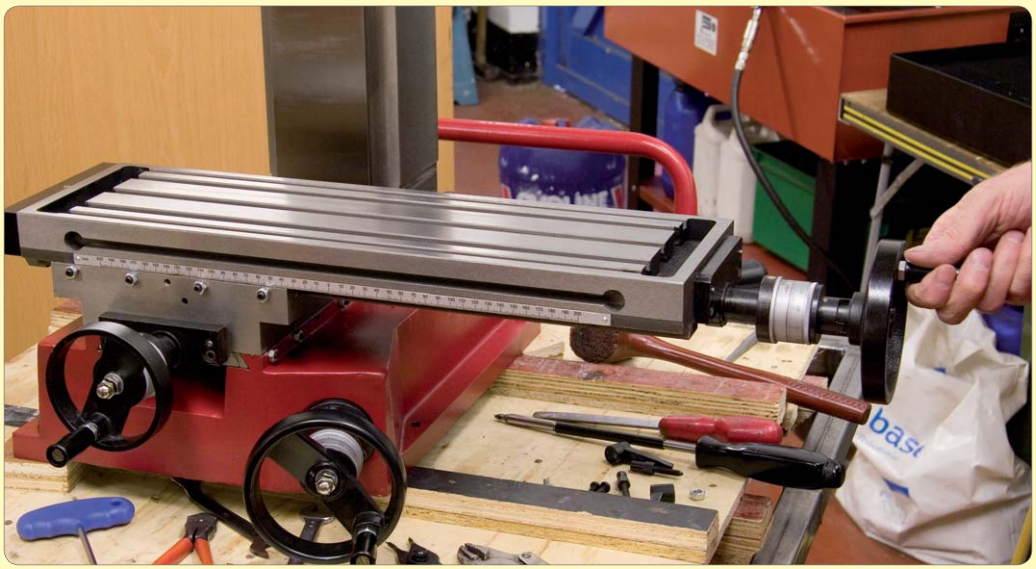
169: Fit outer thrust bearing

170: Grease and assemble micrometer dial with friction spring and sleeve

171: Fit sleeve and locate holes for taper pin

172: Tap pin home

173: Fit handwheel assembly

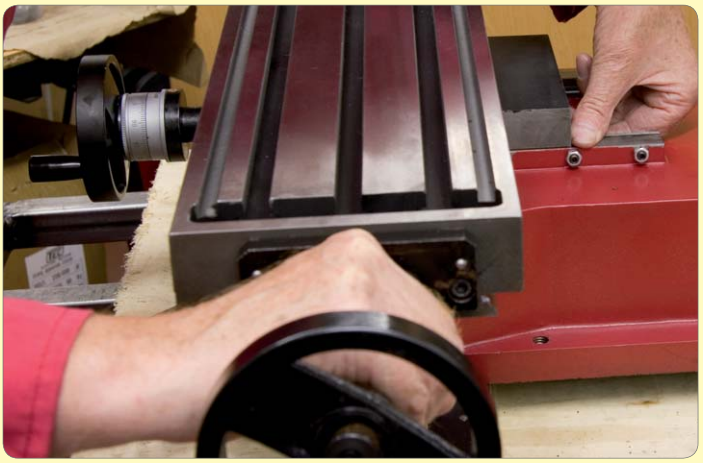


174: Wind table back and forth to check for free movement and minimum drag

175: Wind table to far right. With thumb on joint between table and saddle, use right hand to move table backwards and forwards to check for slack in dovetails

176: The same procedure as above but put thumb over joint between saddle and base - rock to and fro

177: Wind saddle fully in and do check again

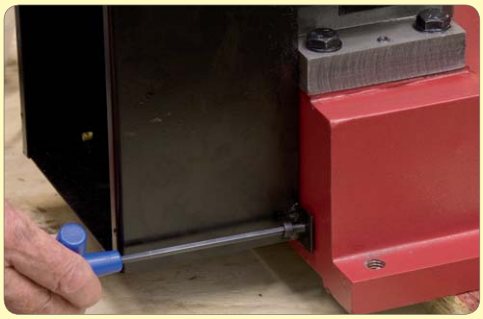


178: Wind saddle fully out and do check again

179: Fit locking levers and scale pointer

190: Finished assembly

191: Fit rear electronics casing



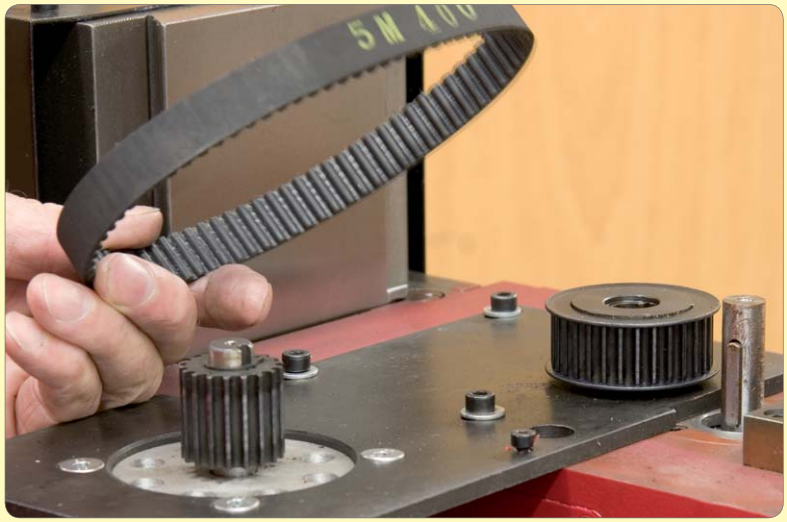
192: Fit 2 lower screws and 2 top casing screws

193: Fit guard micro switch and Secure trunking with P-clip

194: Fit motor and plate making sure trunking is behind motor and above bolt with locknut

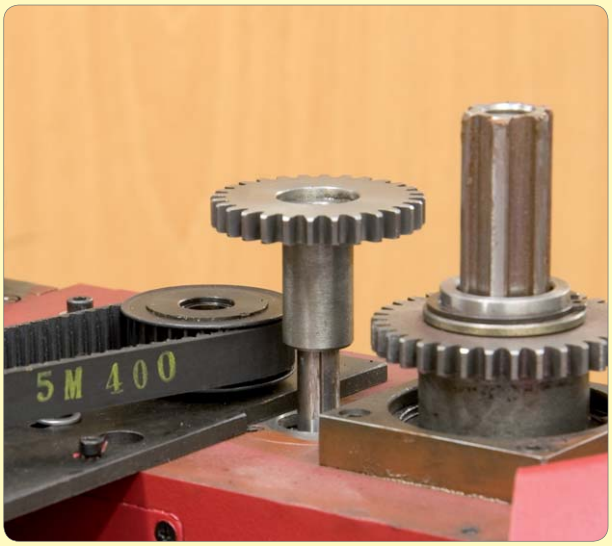
195: Loosly fit motor plate screws

196: Grease reduction box shafts

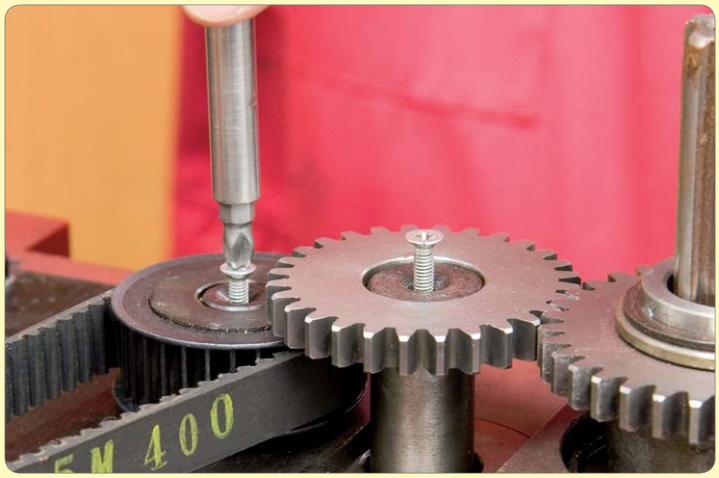


197: Fit driven pulley and belt

198: Pull motor towards you to tension the belt and lock motor plate screws



199: Fit reduction box output gear

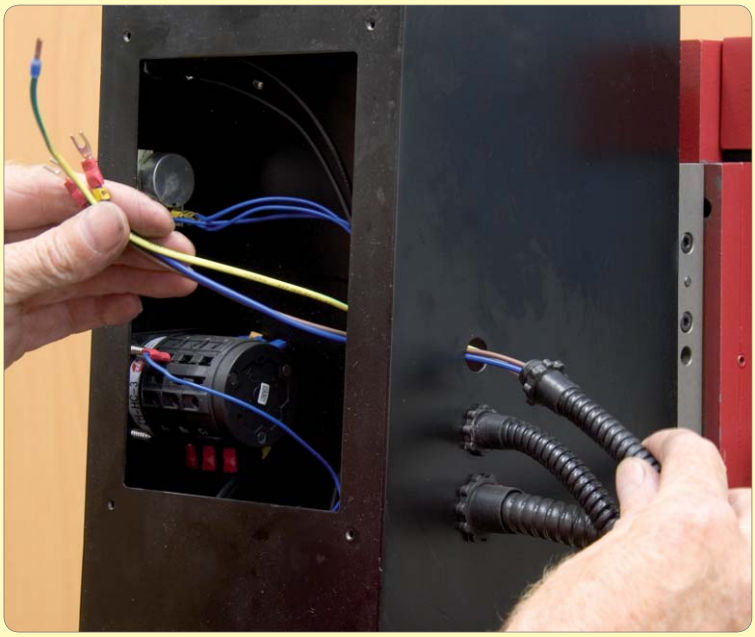


200: Secure pulley and gear with washers and screws

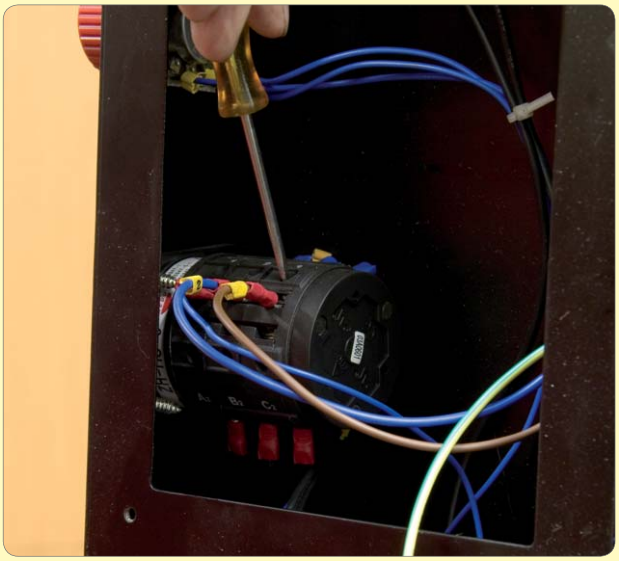
201: Grease gears

202: Fit top cover and lock down

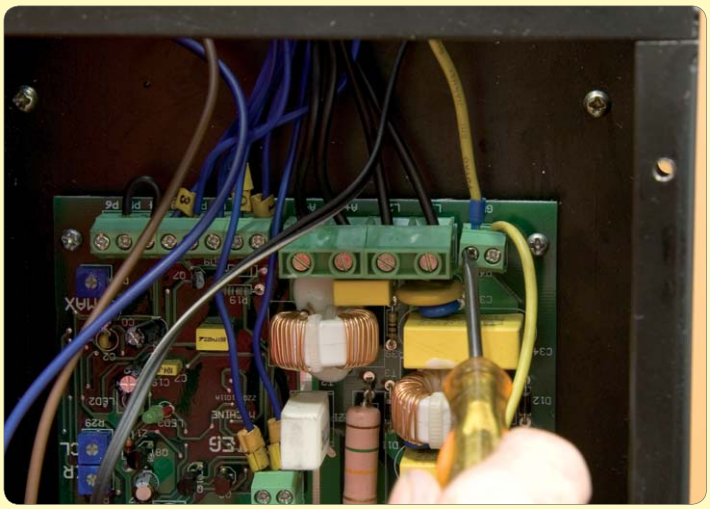
203: Fit stop switch housing - just slide on and pinch screws down



204: Thread motor wires through casing



205: Attach Brown and Blue wires to the forward/reverse switch as previously noted



206: Attach motor earth wire to the board

207: Fit earth wires to base of column. Cable tie any loose wires and replace covers

Always follow the correct Start-Up Procedure:

1. Turn the Power Switch to 0 (off)
2. Turn the Forward/Reverse Switch to 0 (off)
3. Connect the 13amp plug to a suitable socket outlet and switch on the power
4. Select the High or Low range gear as required
5. Rotate the Emergency Stop Switch to re-set
6. Close the Guard
7. Set the Speed Control Knob to a low speed position
8. Check there are no obstructions around the spindle or cutter
9. Turn the Power Switch to 1 (on)
10. Set the Forward/Reverse Switch to the direction you require
11. Slowly turn the Speed Control Knob to the desired speed

Running the spindle for the first time:

1. Follow the Start-Up procedure with Low gear selected and the motor running forwards
2. Run for 10 minutes at a low RPM. (The machine should run smoothly with minimal noise and vibration. If not turn off the machine and investigate the cause of the problem)
3. Slowly increase the speed and run for 10 minutes at a medium RPM
4. Slowly increase the speed and run for 10 minutes at a high RPM
5. Stop the machine and repeat steps 1-4 above in High gear
6. Stop the machine and repeat steps 1-5 above with the motor in Reverse

Note: Failure to follow this procedure may cause rapid deterioration of the spindle and related parts.

WHEN CHANGING THE CUTTER OR SETTING UP, ALWAYS TURN THE POWER SWITCH TO 0 (OFF)

The Completed Machine