

POWERMATIC®

Operating Instructions and Parts Manual Tilting/Sliding Spindle Shaper Model TS29



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Warranty and Service

Powermatic warrants every product it sells against manufacturers' defects. If one of our tools needs service or repair, please contact Technical Service by calling 1-800-274-6846, 8AM to 5PM CST, Monday through Friday.

Warranty Period

The general warranty lasts for the time period specified in the literature included with your product or on the official Powermatic branded website.

- Powermatic products carry a limited warranty which varies in duration based upon the product. (See chart below)
- Accessories carry a limited warranty of one year from the date of receipt.
- Consumable items are defined as expendable parts or accessories expected to become inoperable within a reasonable amount of use and are covered by a 90 day limited warranty against manufacturer's defects.

Who is Covered

This warranty covers only the initial purchaser of the product from the date of delivery.

What is Covered

This warranty covers any defects in workmanship or materials subject to the limitations stated below. This warranty does not cover failures due directly or indirectly to misuse, abuse, negligence or accidents, normal wear-and-tear, improper repair, alterations or lack of maintenance.

Warranty Limitations

Woodworking products with a Five Year Warranty that are used for commercial or industrial purposes default to a Two Year Warranty. Please contact Technical Service at 1-800-274-6846 for further clarification.

How to Get Technical Support

Please contact Technical Service by calling 1-800-274-6846. **Please note that you will be asked to provide proof of initial purchase when calling.** If a product requires further inspection, the Technical Service representative will explain and assist with any additional action needed. Powermatic has Authorized Service Centers located throughout the United States. For the name of an Authorized Service Center in your area call 1-800-274-6846 or use the Service Center Locator on the Powermatic website.

More Information

Powermatic is constantly adding new products. For complete, up-to-date product information, check with your local distributor or visit the Powermatic website.

How State Law Applies

This warranty gives you specific legal rights, subject to applicable state law.

Limitations on This Warranty

POWERMATIC LIMITS ALL IMPLIED WARRANTIES TO THE PERIOD OF THE LIMITED WARRANTY FOR EACH PRODUCT. EXCEPT AS STATED HEREIN, ANY IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE EXCLUDED. SOME STATES DO NOT ALLOW LIMITATIONS ON HOW LONG AN IMPLIED WARRANTY LASTS, SO THE ABOVE LIMITATION MAY NOT APPLY TO YOU.

POWERMATIC SHALL IN NO EVENT BE LIABLE FOR DEATH, INJURIES TO PERSONS OR PROPERTY, OR FOR INCIDENTAL, CONTINGENT, SPECIAL, OR CONSEQUENTIAL DAMAGES ARISING FROM THE USE OF OUR PRODUCTS. SOME STATES DO NOT ALLOW THE EXCLUSION OR LIMITATION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE ABOVE LIMITATION OR EXCLUSION MAY NOT APPLY TO YOU.

Powermatic sells through distributors only. The specifications listed in Powermatic printed materials and on the official Powermatic website are given as general information and are not binding. Powermatic reserves the right to effect at any time, without prior notice, those alterations to parts, fittings, and accessory equipment which they may deem necessary for any reason whatsoever.

Product Listing with Warranty Period

90 Days – Parts; Consumable items
1 Year – Motors, Machine Accessories
2 Year – Woodworking Machinery used for industrial or commercial purposes
5 Year – Woodworking Machinery

NOTE: Powermatic is a division of JPW Industries, Inc. References in this document to Powermatic also apply to JPW Industries, Inc., or any of its successors in interest to the Powermatic brand.

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Warnings

1. Read and understand the entire owner's manual before attempting assembly or operation.
2. Read and understand the warnings posted on the machine and in this manual. Failure to comply with all of these warnings may cause serious injury.
3. Replace the warning labels if they become obscured or removed.
4. This shaper is designed and intended for use by properly trained and experienced personnel only. If you are not familiar with the proper and safe operation of a shaper, do not use until proper training and knowledge have been obtained.
5. Do not use this shaper for other than its intended use. If used for other purposes, Powermatic disclaims any real or implied warranty and holds itself harmless from any injury that may result from that use.
6. Always wear approved safety glasses/face shields while using this shaper. Everyday eyeglasses only have impact resistant lenses; they are not safety glasses.
7. Before operating this shaper, remove tie, rings, watches and other jewelry, and roll sleeves up past the elbows. Remove all loose clothing and confine long hair. Non-slip footwear or anti-skid floor strips are recommended. Do **not** wear gloves.
8. Wear ear protectors (plugs or muffs) during extended periods of operation.
9. Some dust created by power sanding, sawing, grinding, drilling and other construction activities contain chemicals known to cause cancer, birth defects or other reproductive harm. Some examples of these chemicals are:
 - Lead from lead based paint.
 - Crystalline silica from bricks, cement and other masonry products.
 - Arsenic and chromium from chemically treated lumber.Your risk of exposure varies, depending on how often you do this type of work. To reduce your exposure to these chemicals, work in a well-ventilated area and work with approved safety equipment, such as face or dust masks that are specifically designed to filter out microscopic particles.
10. Do not operate this machine while tired or under the influence of drugs, alcohol or any medication.
11. Make certain the switch is in the **OFF** position before connecting the machine to the power supply.
12. Make certain the machine is properly grounded.
13. Make all machine adjustments or maintenance with the machine unplugged from the power source.
14. Remove adjusting keys and wrenches. Form a habit of checking to see that keys and adjusting wrenches are removed from the machine before turning it on.
15. Keep safety guards in place at all times when the machine is in use. If removed for maintenance purposes, use extreme caution and replace the guards immediately.
16. Check damaged parts. Before further use of the machine, a guard or other part that is damaged should be carefully checked to determine that it will operate properly and perform its intended function. Check for alignment of moving parts, binding of moving parts, breakage of parts, mounting and any other conditions that may affect its operation. A guard or other part that is damaged should be properly repaired or replaced.
17. Provide for adequate space surrounding work area and non-glare, overhead lighting.
18. Keep the floor around the machine clean and free of scrap material, oil and grease.
19. Keep visitors a safe distance from the work area. **Keep children away.**

Warnings

20. Make your workshop child proof with padlocks, master switches or by removing starter keys.
21. Give your work undivided attention. Looking around, carrying on a conversation and “horse-play” are careless acts that can result in serious injury.

22. Never pass the hands directly over or in front of the cutters. As one hand approaches the 12-inch radius point, remove it (or the push stick) in an arc motion and reposition hand 12 inches beyond the cutters. See Figure A.

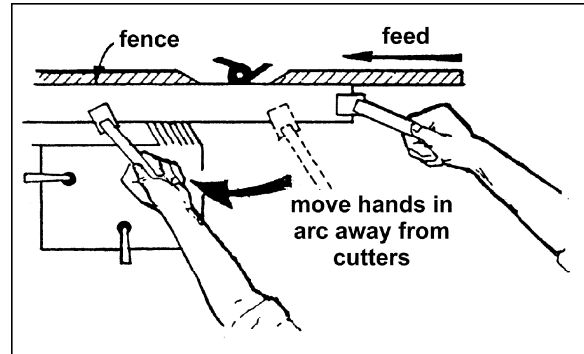


Figure A

23. Maintain a balanced stance at all times so that you do not fall or lean against the cutter or other moving parts. Do not overreach or use excessive force to perform any machine operation.

24. Use the right tool at the correct speed and feed rate. Do not force a tool or attachment to do a job for which it was not designed. The right tool will do the job better and safer.

25. Use recommended accessories; improper accessories may be hazardous.

26. Maintain tools with care. Keep cutters sharp and clean for the best and safest performance. Follow instructions for lubricating and changing accessories.

27. Feed stock opposite to the direction of the cutterhead rotation. Never back stock out of the cutter once the cut has been started. Instead, pull the stock straight out away from the cutter and begin the cut again. See Figure B.

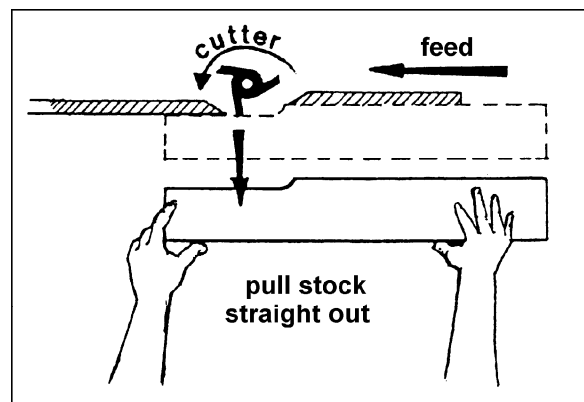


Figure B

28. When shaping, follow the 12-inch rule: Never allow your hands to come closer than 12 inches to the cutter.

29. Never shape stock less than 12 inches in length without special fixtures. Where practical, shape longer stock and cut to size.

30. When shaping with collars, the collar must have sufficient bearing surface (see page 18). The work must also be fairly heavy in proportion to the cut being made. Do not use short, lightweight stock when shaping against collars.

31. The opening between the fence plates should be only just enough to clear the cutter.

32. Never operate the shaper without the keyed lock washer located immediately under the spindle nut. See Figure C. This prevents the nut from coming loose when the spindle is run in a counterclockwise direction. Do not substitute any other type washer in place of the keyed lock washer.

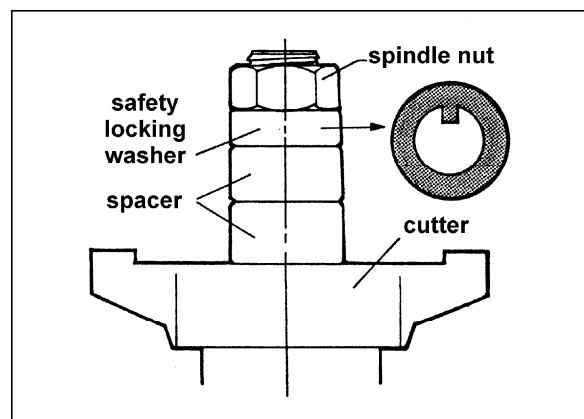


Figure C

33. Always use the miter gauge and clamp attachment when edge shaping stock less than 6” wide. The fence should be removed during this operation.

34. Make sure the spindle and the draw bar are tightened on the arbor.



Warnings

35. Turn off the machine before cleaning. Use a brush or compressed air to remove chips or debris — do not use your hands.
36. Do not stand on the machine. Serious injury could occur if the machine tips over.
37. Never leave the machine running unattended. Turn the power off and do not leave the machine until the cutter comes to a complete stop.
38. Remove loose items and unnecessary work pieces from the area before starting the machine.

Familiarize yourself with the following safety notices used in this manual:



This means that if precautions are not heeded, it may result in minor injury and/or possible machine damage.



This means that if precautions are not heeded, it may result in serious injury or possibly even death.

- - SAVE THESE INSTRUCTIONS - -

Introduction

This manual is provided by Powermatic covering the safe operation and maintenance procedures for a Model TS29 Tilting Spindle Shaper. This manual contains instructions on installation, safety precautions, general operating procedures, maintenance instructions and parts breakdown. This machine has been designed and constructed to provide years of trouble free operation if used in accordance with instructions set forth in this manual. If there are any questions or comments, please contact either your local supplier or Powermatic. Powermatic can also be reached at our web site: www.powermatic.com.

Specifications

Model Number.....	TS29
Stock Number.....	1791284
Motor.....	7.5HP, 3Ph, 230/460V (Prewired 230V)
Electric controls.....	24 volt magnetic
Interchangeable Spindle Sizes (with Capacity Under Nut) (in.).....	1-1/4 (6-1/2); 1 (6); 3/4 (3-1/2); and 1/2 collet chuck with 1/4 bushing
Spindle Vertical Travel (in.).....	7
Spindle Speeds (RPM)	3000, 4000, 6000, 8000 and 10,000
Spindle Tilt (degrees).....	5 back, 45 forward
Overall Table Size (L x W) (in.)	51-1/2 x 33-1/2
Sliding Table Size (L x W) (in.).....	51-1/4 x 11-1/4
Sliding Table Travel (in.).....	49-1/4
Maximum Diameter Cutter Below Table (in.).....	9
Maximum Diameter Cutter Above Table (in.).....	12
Table Inserts (in.).....	three: 2-1/2 I.D.; 5-1/2 I.D.; and oval slotted
Fence Size (with Mechanical Digital Readouts) (in.).....	46 x 5
Fence Travel (Major and Minor) (in.).....	5-3/8 and 3-5/8
Dust Port Diameter (two) (in.)	5
Dust Collection Minimum CFM Required.....	800
Shipping Weight (lbs.).....	1280
Net Weight (lbs.).....	1100
Overall Dimensions (L x W x H) (in.)	51 x 44 x 53

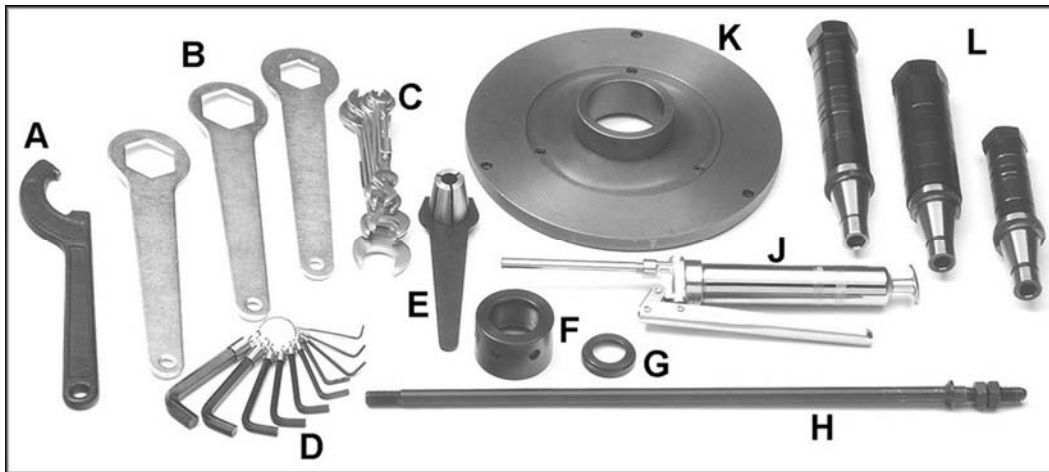
The above specifications were current at the time this manual was published, but because of our policy of continuous improvement, Powermatic reserves the right to change specifications at any time and without prior notice, without incurring obligations.

Unpacking

Open shipping container and all separate cartons containing accessories, and check for shipping damage. Report any damage immediately to your distributor and shipping agent. Compare the contents of your container with the following parts list to make sure all parts are intact. Read the instruction manual thoroughly for assembly, maintenance and safety instructions.

Contents of the Shipping Container

- 1 Shaper
- 1 Fence Assembly
- 1 Dust Chute
- 1 Miter Gauge and Clamp Assembly
- 2 Aluminum Fence Plates
- 1 Box of Standard Accessories (shown below)
- 1 Owner's Manual
- 1 Warranty Card



Standard Accessories:

- A. Spindle Nut Wrench
- B. Spindle Wrenches (3)
- C. Open-End Wrench Set
- D. Hex Wrench Set
- E. Spindle Collet
- F. Spindle Nut
- G. Lock Nut
- H. Draw Bar
- J. Grease Gun
- K. Table Inserts (2)
- L. Interchangeable Spindles (3)

Note: Items A through L comprise Tool Package, p/n TS29-TP.

WARNING

Read and understand the entire contents of this manual before attempting set-up or operation! Failure to comply may cause serious injury.

Assembly

Tools required for assembly:

crane with hoist; or forklift

9/16", 7/16" and 1/2" wrenches

level

1. Remove all wood crating from around the shaper.
2. Remove the bolts securing the machine to the skid.
3. The shaper can be lifted by a crane with hoist (Figure 1), or by a forklift (Figure 2), either of which should be capable of lifting one ton. Remove the skid from under the shaper.
4. The shaper should be placed on a solid, level foundation, preferably a concrete floor. With the machine in position, check table surface left to right and front to back with a machinist's level. If necessary, place metal shims under the corners of the machine to ensure it is level.
5. Secure the machine to the floor with good quality lag screws through the holes in the bottom of the cabinet.
6. Exposed metal parts such as the table top have been given a protective coating at the factory. This should be removed with a soft cloth and solvent (such as mineral spirits). Do not use an abrasive pad.

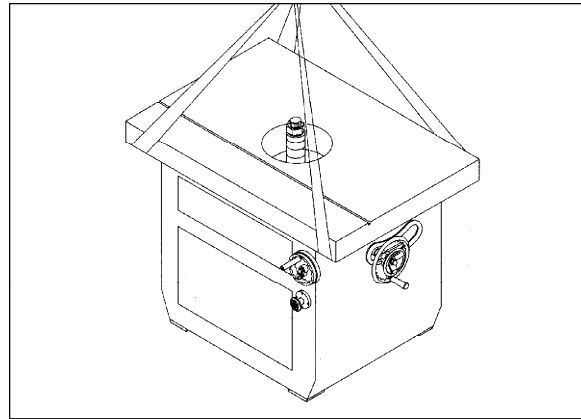


Figure 1

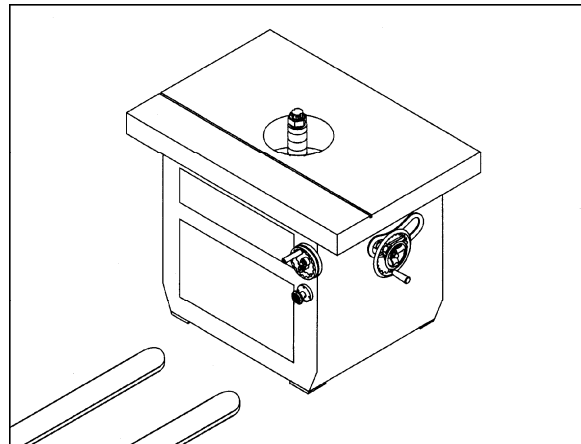


Figure 2

Interchangeable Spindle Installation

One of the features of this machine is that it will accept interchangeable spindles with a drawbar or without a draw bar. Router bits can also be used on this shaper.

Interchangeable Spindle with Drawbar

1. Disconnect the machine from the power source and remove the table inserts (NOTE: Removing the tilting insert is not necessary).
2. Raise the spindle shaft all the way up.
3. Thoroughly clean the taper of the interchangeable spindle and the internal taper of the shaft with a soft cloth moistened with kerosene or mineral spirits (do not use gasoline or lacquer thinner).

4. Thread the short threaded end of the draw bar (B, Figure 3) into the threaded hole in the bottom of the interchangeable spindle (A, Figure 3). Remove the two lock nuts and the bevel washer from the other end of the draw bar (B, Figure 3).
5. Carefully insert the draw bar (B, Figure 3) and spindle (A, Figure 3) down through the shaft as shown. Make sure the tang (C, Figure 3) on the spindle is engaged with the notch (D, Figure 3), and thread the spindle nut (E, Figure 3) onto the threads (F, Figure 3).
6. Engage spindle lock [refer to "Spindle Lock" on page 15].
7. Use the supplied spanner wrench (G, Figure 4), to tighten the spindle nut (E, Figure 4).
8. Open the cabinet door and assemble the bevel washer (H, Figure 5) to the bottom of the draw bar (B, Figure 5).
9. Assemble and securely tighten the two lock nuts (I, Figure 5) with a 19mm wrench.
10. Disengage the spindle lock.

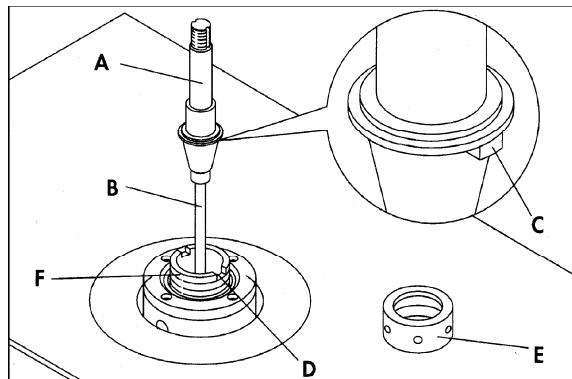


Figure 3

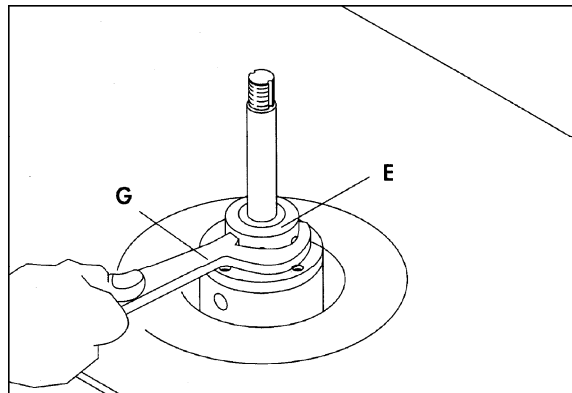


Figure 4

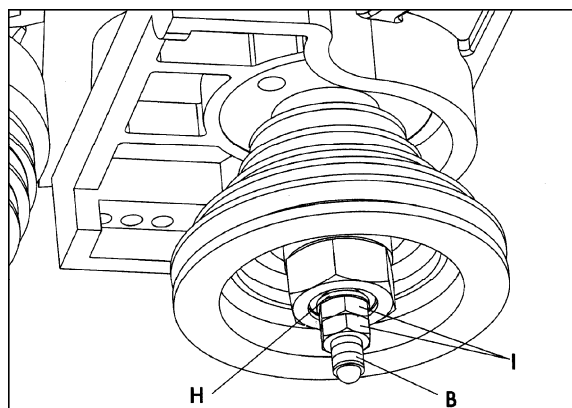


Figure 5

Installing Cutters

1. Disconnect machine from power source and engage spindle lock.
2. Place cutter (A, Figure 6) and desired spindle collars (B, Figure 6) on the spindle as shown.
3. Install keyed washer (C, Figure 6) and tighten nut (D, Figure 6) using the supplied wrench.
4. Disengage spindle lock before operating.

NOTE: Whenever possible, the cutter should be positioned on the spindle in such a way that the cut is being performed under the surface of the workpiece.

⚠ WARNING Always place the keyed washer (C, Figure 6) on the spindle before threading the nut. Failure to comply may cause serious injury.

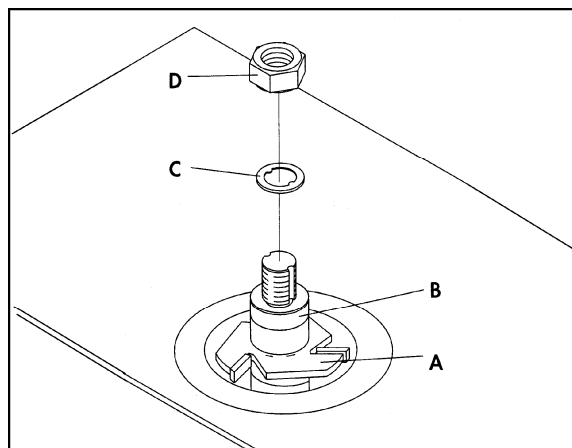


Figure 6

Fence Assembly

1. Place the fence body (A, Figure 7) on the table. Mount the two fence locking handles (E, Figure 7) with washers, and secure fence to table using one of the two sets of holes on the table.
2. Fasten bar (B, Figure 8) to the front of the fence half using the locking lever (C, Figure 8) and washer. Slide an aluminum fence (D, Figure 8) onto the bar. (NOTE: Right hand and left hand fences are slightly different. Only one washer is required under lever (C) shown in Figure 8. Other side requires two washers under the lever.)
3. Repeat for the other side.

NOTE: Locking levers (C, Figure 8) are spring loaded and can be repositioned by pulling out the handle and rotating it on the nut.

4. Mount the cover plate (K, Figure 7) using the two locking knobs and flat washers.

Guard Assembly

The guard assembly can be mounted in various configurations, depending upon the type of work being done. Figure 7 shows one such configuration.

1. Mount the spring guard (F, Figure 7), hold-down (G, Figure 7) and clear plastic guard (H, Figure 7) to mounting rod (J, Figure 7) located on top of fence cover (K, Figure 7) using rod and clamps. The latch on the mounting rod (L, Figure 7) can be pushed down to help secure the guards in place.
2. The spring guard (F, Figure 7), hold-down (G, Figure 7) and clear plastic guard (H, Figure 7) can be flipped up out of the way when not in use or when making adjustments. Simply pull up the latch (L, Figure 7) and flip the entire assembly to the back.

Dust Chute

Mount the dust chute to rear edge of table using two M5 x 10 pan head screws and two M5 flat washers. See Figure 9.

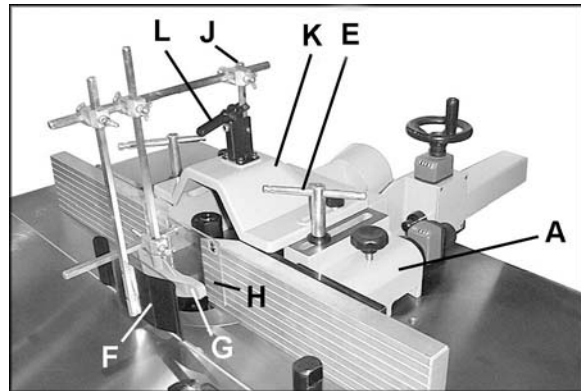


Figure 7

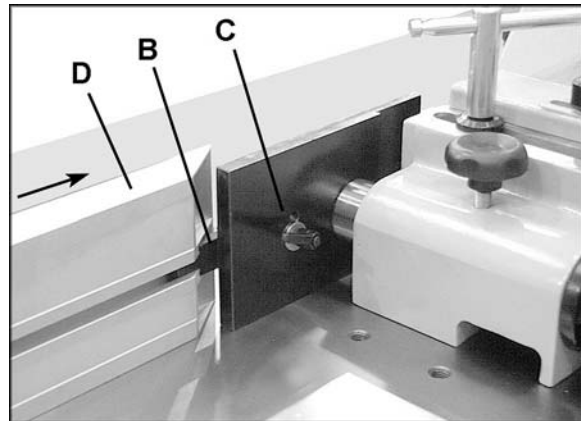


Figure 8

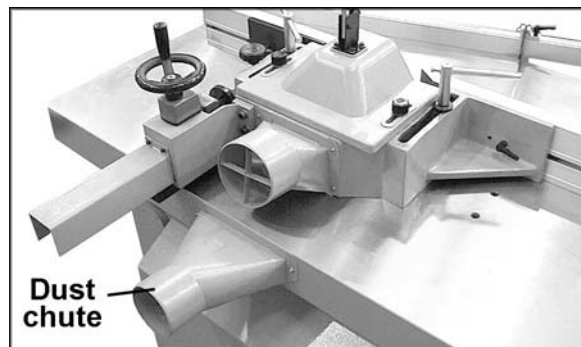


Figure 9

Miter Gauge and Clamp

Mount miter gauge and clamp to the sliding table as follows:

1. Insert post (A, Figure 10) of the clamp assembly down through hole (B, Figure 10) of the miter gauge body (C, Figure 10), and thread post (A, Figure 10) into hole (D, Figure 10) of sliding table.
2. Insert shaft of locking handle (E, Figure 10) down through opening (F, Figure 10) of miter gauge and thread shaft into hole (G, Figure 10) of sliding table.
3. The clamp (H, Figure 11) is supplied with the miter gauge to securely hold the workpiece when shaping small pieces across the grain. The clamp should be mounted as shown, and can be adjusted by loosening the screws (J, Figure 11).

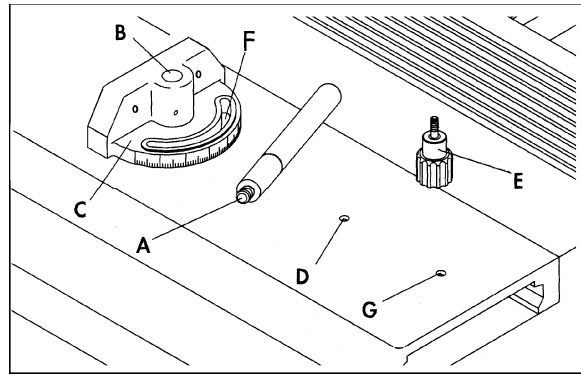


Figure 10

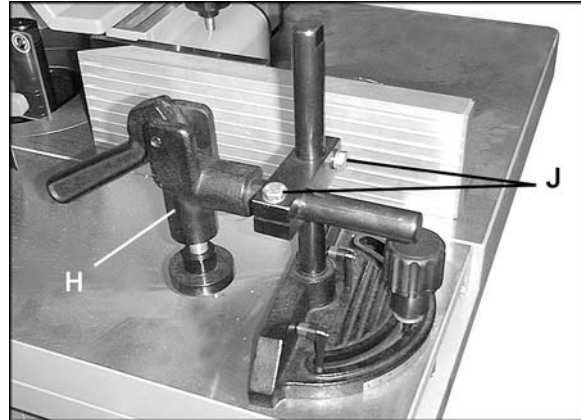


Figure 11

Miter Fence

1. Slide the miter fence (A, Figure 12) onto the two square nuts (B, Figure 12) that are attached to the threaded part of the locking levers (C, Figure 12).
2. To slide miter fence to the left or right, loosen locking levers (C, Figure 12), slide fence (A, Figure 12) to the desired position and tighten locking levers (C, Figure 12). To change the angle of the fence loosen locking handle (D, Figure 12) and rotate the entire assembly. A scale (E, Figure 12) is provided to indicate the miter angle of the fence.
3. Loosen locking screw (I, Figure 13) and insert nut (J, Figure 13) of workstop assembly into the channel on end of fence as shown.
4. Slide workstop to desired position on fence and tighten locking screw (I, Figure 13).

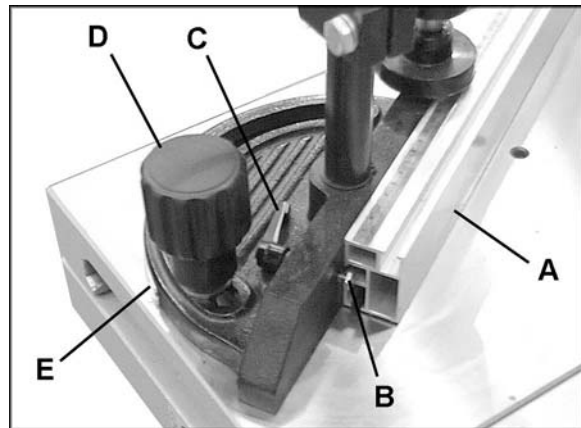


Figure 12

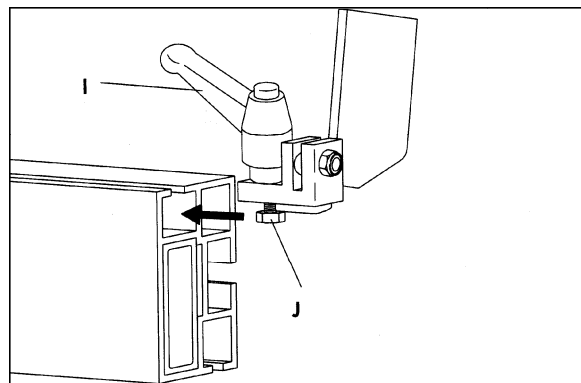


Figure 13

Grounding Instructions

⚠WARNING Electrical connections must be made by a qualified electrician in compliance with all relevant codes. This machine must be properly grounded while in use to protect the operator from electric shock and possible fatal injury.

Before connecting power, make sure the electrical current of your power source matches the electrical system on the shaper.

To connect power, proceed as follows:

1. Remove two screws (A, Figure 14) and remove terminal strip cover (B, Figure 14).
2. Remove clear plastic insulator (C, Figure 15) that covers the terminals.
3. Insert power line through opening (D, Figure 14) of terminal strip box.
4. Connect the three power lines to terminals L1, L2 and L3, as shown (E, Figure 16). Also connect the green ground wire to terminal (F, Figure 16).
5. Reassemble the clear plastic insulator (C, Figure 15) and the terminal strip cover (B, Figure 14).

⚠CAUTION Make sure incoming power matches voltage on motor plate.

6. The shaper is prewired 230V. If you will be connecting to 460V power, you must first:
 - Connect the inbound line on the transformer from the 230V to the 460V post, and wire motor to 460V.
 - Set overload relay to lowest setting.

The same controls will be used as for 230V.

7. Turn the machine on and make sure the direction of the shaft rotation is correct. Looking down on the top of the spindle, the spindle should be turning counterclockwise as shown in Figure 17. If it is not, reverse any two incoming power leads.
8. When wiring is completed, tape all power box joints to keep out dust.

⚠WARNING After connecting this machine to the power source, the terminal box is still electrified even while the power switch is shut off. Open the terminal box only when power has been disconnected

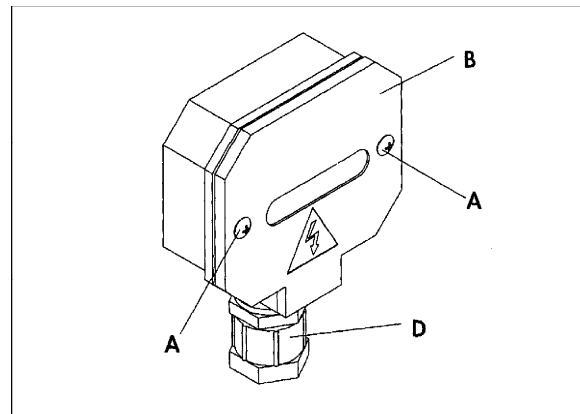


Figure 14

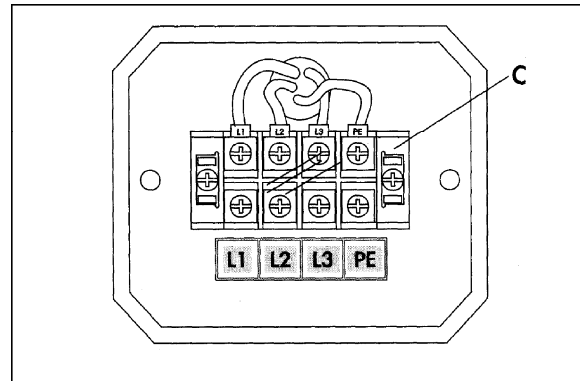


Figure 15

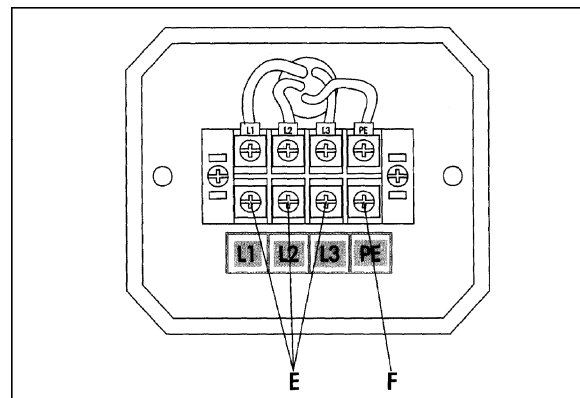


Figure 16

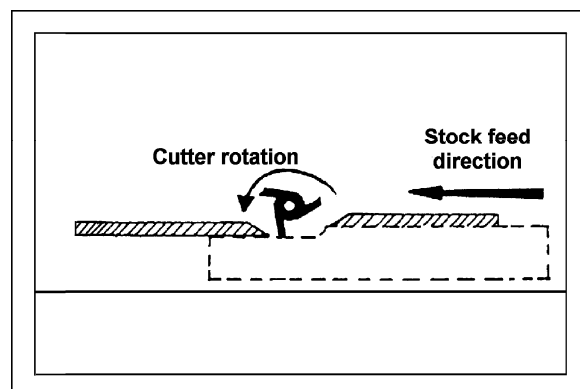


Figure 17

from the machine.

Adjustments

Speed Change

Your machine is supplied with a 5-step motor pulley and a 5-step spindle pulley that provide spindle speeds of 3000, 4000, 6000, 8000 and 10,000 RPM.

A speed chart, shown in Figure 18, is located on the inside of the front cabinet door for easy reference of the belt position on the pulleys for the five speeds available.

Check machine speed setting before operating. Make sure cutter meets or exceeds speed rating of tool. Figure 19 shows a chart for finding optimum speed range in relation to the cutter size. A similar chart can be seen on the front of the shaper, with indicator lights showing the current speed of rotation.

The cutting speed should always exceed 40 meters-per-second to lessen risk of kickback but should not exceed 70 m/s to lessen the risk of tool damage.

To change the speed and adjust the proper belt tension, proceed as follows:

1. Disconnect machine from power source.
2. Open front cabinet door and move belt tension lever (A, Figure 20) to the right to loosen belt tension.
3. Move the belt (B, Figure 20) to the desired position on the pulleys, while at the same time rotate the knob (C, Figure 20) on the speed indicator so that the belt will remain positioned in the cut-out in the speed bar.
4. When the belt is positioned properly, move the tension lever (A, Figure 20) to the left.

NOTE: During the first use after speed adjustment, the belt will settle and produce a slight decrease in tension. To obtain best tension, turn the two nuts (E & F - Figure 20).

Proper belt tension is achieved when the belt midway between the pulleys can be deflected using moderate finger pressure.

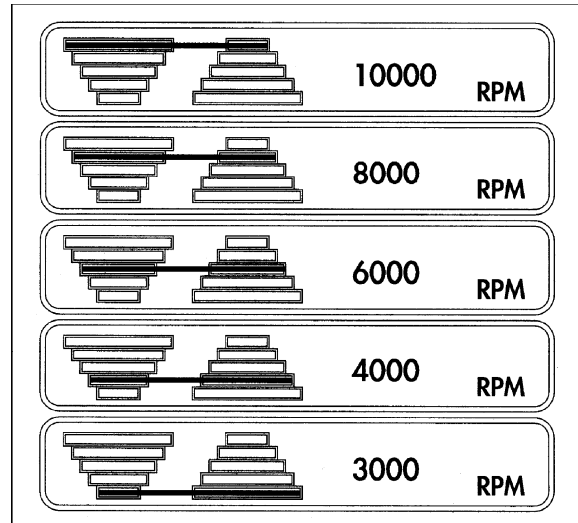


Figure 18

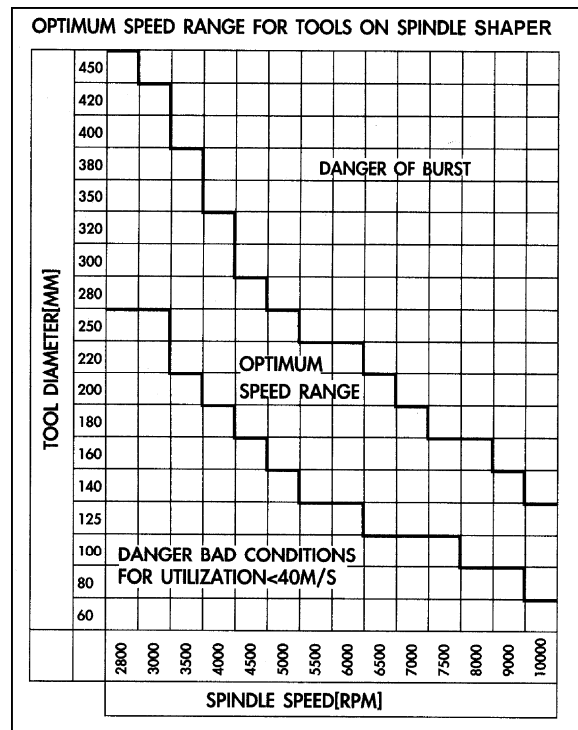


Figure 19

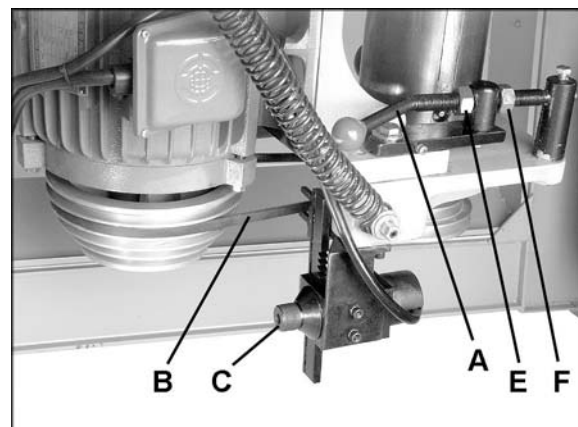


Figure 20

Spindle Lock

The spindle lock will assist you in replacing the spindle or installing and removing cutters.

NOTE: The spindle lock can be engaged only when the machine has stopped completely.

1. Open rear cabinet door.
2. Pull out the knurled part of the lock knob (A, Figure 21) and rotate it 180 degrees until the opposite hole in the knurled lock knob engages the pin. The spindle is now locked.
3. To release the spindle, pull out the knurled lock knob and rotate it 180 degrees until it engages the pin.

CAUTION Make sure the spindle is unlocked before turning on the machine.

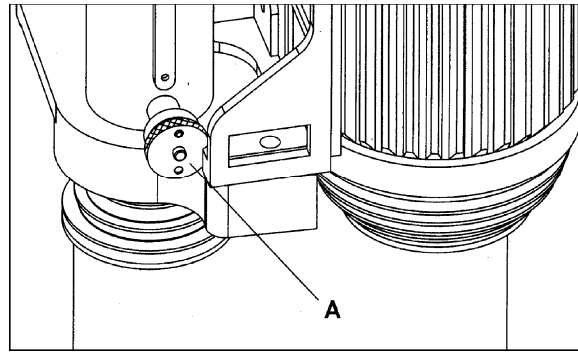


Figure 21

Spindle Vertical Travel

1. Loosen handwheel lock (A, Figure 22) and turn handwheel (B, Figure 22) counterclockwise to raise the spindle; clockwise to lower the spindle.

NOTE: One complete revolution of the handwheel moves the spindle up or down by 0.1" (2.5mm), as shown on the label beside the handwheel.

2. Re-tighten lock (A, Figure 22).

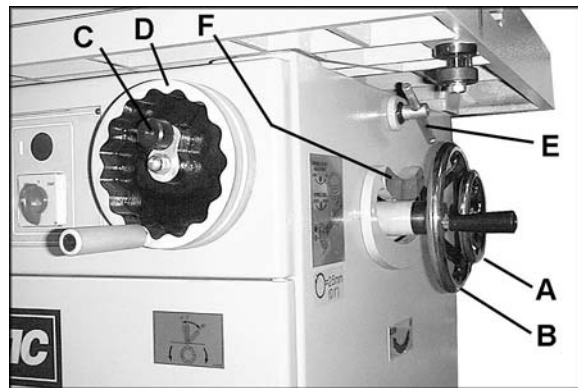


Figure 22

Spindle Tilting

The machine should come to a complete stop before the spindle is tilted, and the insert with the oval slot should be placed into the table. Make sure the cutter does not touch the table or the fence when in tilted position.

1. Loosen the knob (C, Figure 22) on the front handwheel (D, Figure 22).
2. Loosen the two locking handles (E, Figure 22) on both sides of the machine.
3. Turn the handwheel (D, Figure 22) to the required tilting angle shown on the indicator (F, Figure 22).
4. Tighten the knob (C, Figure 22) and locking handles (E, Figure 22).

Fence Adjustment

1. To laterally adjust the aluminum fence plates, loosen the two fence locking levers (refer to C, Figure 8), slide the fence plates to the required positions and tighten locking levers.

CAUTION The aluminum fence plates should be adjusted inward so that the opening at the spindle is just enough to clear the cutter.

2. The right fence plate (infeed) can be moved independently, in or out, depending on the type of shaping operation that is being performed. To move the right fence plate in or out, loosen the locking knob (A, Figure 23) and turn the adjusting knob (B, Figure 23). Precise movements are possible by using the dial indicator beneath the knob. When finished, re-tighten locking knob (A, Figure 23).
3. The entire fence assembly can be rapidly positioned on the table by slightly loosening both locking handles (C, Figure 23) and moving the fence assembly to desired position by rotating the handwheel (D, Figure 23). Use the dial indicator for more precise measurement. Re-tighten the handles (C, Figure 23) when finished.

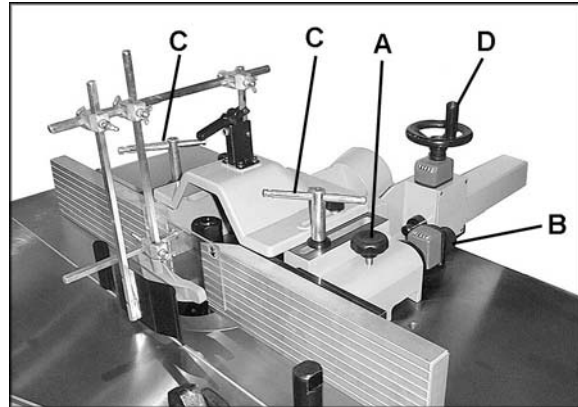


Figure 23

Sliding Table Adjustment

There are six adjustable eccentric rollers (A, Figure 24) on the sliding table. Wherever the sliding table is unstable or not traveling in line, adjust the sliding table as follows:

1. Loosen the roller (A, Figure 24) with a hex wrench (C, Figure 24).
2. Use open end wrench (B, Figure 24) to rotate the rollers as needed.
3. Lock the setting of the roller by using the hex wrench (C, Figure 24).

To operate the sliding table (F, Figure 24) pull down on the knurled knob (D, Figure 24) and rotate it 180 degrees until the opposite hole engages the pin. The sliding table can then be moved back and forth.

To lock the sliding table in centered position, move the sliding table flush with the main table. Pull down on the knurled knob (D, Figure 24) and rotate it 180 degrees until it engages the pin.

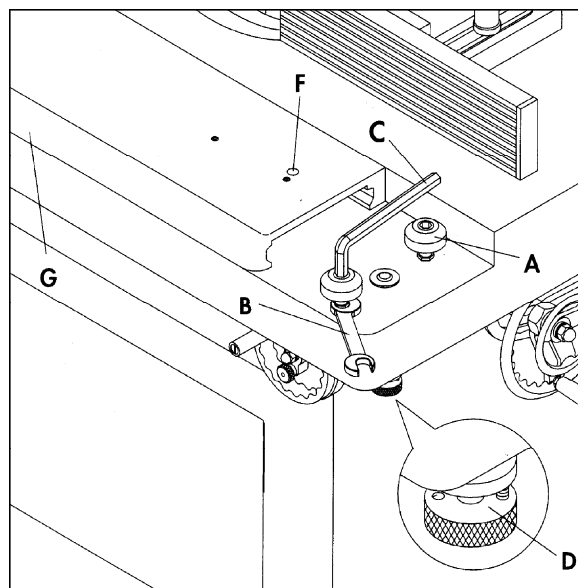


Figure 24

Operating Controls

The elements of the control panel are shown in Figure 25:

- A. Power Indicator
- B. On-off Switch
- C. Forward/reverse Switch
- D. Start Indicator
- E. Emergency Stop

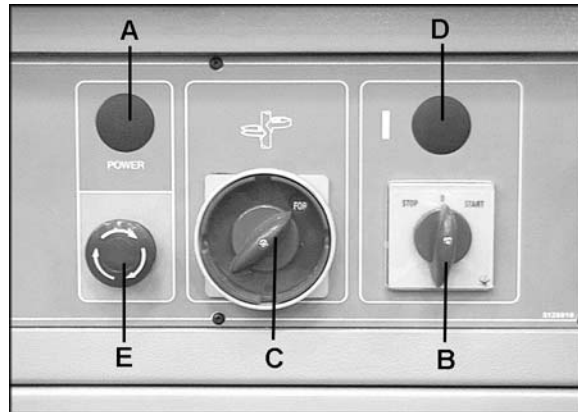


Figure 25

1. Make certain the spindle lock is disengaged as explained in the section "Spindle Lock" and that the cabinet door is closed. Be sure there is no conflict between the cutter(s) and the fence or insert, and that any bystanders are clear of moving parts.
2. Rotate the forward/reverse switch (C, Figure 25) to the desired setting. Rotate the start switch (B, Figure 25) to the right to start the machine. The start switch is magnetic; as soon as the machine is started, the switch will return to the center position as shown.

⚠WARNING Never attempt to reverse the rotation of the spindle while the motor and spindle are running.

3. To stop the machine, push the emergency stop button (E, Figure 25) or turn the start/stop switch (B, Figure 25) to the left.
4. If the emergency button is used to shut down the machine, twist the emergency button clockwise until it pops back out. The machine can then be re-started.

⚠CAUTION Do not use the forward/reverse switch to stop the machine, or damage to the electrical controls will result.

Operation

Using the fence is the safest and most satisfactory method of shaping, and it should always be used when the work permits. Almost all straight work can be done with the fence.

1. For normal work, where a portion of the original edge of the stock is not touched by the cutter, both the infeed and outfeed fences are in a straight line, as shown in Figure 26.

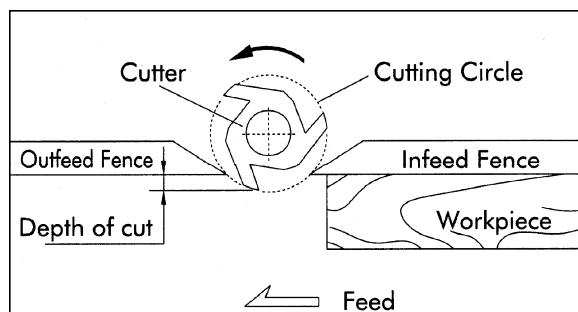


Figure 26

- When the shaping operation removes the entire edge of the stock, e.g. in jointing or making a full bead, the shaped edge will not be supported by the outfeed fence when both fences are in line, as shown in Figure 27. In this case, the stock should be advanced to the position shown in Figure 27 and stopped. The outfeed fence should then be moved forward to contact the work, as shown in Figure 28. The outfeed fence will then be in line with the cutting circle, and the operation can continue.

WARNING Keep guards in place and in working order. Always use fence assembly when the work permits.

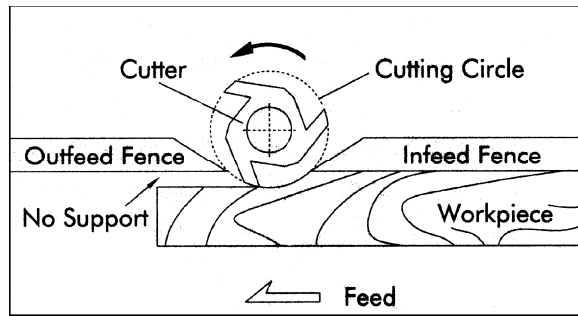


Figure 27

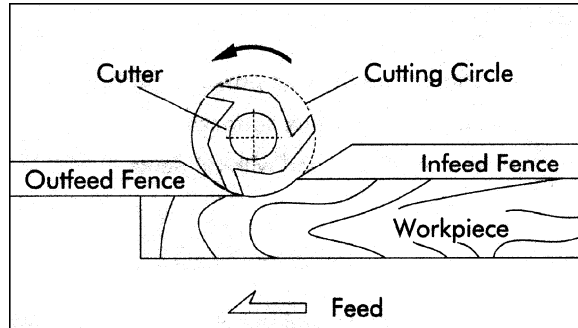


Figure 28

Position of Collars

When shaping with collars, the collar must have sufficient bearing surface, as shown in Figure 29. The workpiece must also be fairly heavy relative to the cut being made. Under no circumstances should a short, light workpiece be shaped against the collars, as shown in Figure 30.

The collars may be used in any of the following positions: above, below, or between the cutters.

- When the collar is used below the cutter, as shown in Figure 31, the progress of the cut can be seen throughout the operation. However, any accidental lifting of the work will gouge the wood and ruin the workpiece.

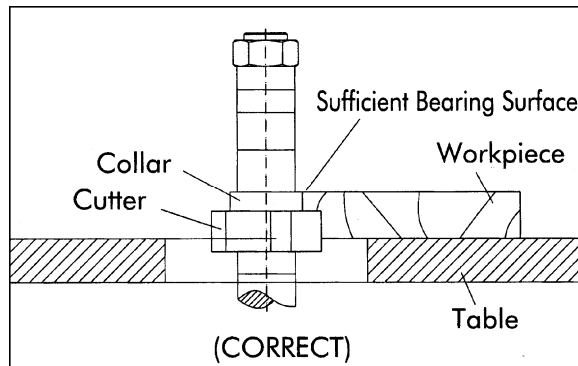


Figure 29

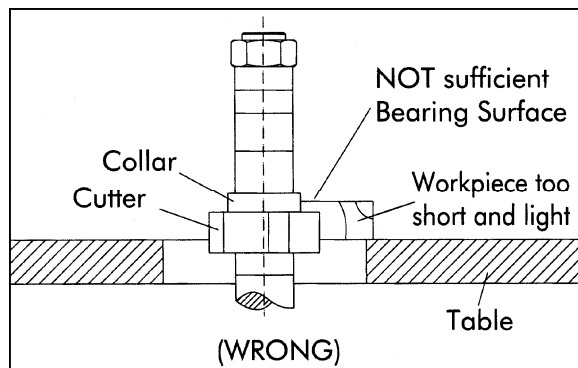


Figure 30

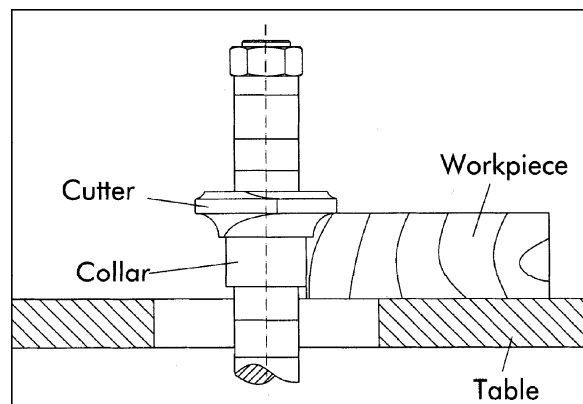


Figure 31

- When the collar is used above the cutter, as shown in Figure 32, the cut cannot be seen, but this method offers an advantage in that the cut is not affected by slight variations in the thickness of the stock. Also, accidental lifting of the workpiece will not gouge the workpiece; simply repeat the operation to correct the mistake.
- Using the collar between two cutters has the advantages and disadvantages of the first two procedures, and is frequently used where both edges of the work are to be molded. See Figure 33.

NOTE: It is advisable to place the cutter as low as possible on the spindle to reduce spindle deflection and ensure the best possible finish. Also make sure that the contacting surfaces of the cutter are smooth, sharp, clean and without dents.

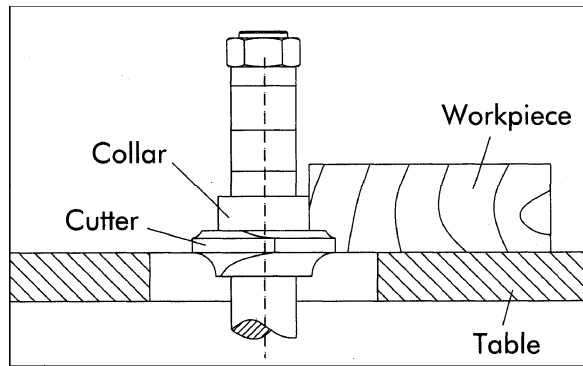


Figure 32

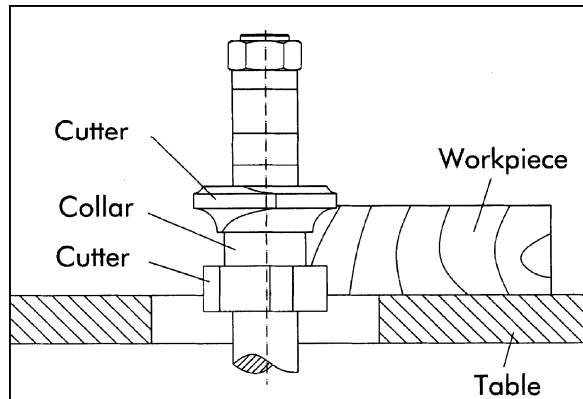


Figure 33

Copying (Machining with a Jig)

When using the same procedure on multiple workpieces, a jig or template can be made to facilitate the operation.

- Prepare the jig (A, Figure 34) to accommodate your original workpiece.
- Place the jig (A, Figure 34) against the table ring guide shoulder (B, Figure 34).
- Fasten the new workpiece (C, Figure 34) on the jig (A, Figure 34) with the clamp (D, Figure 34) and push the assembly past the cutter.

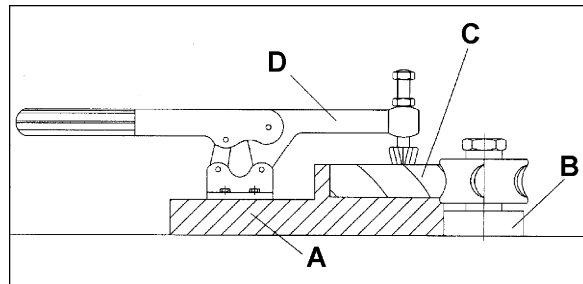


Figure 34

Feeding Stock

Power feeders are available and can be ordered by calling our customer service number. These units mount to the shaper table and will help ensure smooth, consistent feed of material, as well as keep hands safely away from the cutterhead.

Stock No.

- | | |
|----------|--------------------------------|
| 1790800K | 3-Wheel Feeder, 1HP, 3Ph, 230V |
| 1790810K | 3-Wheel Feeder, 1HP, 3Ph, 460V |
| 1790811K | 4-Wheel Feeder, 1HP, 3Ph, 230V |

Maintenance

⚠WARNING Disconnect machine from power source before doing any maintenance.

Periodically clean the inside of the machine of shavings and dust. This will increase machine performance and extend its life.

Clean the spindle with compressed air.

Do not get oil on the pulleys and belts. If they are dirty, use paper or a soft rag to clean and dry them.

Never place the v-belt under excessive strain, as this can overload the motor and damage the bearings, spindle or belt.

If the power cord is worn, cut, or damaged in any way, have it replaced immediately.

The table surface must be kept clean and free of rust for best results. Some users prefer a paste wax coating. Another option is talcum powder applied with a blackboard eraser rubbed in vigorously once a week; this will fill casting pores and form a moisture barrier. This method provides a table top that is slick and allows rust rings to be easily wiped from the surface. Important also is the fact that talcum powder will not stain wood or mar finishes as wax pickup does.

Lubrication

Apply a drop of light machine oil occasionally on the ledge and wall of the table opening to facilitate the changing of table inserts.

The bearings in the motor are sealed for life and do not require lubrication.

The spindle bearing should be lubricated every 200 hours of use by using the supplied grease gun (A, Figure 35). Two grease fittings, one of which (B, Figure 35) is shown, are supplied on the spindle housing for this purpose. The other grease fitting is directly opposite. Before lubricating, clean grease fittings thoroughly and then lubricate the spindle bearings with two pumps of a good quality, non-hardening grease.

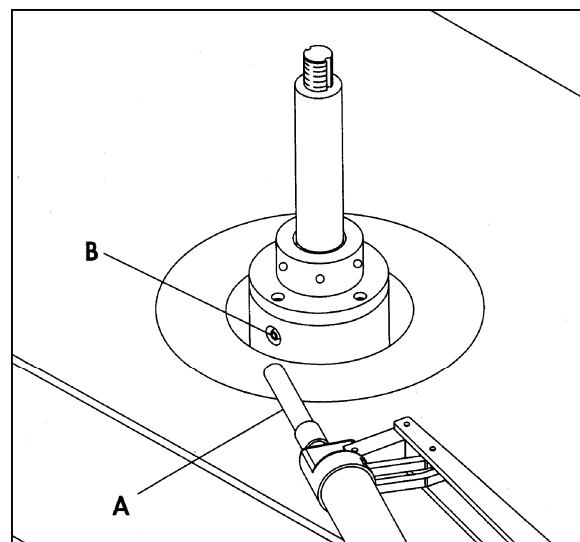


Figure 35

Troubleshooting

Trouble	Probable Cause	Remedy [with page #]
Machine will not start.	Not connected to power source.	Check connection.
	Cord damaged.	Have cord replaced by authorized service person.
	Connected to wrong voltage.	Check voltage.
	Faulty switch.	Replace switch.
	Fuse blown or circuit breaker tripped at incoming power source.	Replace fuse, reset breaker.
Overload kicks out frequently.	Extension cord too light or too long.	Replace with adequate size cord.
	Feeding stock too fast.	Feed stock more slowly.
	Cutter is dull or has gum on it.	Clean or replace cutter. [10]
Cutter does not come up to speed.	Extension cord too light or too long.	Replace with adequate size cord.
	Low current.	Contact local electric company.
	Motor not wired for correct voltage.	Refer to motor nameplate for correct wiring.
	Spindle is locked.	Release spindle lock knob. [15]
Machine makes unsatisfactory cuts.	Dull cutter.	Replace cutter. [10]
	Gum or pitch on cutter.	Remove cutter and clean with turpentine and steel wool.
	Gum or pitch on table causing erratic feed.	Clean table with turpentine and steel wool.
	Feeding work in wrong direction.	Feed work against cutter rotation. [5]
Workpiece burns.	Dull cutter.	Sharpen by honing on the flat side.
	Cut is too deep.	On hardwoods take light cuts; attain full depth of cut with several passes.
	The work is being forced.	Feed slowly and steadily.
Machine vibrates excessively.	Damaged cutter	Replace cutter. [10]
	Machine is on uneven floor.	Reposition on flat, level surface.
	Bad v-belt.	Replace belt.
	V-belt not tensioned properly.	Adjust belt tension. [14]
	Bent pulley.	Replace pulley.
	Improper motor mounting.	Check and adjust motor mounting.
Edge splits off on cross-grain cut.	Characteristic of cut.	Make cross-grain cuts first, then finish with-grain. Use scrap block for support at end of cut.

Trouble	Probable Cause	Remedy [with page #]
Raised areas on shaped edge.	Variation in pressure which holds work against cutter.	Keep work firmly against fence or collars throughout pass. Use hold-downs or stock feeder. [19]
	Excessive feed rate.	Decrease feed rate.
Work pulled from hand.	No support of workpiece.	Use miter gauge with clamp or hold-down to start cut when shaping freehand; hold work firmly against fence. Adjust tension of spring guard.
Depth of cut not uniform.	Outfeed fence is misaligned.	Adjust outfeed fence.
	Side pressure not uniform.	Use hold-downs or stock feeder; keep pressure against fence or collars consistent.
Variation in height of cut.	Variation in pressure which holds work down on table.	Keep pressure firm throughout pass; use hold-downs; make pass slowly and steadily. Whenever possible, keep cutter under stock. [19]
	Spindle lock not engaged.	Engage spindle lock. [15]
Cuts not smooth.	Wrong cutter speed.	Use faster RPMs.
	Feeding too fast.	Pass stock more slowly.
	Working against grain.	Work with grain whenever possible.
	Cutting too deep.	For very deep cuts make several passes.
Resistance in spindle while being raised.	Sawdust and/or dirt in raising mechanisms.	Brush or blow out loose dust and dirt.

Replacement Parts

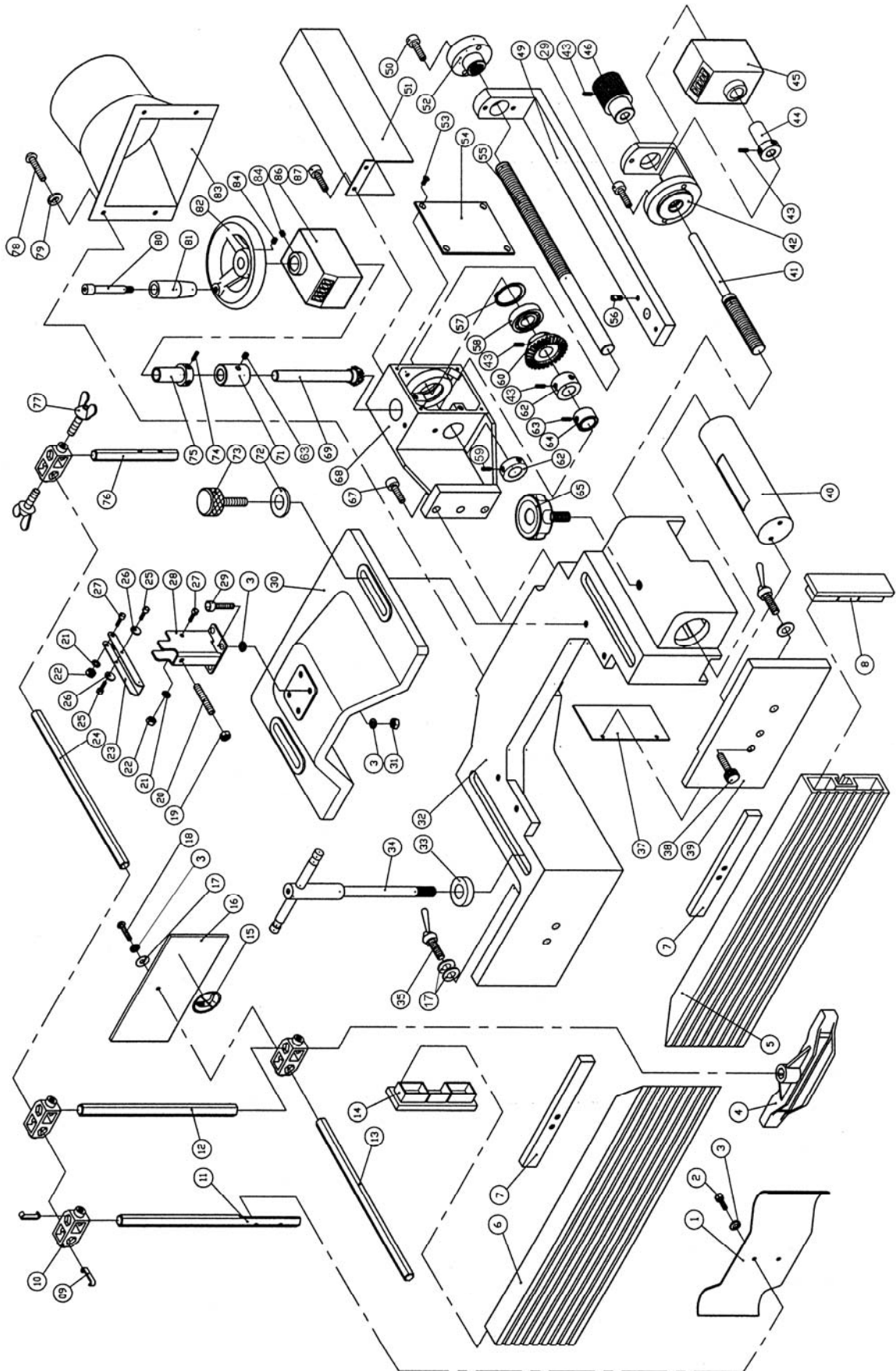
Replacement parts are listed on the following pages. To order parts or reach our service department, call 1-800-274-6848 Monday through Friday (see our website for business hours, www.powermatic.com). Having the Model Number and Serial Number of your machine available when you call will allow us to serve you quickly and accurately.

Fence Assembly – Parts List

Index No.	Part No.	Description	Size	Qty
1	TS29-001	Spring Guard		1
2	TS-1503021	Socket Head Cap Screw	M6 x 10	1
3	TS-236106	Lock Washer	M6	9
4	TS29-002	Hold-down		1
5	TS29-003	Fence R.H.		1
6	TS29-004	Fence L.H.		1
7	TS29-005	Slide Bar		2
8	TS29-006	Fence End Cap R.H.		1
9	TS29-007	Clip		8
10	TS29-008	Post Clamp Block		4
11	TS29-009	Vertical Hex Post		1
12	TS29-010	Vertical Hex Post		1
13	TS29-011	Horizontal Hex Post - Short		1
14	TS29-012	Fence Cap L.H.		1
15	TS29-013	Warning Label, for TS29 shield		1
16	TS29-014	Clear Shield		1
17	TS-1550061	Flat Washer	M8	5
18	TS-1534052	Pan Head Phillips Machine Screw	M6 x 20	1
19	TS-1540061	Hex Nut	M8	1
20	TS29-195	Hex Socket Set Screw	M8 x 35	1
21	TS-236105	Lock Washer	M5	2
22	TS-1541011	Lock Nut	M5	2
23	TS29-015	Latch Handle		1
24	TS29-016	Horizontal Hex Post - Long		1
25	TS-1502021	Socket Head Cap Screw	M5 x 10	2
26	TS29-017	Cam Washer		2
27	TS-1502061	Socket Head Cap Screw	M5 x 25	2
28	TS29-018	Guard Support Bracket		1
29	TS-1503051	Socket Head Cap Screw	M6 x 20	6
30	TS29-019	Fence Cover Plate		1
31	TS-1540041	Hex Nut	M6	2
32	TS29-020	Fence Body Casting		1
33	TS29-021	Beveled Flat Washer	M14	2
34	TS29-022	Lock Handle		2
35	TS29-023	Lock Lever	M10 x 35	2
37	TS29-024	Cover Plate		1
38	TS-1503071	Socket Head Cap Screw	M6 x 30	2
39	TS29-025	Fence Back Plate		1
40	TS29-026	Fence Ram		1
41	TS29-027	Fence Adjustment Screw		1
42	TS29-028	Housing		1
43	TS-1524011	Socket Set Screw	M8 x 8	7
44	TS29-029	Bushing		1
45	TS29-030	Lower Dial Indicator		1
46	TS29-031	Adjustment Knob		1
49	TS29-032	Fence Guide		1
50	TS-1503061	Socket Head Cap Screw	M6 x 25	2
51	TS29-033	Worm Cover		1
52	TS29-034	Worm Guide		1
53	TS-1512011	Socket Head Flat Screw	M4 x 10	4
54	TS29-035	Worm Base Cover		1
55	TS29-036	Worm Shaft		1
56	TS29-199	Fence Locating Pin		2
57	TS29-037	Retaining Ring		1
58	BB-6204	Ball Bearing	6204	1
60	TS29-038	Bevel Gear		1
62	TS29-039	Retainer		1

Index No.	Part No.	Description	Size	Qty
63	TS-1524041	Socket Set Screw	M8 x 16	2
64	TS29-040	Retainer	R42	1
65	TS29-041	Lock Knob	M12	1
67	TS-1505041	Socket Head Cap Screw	M10 x 30	3
68	TS29-042	Worm Base		1
69	TS29-043	Bevel Gear		1
71	TS29-044	Collar		1
73	TS29-045	Knob w/Stud	M8	2
74	TS29-196	Socket Set Screw	M5 x 4	1
75	TS29-046	Bushing		1
76	TS29-047	Vertical Hex Post		1
77	TS29-048	Thumb Screw	M8 x 17	8
78	TS-1533042	Pan Head Phillips Machine Screw	M5 x 12	4
79	TS-1550031	Flat Washer	M5	4
80	TS29-049	Bolt		1
81	TS29-050	Swivel Handle		1
82	TS29-051	Handwheel		1
83	TS29-052	Dust Port		1
84	TS-1523011	Socket Set Screw	M6 x 6	2
86	TS29-053	Upper Dial Indicator		1
87	TS-1502031	Socket Head Cap Screw	M5 x 12	2

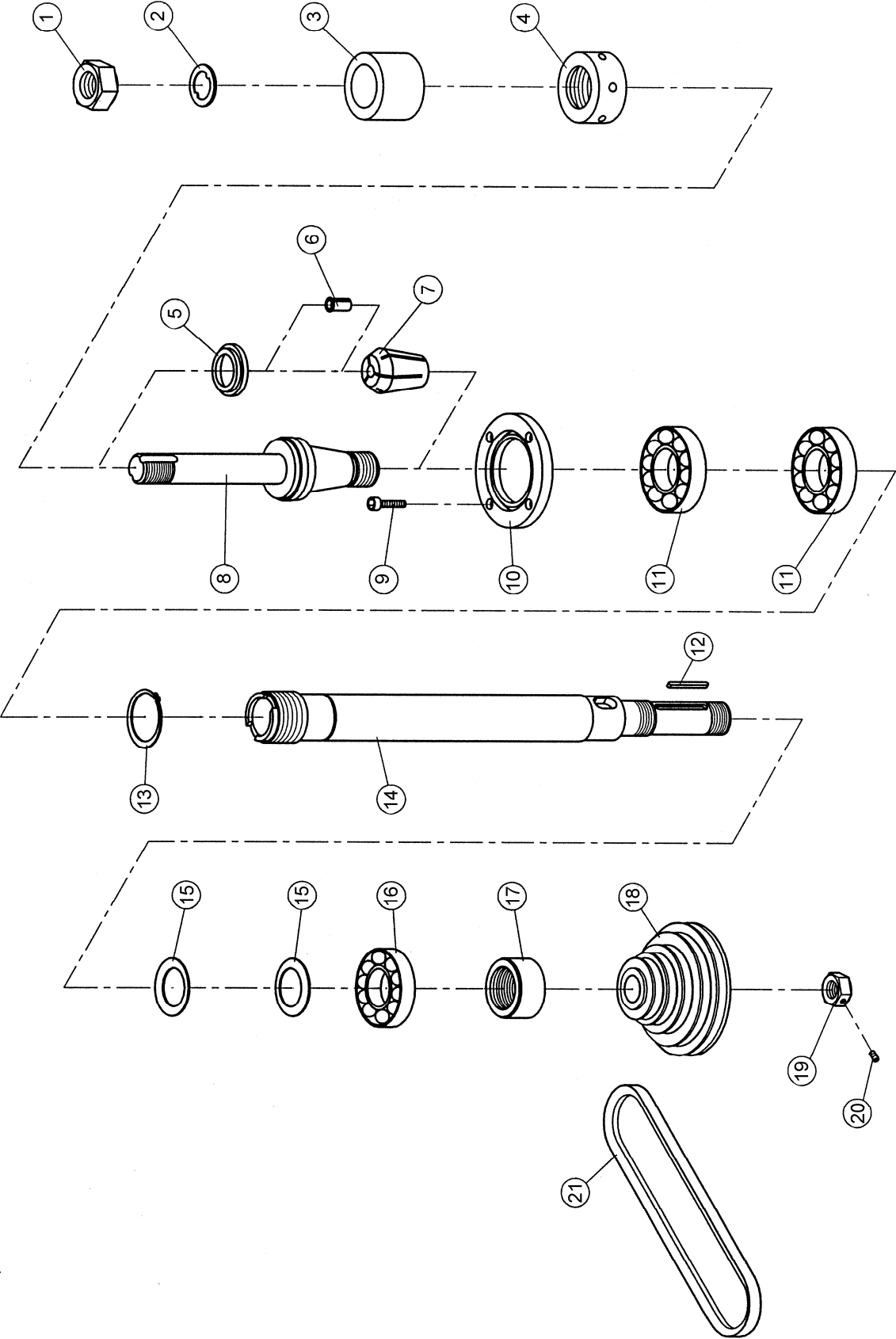
Fence Assembly – Exploded View



Spindle Assembly – Parts List

Index No.	Part No.	Description	Size	Qty
1	6293033	Spindle Nut	3/4	1
	6293034	Spindle Nut	1	1
	6293035	Spindle Nut	1-1/4	1
2	TS29-054	Keyed Washer	3/4	1
	TS29-055	Keyed Washer	1	1
	TS29-056	Keyed Washer	1-1/4	1
3	TS29-057	Spacer (Set of 6 pcs.)	3/4	1
	TS29-058	Spacer (Set of 9 pcs.)	1	1
	TS29-059	Spacer (Set of 11 pcs.)	1-1/4	1
4	6293040	Retainer Nut	1-1/4	1
5	6293041	Collet Nut	1-1/4	1
6	6293042	Bushing	1/4	1
7	6293043	Collet Chuck	1/2	1
8	TS29-060	Interchangeable Spindle	3/4	1
	TS29-061	Interchangeable Spindle	1	1
	TS29-062	Interchangeable Spindle	1-1/4	1
9	TS-1502041	Socket Head Cap Screw	M5 x 16	4
10	TS29-063	Plate		1
11	BB-6008Z	Bearing	6008Z	2
12	TS29-064	Key	M6 x 54	1
13	TS29-065	Retaining Ring	S40	1
14	TS29-066	Spindle		1
15	TS29-067	Spring Disk	61.5 x 40.5 x 0.7	2
16	BB-6206Z	Bearing	6206Z	1
17	TS29-068	Spacer		1
18	TS29-069	Spindle Pulley		1
19	TS29-070	Pulley Nut		1
20	TS-1523011	Socket Set Screw	M6 x 6	1
21	TS29-200	Belt	3V x 375	1
	TS29-071	3/4" Interchangeable Spindle Assembly (Items 1, 2, 3, 8)		
	TS29-072	1" Interchangeable Spindle Assembly (Items 1, 2, 3, 8)		
	TS29-073	1-1/4" Interchangeable Spindle Assembly (Items 1, 2, 3, 8)		
	TS29-074	Collet Chuck w/Bushing Assembly (Items 5 thru 7)		

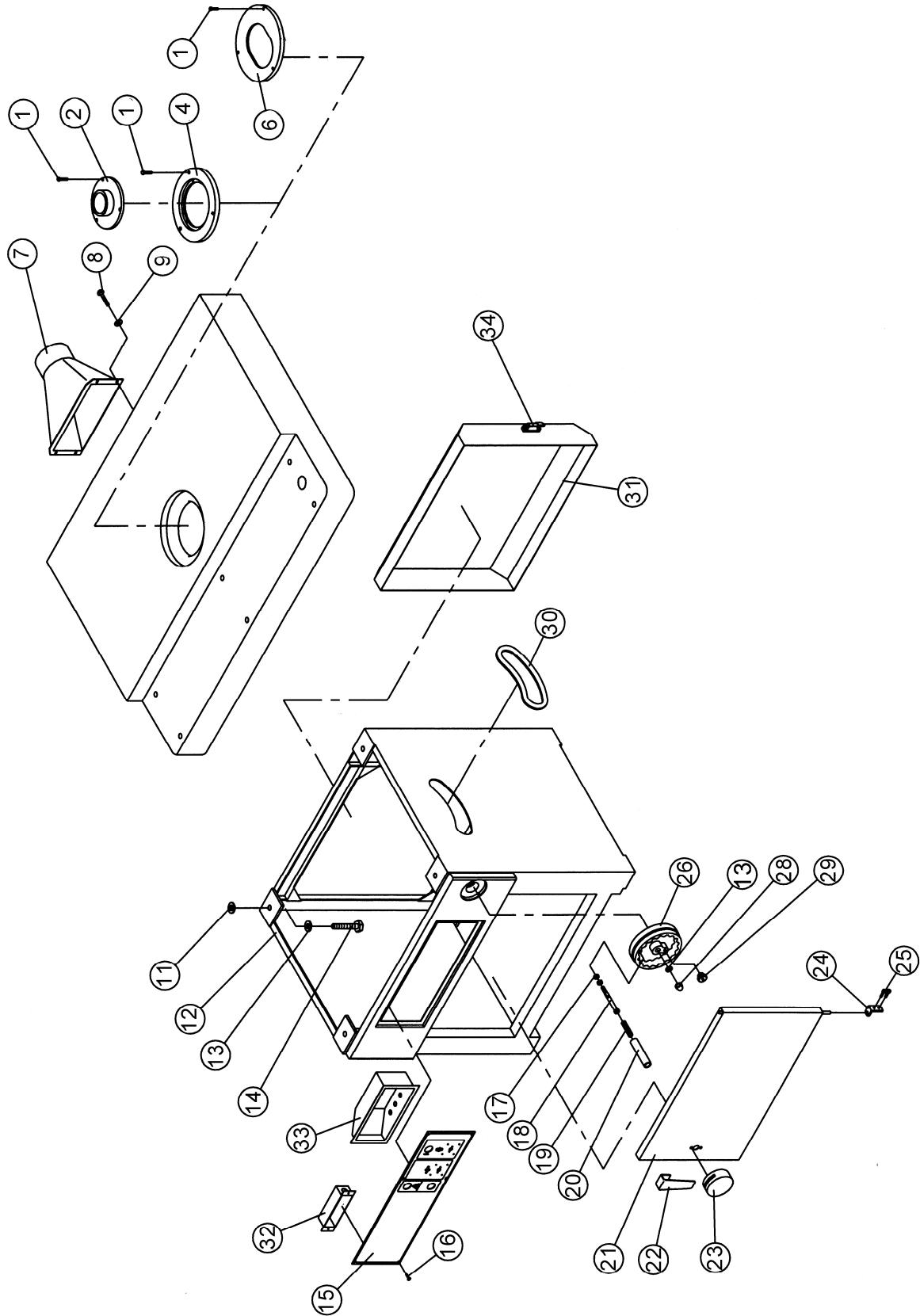
Spindle Assembly – Exploded View



Cabinet Assembly – Parts List

Index No.	Part No.	Description	Size	Qty
1	TS-1502041	Socket Head Cap Screw	M5 x 16	9
2	TS29-075	Table Insert	2-1/2" I.D.	1
4	TS29-076	Table Insert	5-1/2" I.D.	1
6	TS29-077	Table Insert (Tilting)		1
7	TS29-078	Dust Chute		1
8	TS-1533032	Pan Head Phillips Machine Screw	M5 x 10	4
9	TS-1550031	Flat Washer	M5	4
11	TS-2360121	Flat Washer	M12	4
12	TS29-079	Cabinet		1
13	TS-236112	Lock Washer	M12	5
14	TS-2211451	Hex Cap Screw	M12 x 45	4
15	TS29-080	Control Panel		1
16	TS-2244102	Pan Head Phillips Machine Screw	M4 x 10	3
17	TS-154007	Hex Nut	M10	2
18	TS29-081	Fixed Screw		1
19	TS29-082	Spring		1
20	TS29-083	Knob		1
21	TS29-084	Front Cabinet Door		1
22	TS29-085	Front Door Handle		1
23	TS29-086	Latch Assembly		1
24	TS29-087	Hinge Bracket		1
25	TS-1502021	Socket Head Cap Screw	M5 x 10	2
26	TS29-088	Handwheel		1
28	TS-231121	Cap Nut	M12	1
29	TS29-089	Knob w/Stud		1
30	TS29-090	Tilting Scale Base		1
31	TS29-091	Rear Cabinet Door		1
32	TS29-092	Plastic Switch Cover		1
33	TS29-093	Speed Indicator Cover		1
34	TS29-094	Rear Door Latch Assembly		1

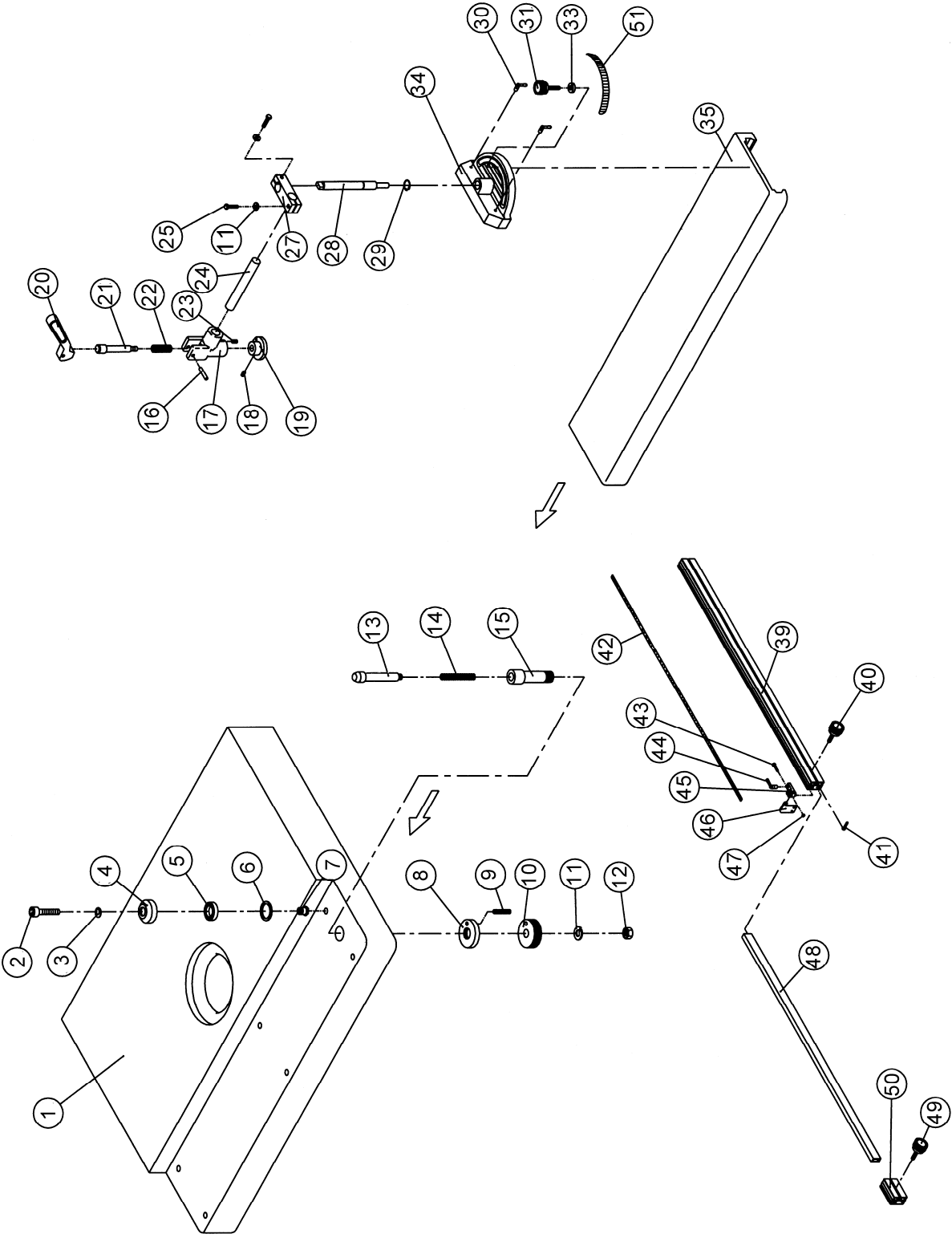
Cabinet Assembly – Exploded View



Sliding Table Assembly – Parts List

Index No.	Part No.	Description	Size	Qty
1	TS29-095	Main Table		1
2	TS-1504101	Socket Head Cap Screw	M8 x 50	6
3	TS29-096	Ring Nut		6
4	TS29-097	Bearing Race		6
5	BB-6004ZZ	Ball Bearing	6004ZZ	6
6	TS29-098	Retaining Ring	R42	6
7	TS29-099	Bushing		6
8	TS29-100	Nut		1
9	TS29-197	Socket Set Screw	M5 x 30	1
10	TS29-101	Lock Ring		1
11	TS-236110	Lock Washer	M10	3
12	TS-1540072	Hex Nut	M10	1
13	TS29-102	Table Lock Pin		1
14	TS29-103	Spring		1
15	TS29-104	Housing		1
16	TS29-105	Roll Pin		1
17	TS29-106	Clamp Casting		1
18	TS-1523041	Socket Set Screw	M6 x 12	1
19	TS29-107	Plunger Pad		1
20	TS29-108	Locking Arm		1
21	TS29-109	Plunger		1
22	TS29-110	Spring		1
23	TS-1524031	Socket Set Screw	M8 x 12	1
24	TS29-111	Horizontal Post		1
25	TS-149105	Hex Cap Screw	M10 x 35	2
27	TS29-112	Post Clamp		1
28	TS29-113	Vertical Post		1
29	TS29-114	Retaining Ring	S25	1
30	TS29-115	Lock Lever	M6	2
31	TS29-116	Knob	M10	1
33	TS-1550071	Flat Washer	M10	1
34	TS29-117	Mitre Gauge Body		1
35	TS29-118	Sliding Table		1
39	TS29-119	Aluminum Fence		1
40	TS29-120	Knob w/ Stud		1
41	TS-1482071	Hex Cap Screw	M6 x 35	1
42	TS29-121	Scale		1
43	TS-1481061	Hex Cap Screw	M5 x 25	1
44	TS29-122	Lock Lever		1
45	TS29-123	Sliding Block		1
46	TS29-124	Stop Plate		1
47	TS-1540031	Hex Nut	M5	1
48	TS29-125	Extension Bar		1
49	TS29-126	Knob w/ Stud		1
50	TS29-127	Support Fence		1
51	TS29-128	Scale		1

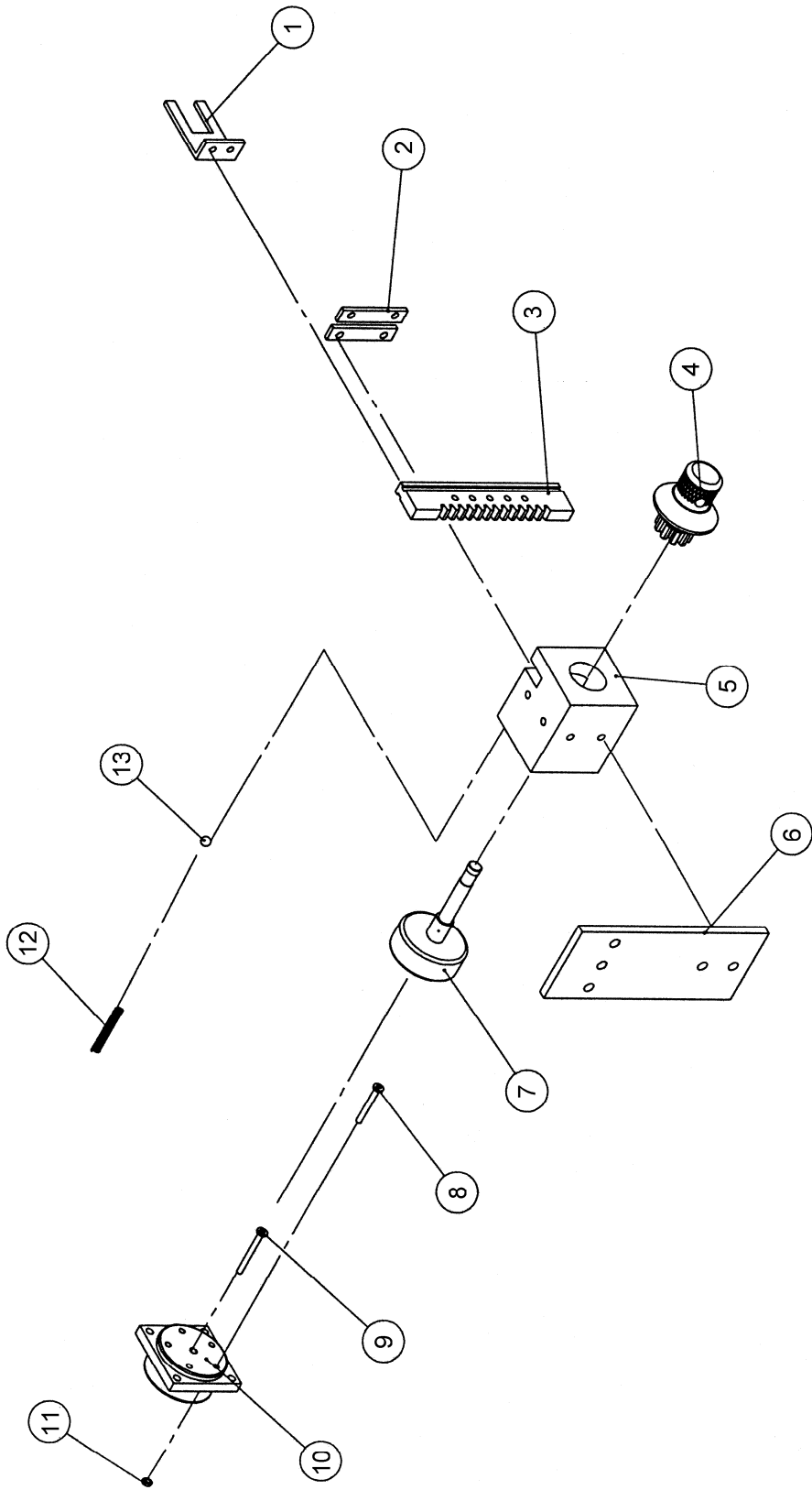
Sliding Table Assembly – Exploded View



Speed Indicator – Parts List

Index No.	Part No.	Description	Size	Qty
1	TS29-129	Belt Fork		1
2	TS29-130	Fork Slide		2
3	TS29-131	Rack		1
4	TS29-132	Gear		1
5	TS29-133	Block		1
6	TS29-134	Mount Bracket		1
7	TS29-135	Sensor		1
8	TS29-201	Pan Head Machine Screw	5/32 x 1-1/4 Lg	5
9	TS29-202	Pan Head Machine Screw	5/32 x 1-1/2 Lg	1
10	TS29-136	Terminal		1
11	TS29-203	Hex Nut	5/32	13
12	TS29-137	Spring		1
13	TS29-138	Steel Ball	1/4	1

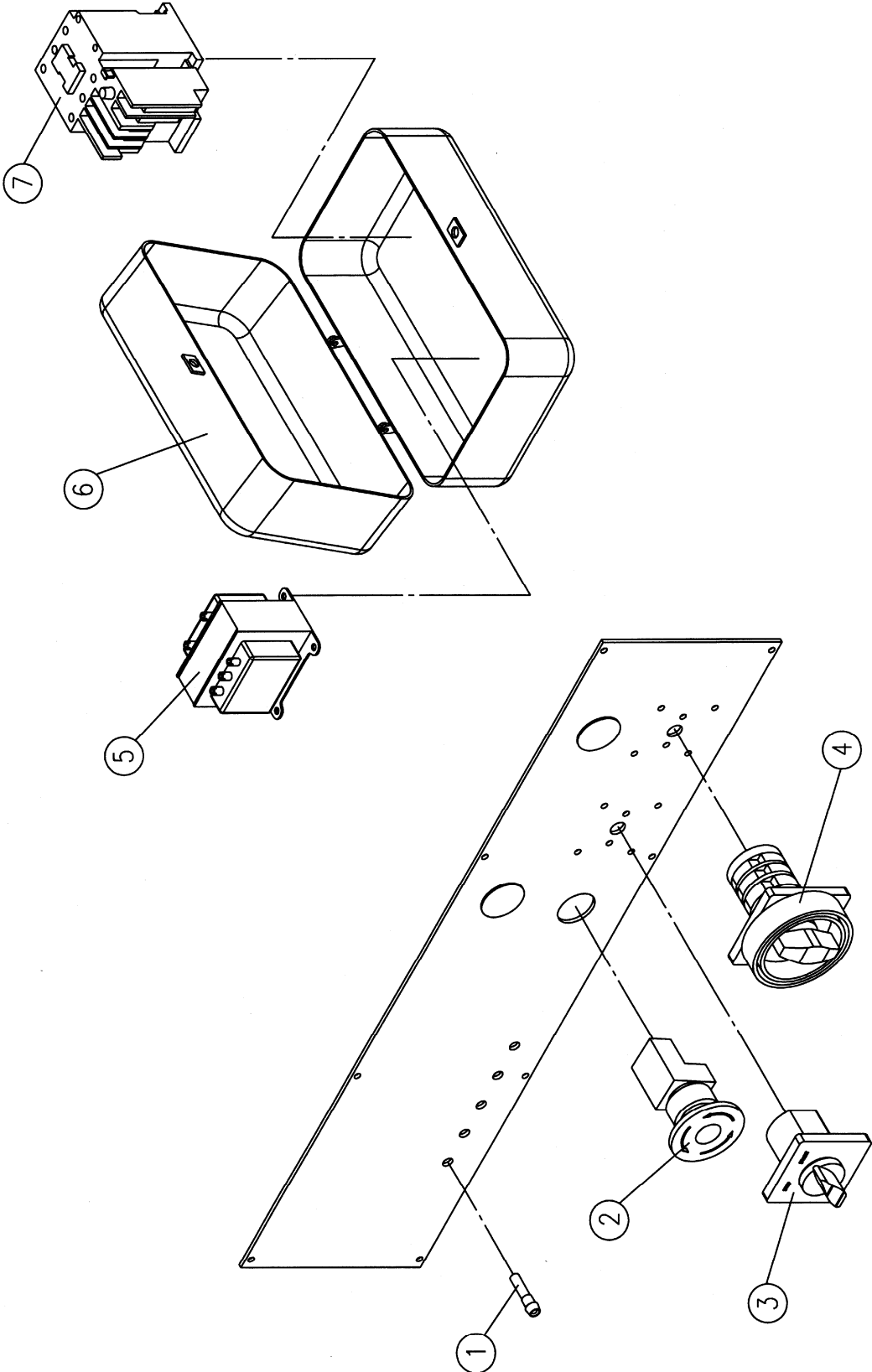
Speed Indicator – Exploded View



Electrical Components – Parts List

Index No.	Part No.	Description	Size	Qty
1.....	TS29-139.....	Speed Indicator Light.....		5
2.....	TS29-140.....	Stop Button		1
3.....	TS29-141.....	Start Switch.....		1
4.....	TS29-142.....	Forward/Reverse Switch.....		1
5.....	TS29-143.....	Transformer.....		1
6.....	TS29-144.....	Control Box		1
7.....	TS29-145.....	Magnetic Starter w/Overload Relay.....		1

Electrical Components – Exploded View

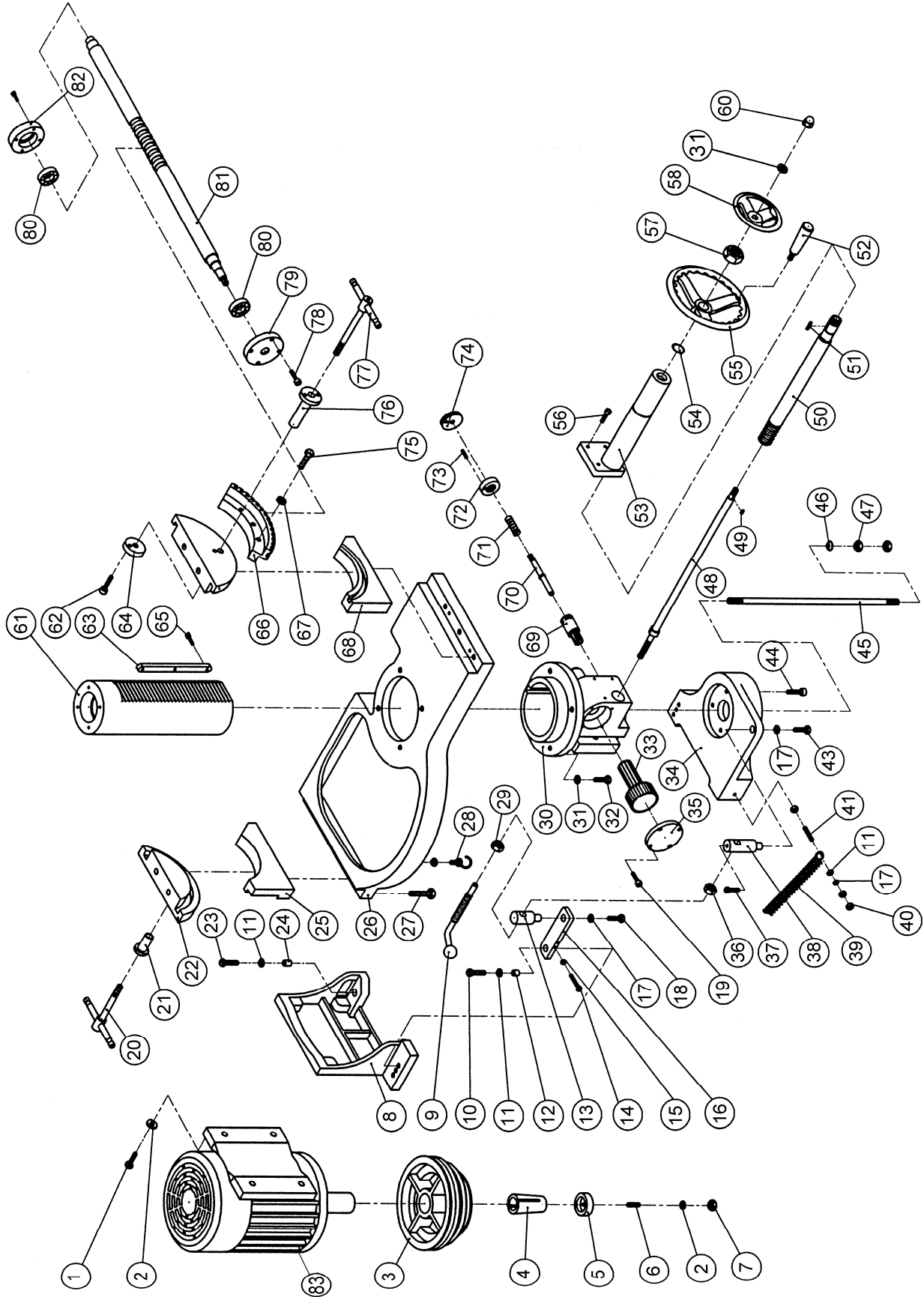


Quill Assembly – Parts List

Index No.	Part No.	Description	Size	Qty
1	TS-149105	Hex Cap Screw	M10 x 35	4
2	TS-236110	Lock Washer	M10	4
3	TS29-146	Motor Pulley		2
4	TS29-147	Motor Shaft Sleeve		1
5	TS29-148	Retainer		1
6	TS-2279351	Socket Set Screw	M10 x 35	1
7	TS-1540071	Hex Nut	M10	1
8	TS29-149	Motor Mount		1
9	TS29-150	Belt Release Handle		1
10	TS-1491041	Hex Cap Screw	M10 x 30	1
11	TS-1550071	Flat Washer	M10	3
12	TS29-151	Spacer		1
13	TS29-152	Stud		1
14*	TS-2288202	Pan Head Phillips Machine Screw	M8 x 20	1
15	TS-1540061	Hex Nut	M8	1
16	TS29-153	Linkage		1
17	TS-1550061	Flat Washer	M8	2
18	TS-1491031	Hex Cap Screw	M8 x 25	1
19	TS-1502051	Socket Head Cap Screw	M5 x 20	4
20	TS29-154	Handle L.H.		1
21	TS29-155	Bushing L.H.		1
22	TS29-156	Top Trunnion L.H.		1
23	TS-1491081	Hex Cap Screw	M10 x 50	1
24	TS29-157	Spacer		1
25	TS29-158	Bottom Trunnion L.H.		1
26	TS29-159	Trunnion Main Frame		1
27	TS-1491031	Hex Cap Screw	M10 x 25	6
28	TS29-160	Spring Hook		1
29	TS-154010	Hex Nut	M16	1
30	TS29-161	Quill Housing		1
31	TS-2360121	Flat Washer	M12	5
32	TS-2211451	Hex Head Bolt	M12 x 45	4
33	TS29-162	Raising Gear		1
34	TS29-163	Base Plate		1
35	TS29-164	End Cap		1
36	TS-2310162	Hex Nut	M16	1
37	TS29-165	Hex Head Bolt	M8 x 10	1
38	TS29-166	Stud		1
39	TS29-167	Spring		1
40	TS-1540061	Hex Nut	M8	3
41	TS29-198	Socket Set Screw	M8 x 50	1
43	TS-1490021	Hex Cap Screw	M8 x 16	1
44	TS-1502071	Socket Head Cap Screw	M5 x 30	4
45	TS29-168	Draw Bar		1
46	TS29-169	Bevel Washer		1
47	TS-0561051	Hex Nut	1/2-13	2
48	TS29-170	Locking Post		1
49	TS29-171	Key	4 x 12mm	1
50	TS29-172	Raising Shaft		1
51	TS29-173	Key	4 x 24mm	1
52	TS29-174	Swivel Handle		1
53	TS29-175	Outer Casing		1
54	TS29-176	Retaining Ring		1
55	TS29-177	Handwheel		1
56	TS-1503071	Socket Head Cap Screw	M6 x 30	4
57	TS-1540081	Hex Nut	M12	1
58	TS29-178	Handwheel		1

Index No.	Part No.	Description	Size	Qty
60	TS-2331121	Cap Nut	M12	1
61	TS29-179	Quill		1
62	TS-1503041	Socket Head Cap Screw	M6 x 16	1
63	TS29-180	Key		1
64	TS29-181	Fixed Nut		1
65	TS-1502041	Socket Head Cap Screw	M5 x 16	3
66	TS29-182	Segment Gear		1
67	TS-1550061	Flat Washer	M8	3
68	TS29-183	Inner Trunnion R.H.		1
69	TS29-184	Locking Post		1
70	TS29-185	Locking Pin		1
71	TS29-186	Spring		1
72	TS29-187	Spring Retainer		1
73	TS-1523071	Socket Set Screw	M6 x 25	1
74	TS29-188	Lock Knob		1
75	TS-1490071	Hex Cap Screw	M8 x 40	3
76	TS29-189	Sleeve		1
77	TS29-190	Handle R.H.		1
78	TS-1502051	Socket Head Cap Screw	M5 x 20	8
79	TS29-191	Tilt Shaft End Plate		1
80	TS29-204	Bearing		2
81	TS29-192	Tilt Shaft		1
82	TS29-193	Bearing Block		1
83	TS29-194	Motor 7.5HP, 3Ph, 230/460V, 60Hz, TEFC		1

Quill Assembly – Exploded View





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