SHOPMASTER™
TRI-POWER™

OWNERS MANUAL

SAFETY RULES FOR THE SHOPMASTER TRI POWER

WARNING -- DO NOT ATTEMPT TO OPERATE UNTIL YOU HAVE READ THOROUGHLY AND UNDERSTAND COMPLETELY ALL INSTRUCTIONS AND RULES CONTAINED IN THIS MANUAL. FAILURE TO COMPLY CAN RESULT IN ACCIDENTS INVOLVING FIRE, ELECTRIC SHOCK, OR SERIOUS PERSONAL INJURY. MAINTAIN YOUR OWNERS MANUAL AND REVIEW FREQUENTLY FOR CONTINUING SAFE OPERATION AND INSTRUCTING POSSIBLE THIRD-PARTY USER.

1. KNOW YOUR TRI POWER MACHINE
For your own safety, read the owner's manual carefully. Learn it's application and limitation as well as the specific potential hazards peculiar to this tool.

2. NEVER ATTEMPT ANY OPERATION OR ADJUSTMENT IF THE PROCEDURE IS NOT UNDERSTOOD.

3. KEEP GUARDS IN PLACE AND IN WORKING ORDER.

4. REMOVE ADJUSTING KEYS AND WRENCHES.
Form habits of checking to see that keys and adjusting wrenches are removed from the TRI POWER before turning on the machine.

5. DON'T USE IN DANGEROUS ENVIRONMENT.
Don't use the TRI POWER in damp or wet locations or expose it to rain. Keep work area well illuminated.

6. DO NOT REMOVE DRIVE COVERS WHILE IN OPERATION.

7. DON'T FORCE TOOLS.
It will do the job better and be safer at the rate for which it was designed .

8. WEAR PROPER APPAREL.
No loose clothing, gloves, neckties, rings, bracelets, or jewelry to get caught in moving parts. Non-slip footwear is recommended. Wear protective hair covering to contain long hair.

9. ALWAYS USE SAFETY GLASSES.
Every day eyeglasses only have impact-resistant lenses. They are NOT safety glasses.

10. SECURE WORK.
Always secure your work to the table with clamps or vise-NEVER attempt to hold a part by hand.

11. DON'T OVERREACH
Keep your balance and proper footing at all times.

12. MAINTAIN TOOLS IN TOP CONDITION.

Keep tools sharp and clean for best and safest performance. Follow instructions for lubricating and changing accessories.

I3. DISCONNECT TOOL FROM POWER SOURCE.
Before servicing and when changing accessories such as bits or cutters .

14. AVOID ACCIDENTAL STARTING.
Make sure switch is in "OFF" position before plugging in cord.

15. USE RECOMMENDED ACCESSORIES.
Consult the owner's manual for recommended accessories. Use of Improper accessories may be hazardous.

16. CHECK DAMAGED PARTS.
Before further use of the TRI POWER, a guard or other part that is damaged should be carefully checked to ensure that it will operate properly and perform its intended function-check for alignment of moving parts, binding of moving parts, breakage of parts and any other conditions that may affect its operation. A guard or other part that is damaged should be properly repaired or replaced.

17. DIRECTION OF FEED.
Only feed work into a cutter against the direction or rotation of the cutter.

18. NEVER LEAVE YOUR TRI POWER RUNNING UNATTENDED.
TURN POWER OFF.
Don't leave the machine until it comes to a complete stop.

19. NEVER PERFORM AN ABNORMAL OR LITTLE USED OPERATION WITHOUG STUDY AND USE OF ADEQUATE BLOCKS, JIGS OR FIXTURES.

SHOPMASTER CONTROLS

Take a few minutes to familiarize yourself with the location of the various controls on your machine. This will make using your Shopmaster much easier when you are ready to operate the machine.

Standard Features on Every ShopMaster ElDorado TriPower
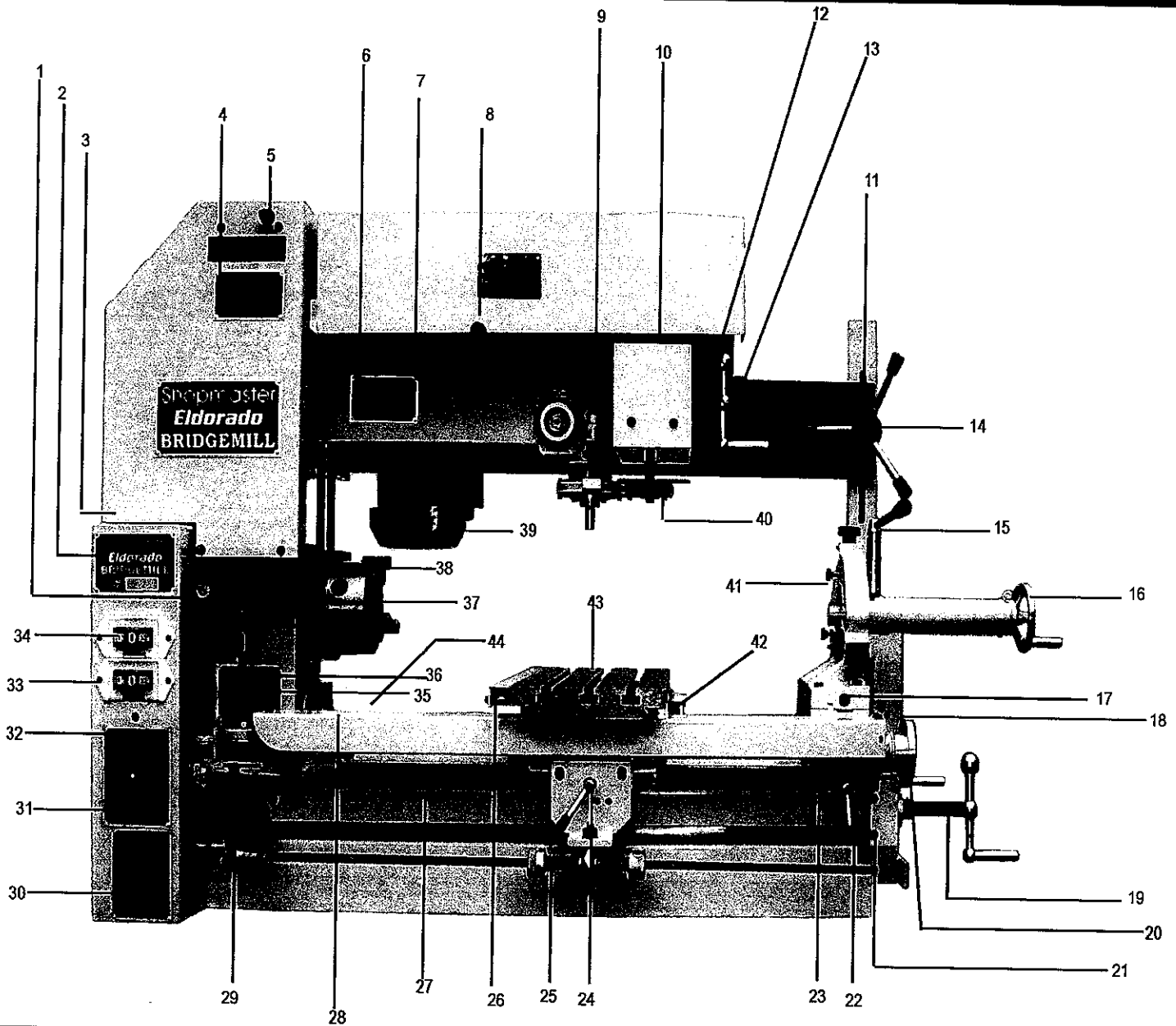
1. High-Neutral-Low/ Spindle Brake	12. Z-Axis Power Feed Control	23. Tailstock Gib Screw	34. Mill Switch
2. Gearbox Housing	13. Z-Axis Manual Downfeed	24. X-Axis Lock	35. Y-Axis Power Feed Control
3. CNC Housing	14. 5th Column Lock	25. X-Axis Auto-stop	36. Hi-Lo Threading Gear Box
4. Front Cover	15. Tailstock Barrel Lock	26. Y-Axis DRO mount	37. Spindle Indexer
5. Mill Head Lift Control	16. Tailstock Barrel Drive	27. X-Axis Lead Screw Shield	38. 3-Jaw Chuck
6. Mill Speed Chart	17. Tailstock Offset Adjuster	28. Y-Axis Power Feed Shield	39. Mill Motor
7. Mill Head	18. X-Axis CNC Housing	29. X-Axis Power Feed Control	40. Z-Axis Drive Plate
8. Mill Speed Control Lever	19. X-Axis Manual Control	30. Threading Gears (inside)	41. SteadyRest
9. Mill/Drill Depth Stop	20. Y-Axis Manual Control	31. Hi-Lo Spindle Assembly (inside)	42. Y-Axis Lock
10. Z-Axis	21. X-Axis CNC Cover	32. Lathe Speed Adjuster (inside)	43. Y-Axis CNC Drive (behind)
11. 5th Column Mill Support	22. Tailstock Lock	33. Lathe Switch	44. Lathe Motor (behind)

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CONTROL FUNCTIONS

1. The high-low spindle speed and spindle brake is operated by a shifter mechanism mounted on the sheet metal housing near the top corner. The shifter block is spring loaded and has a pin lock for all 3 positions. In the center position, the shift block releases tension on both drive belts from the motor to the first pulley. At the same time, the special spring loaded lever arm is forced against the pulley and the friction material stops its rotation. The tension of the brake is determined by adjusting the 2 adjuster screws against the lever arm. Tension should be set so that the lathe chuck stops when neutral is engaged, but the chuck can be rotated with the use of the chuck in the scroll drives. This will allow you to turn the chuck even while the brake is engaged. **CAUTION- DO NOT CHANGE PARTS OR ROTATE THE CHUCK WHILE THE LATHE MOTOR IS RUNNING. ALWAYS INSURE THAT THE SHIFTER IS FULLY SEATED INTO IT DETENT POSITION BEFORE MEASURING ANY PARTS HELD IN THE CHUCK.**
When you shift the lever up, the low speed belt will be engaged and your spindle will rotate at the low ratio. When the lever is moved down, the high speed belt is engaged and the spindle will rotate at the higher speed. For the majority of lathe operations you will find that selecting a medium speed, such as 1000 rpm in the high range will give you a good set of speeds for many operations. You can see that when the lever is engaged in neutral, the motor will run free because both drive belts are free of tension. There are 2 adjustments to keep your High-Low speed belts operating properly.

A. Motor tension is adjusted by the threaded rod coming from the rear of the lathe column and attached to the motor mount. By moving the mount away from the column, the belt tension will be increased.

However, the belt should not be too tight so that when in neutral, the pulley will drag against the belts. This would creat a squealing and burning of the belts. Only allow enough tension on the motor mount so that the belts are properly tensioned when engaged in high or low speed.

B. The belts are also retained by a roller bearing idler mounted in a slotted bracket. This idler keeps the belts at the proper angle to prevent them from falling off the pulley when one speed is engaged or when the system is in neutral for a period of time. This idler should also have just enough tension to support the belts, but not so much as to cause dragging in neutral.

You will see that the motor drives a pulley which acts as the spindle brake. The mounting bracket of this pulley contains the brake adjuster screws and also has slotted holes. The slotted holes are for alignment of the pulley shaft, since the shaft is in a threaded hole in the casting and the plate is mounted to the sheet metal housing, the slotted holes allow proper alignment of the 2 parts. The pulley runs on 2 roller bearings which should be cleaned and re-packed every 100 hours of use.

This pulley also has a removable chain sprocket which drives the chain to the next pulley in line, the chain is tensioned by an idler sprocket mounted to a sliding plate bolted to the casting. The chain should be oiled periodically with chain oil, but not too much that will sling around and contaminate the belts.

2. This is the lathe drive housing. Made of heavy gauge steel it has a door to open for access to the spindle drive mechanism and the threading gear set. The belt tension and speed selection for the lathe spindle is controlled by a sliding idler puller moved by a handle and acme screw thread. The handle is found in your accessories box and should be installed onto the square drive found on the rear of the sheet metal housing. The main drive belt system consists of 3 pulleys and 2 belts.

The first pulley in line is mounted on a shaft threaded into the casting and riding on 2 roller bearings. These bearings should be cleaned and packed every 100 hours of use. This pulley is driven by the chain from the pulley described in the previous section. This primary pulley drives the center idler with a belt, and the center idler drives the main spindle pulley with the second belt. Tension and speed selection is accomplished by turning the adjuster crank. As the center idler moves on its sliding mount, it also has a second swing arm which allows both belts to be tensioned at the same time and to the same tightness. Simply turn the crank to release the belt tension, select the ratio of drive for the speed desired and re-tighten the crank. CAUTION:

THE CRANK CAN PUT AN EXTREME AMOUNT OF PRESSURE ON THE SYSTEM IF OVERTENSIONED- USE COMMON SENSE AND TIGHTEN THE BELTS ONLY ENOUGH FOR NON SLIPPAGE.

The center idler pulley also rides on 2 roller bearings which should be cleaned and packed every 100 hours.

3. This is the housing for the CNC electronic drivers. When you order CNC with your machine, we will send the housing to the CNC manufacturer for installation and testing of the system. If you build your own system, you have the enclosure ready for the components and the industry standard cable connectors. If you upgrade to our system in the future, simply remove the housing and ship it to us.

4. This front cover contains your name tag and warning label for the mill lift mechanism.

5. This square head shaft drives a set of helix gears to raise and lower your mill head assembly. In your box of tools there is a handle which attaches to the square head with a set screw.

6. This is the mill speed chart.

7. This is the main mill head casting The mill head assembly can be raised and lowered a total of 10". The mechanism consists of a 4 column support plate which holds the head moved by an acme screw activated by the handle on the front of the assembly. Beneath the mill belt cover you will find the 2 drive belts for your milling speed selections. The primary belt drives from the motor to an idler and the secondary belt drives from the idler to the spindle pulley. The center idler pulley runs on 2 roller bearings which should be cleaned and packed every 100 hours. The center idler swings on a swing bracket in the mill head casting. The belt tension is set automatically by the return spring. The mill head is supported by a heavy steel plate which attaches to the back of the 4 column lift mechanism and extends to the tailstock end of the machine. There it is supported by a vertical column with a slot and locking handle. This plate also acts as the mill motor mounting.

8. This lever releases tension to the mill belts for speed selection.

9. The mill drill depth stop consists of a threaded rod attached to the quill drive bracket. It travels up and down with the quil, and the micrometer dial can be adjusted for pre-setting the depths of your holes. The dial also has a quick release button for rapid positioning. CAUTION- when using the power feed, be sure you do not go beyond the limit of the stop or sever damage could result to the drive mechanism.

10. This sheet metal shield covers the Z axis CNC motor mount and drive belts. It also serves as the mounting point for the DRO display.

11. This heavy steel plate supports the mill head assembly and locks to the vertical support attached to the bench top to solidify the mill head position once it is set in the desired height.

12. This lever operated the Z axis power feed gearbox. Pulling down on the lever drives the quill down and pushing up drives the quill upwards. There is a detent for the neutral position. CAUTION- use care when operating the power feed. If you go beyond the limits of your mill/drill depth stop or the travel of the quill, the force of the gearbox could cause severe damage to the drive components.

13. This drive handle operates your quill manually for fine positioning or manual drilling. It will spin when the power gearbox is engaged, but when the gearbox is in neutral you can move the quill up and down by turning the handle manually. Just to the left and behind the mill drill depth stop is your dial to read your motions.

14. This round lock has 3 handles found in your box and locks the mill head support plate to the vertical column. Locking this handle solidifies the mill head once you have set the desired height of the mill. CAUTION- read the warning label and ALWAYS loosen this lock before adjusting the height of the mill.

15. This is the barrel lock for your tailstock. When turning on the lathe and using a center, you can set the pressure and lock the barrel into place.

16. This is the tailstock barrel drive. With the lock loosened, you can extend the barrel to about 7" of travel. When drilling with the tailstock, use the handle to advance into the part and retract to clear chips. The handle has a dial for your depth measurements.

17. The tailstock can be offset for cutting long tapers in the lathe. After loosening the 4 top hold down bolts, move the top slide to the desired offset by turning the 2 adjuster screws. (one is on opposite side)

18. At the end of the machine casting is the X axis CNC drive assembly. Covered by a metal shield, inside is the drive pulley and motor mounting bracket. Center distances are factory set for the proper tooth belts, so no adjustment is necessary after installation.

19. This handle drives your X axis carriage toward and away from the lathe chuck. Use this handle for manual positioning or fine motions. The handle is removed for shipping and is found in your box of tools.

20. Just above the X handle is the handle for your Y axis manual feed. This handle will drive your table toward and away from you in lathe and mill modes. Use this for fine positioning.

21. This is the shield for the X axis CNC drive system.

22. This lock handle will set the position of your tailstock/ steady rest assembly along the length of the carriage.

23. All the motions of the machine are adjustable by means of gib screws. This is one of 2 on the tailstock. Your main carriage has 2 and the cross slide has 4.

24. This handle locks the main carriage in position along the bedway.

25. The auto stop mechanism has several functions. Primarily it is designed as a safety feature to prevent accidents when the operator allows the carriage or part to run into the chuck. By setting the auto stop adjusters at a pre-set point, even if the operator is distracted, the auto stop will disengage the lead screw gearbox before the carriage goes beyond the safety point. The stops can be set for both left and right hand travel. As a tool for production, it can also be set to a predetermined depth when using the power tailstock for deep hole drilling and reaming. When turning up to a shoulder or in a blind hole, the stops will stop your carriage at the pre-set point every time. When threading, the auto stop will start your carriage at the same point each time and stop it at the same point for easy repeats on your thread passes. The auto stops are mounted on a threaded rod and attached to the lead screw gearbox. When the carriage hits the auto stop it shifts the gearbox into neutral and stops the carriage. Each stop mechanism has a spring to clear the gears once the stop trips the lever. Each stop has a micrometer dial graduated in 0.001" increments for fine tuning of your position. To avoid tedious long travel of the dials, each one is equipped with a quick release spring nut which allows the stop to slide along its rod until the position is found and then the spring nut is released for fine tuning with the dial.

26. This heavy shield is designed for the installation of the DRO on the Y axis. All the holes are drilled and tapped at the factory for easy, professional installation. The shield is made of heavy gauge steel and painted to match the machine.

27. All the lead screws on the TRI POWER machine are fully shielded to protect the moving parts. This shield is made of heavy gauge steel and painted to match the machine.

28. The Y axis lead screw shield is also of heavy gauge steel and painted to match the machine.

29. The lead screw engagement gearbox activates the sliding gear which meshes with the final output gears in your gear box assembly. Moving the lever to the left will engage forward and travel your main carriage toward the lathe spindle. In the center (straight up) position, your lead screw is disengaged from the gears and can be turned using the X axis handle or your CNC drive if you have one installed. Moving the handle to the right will travel your carriage toward the tailstock. Each position has a spring loaded detent to hold it in place, but we recommend that you always keep your hand on or near the lever in case of a problem requiring quick

disengagement of the drive. The lead screw gearbox is also controlled by the auto stop rod assembly.

30. When you open the large door at the left side of the machine, you will find your power feed and threading gear set. The factory has already installed one set of gears on the machine, this one is the lowest feed rate and is used for turning operations. By reading the chart in this manual and on your machine you can select the gears you need for cutting various types of threads. The gear assembly consists of 3 main parts.

    A. The primary drive gearbox which is contained in the lathe column casting.

    B. The change gear sets as characterized by their 4 spline center holes and fine module teeth.

    C. The final drive gear box and lead screw engagement.

Inside the lathe column you have a cluster gear which is driven by the lathe spindle and a sliding cluster gear which switches from high to low ratio and powers the final output gear. This out put gear drives a combination gear, which has a course tooth gear on one end and a spline on the other to accept the fine tooth change gears. This combination gear rides on Shaft "A". Next in line are 2 gears of the fine tooth style riding on shaft "B" and finally, another combination gear, separated by a spacer. The final fine tooth gear and a coarse tooth gear ride on shaft "C". this final coarse tooth gear drives 2 idler gears held in a bracket, which in turn engage the lead screw when the sliding gear is moved by the lead screw shifter. **REMEMBER, WHEN CHANGING RATIOS, YOU ONLY CHANGE THE FINE TOOTH GEARS. THESE GEARS ALWAYS MESH AS FOLLOWS- A TO B   AND C TO D WITH B AND C ON SHAFT "B"**

When changing gears, you have 2 adjustments to mesh your gears properly.   Shaft "B" which holds gears B and C moves in 2 directions. It is attached to a bracket which swings when the allen bolt is loosened, and it also slides up and down in a slot when the square end of the shaft is loosened using the "T" handle from your toolpost.

KEY TO DIAGRAM

1.   SHAFT "A" WITH BUTTON OILER IN CENTER
2.   SHAFT "B" WITH SQUARE DRIVE END
3.   SHAFT "C"
4.   ADJUSTER SLOT WITH ALLEN BOLT
5.   GEAR "A"

6. GEAR "B"
7. GEAR "C"
8. GEAR "D"
9. SWIVELING PLATE
10. SLOT IN PLATE FOR SHAFT "B"
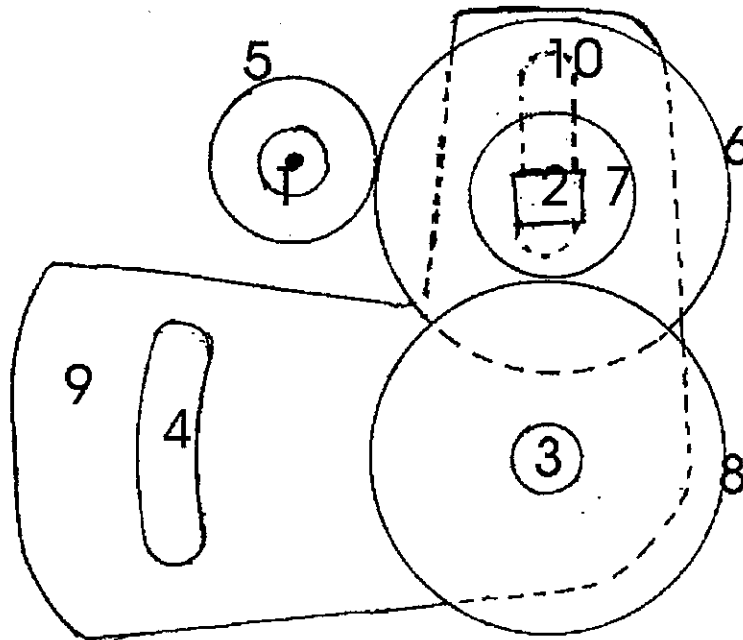
CHANGING GEAR RATIOS

1. Remove the " C " clips from shafts A,B.C
2. Loosen the allen screw adjuster nut and swing gear "B" away from gear "A", loosen the shaft "B" with your toolpost tool.
3. Remove the gears from the shafts. On shaft "A" you will remove the fine tooth gear from the shaft end leaving the course tooth gear in place, on shaft "B" you will remove both gears and on shaft "C" you will remove the fine tooth gear, leaving the spacer and coarse tooth gear in place.
4. Place your new gear "A" on shaft "A"
5. Place your new gear "B" on shaft "B" followed by your new gear "C".
6. Place your new gear "D" on shaft "C"

7. Slide shaft "B" down until gears "C" and "D" are meshed and then tighten shaft "B"
8. Swing shaft "B" until gears "A" and "B" are meshed and tighten the allen adjuster.
9. Replace all "C" clips
10. Engage your lead screw gearbox and turn the spindle by hand to test the mesh of the gears before turning motor on.

31. Inside the housing you will find the High-Low spindle speed and spindle brake assembly.
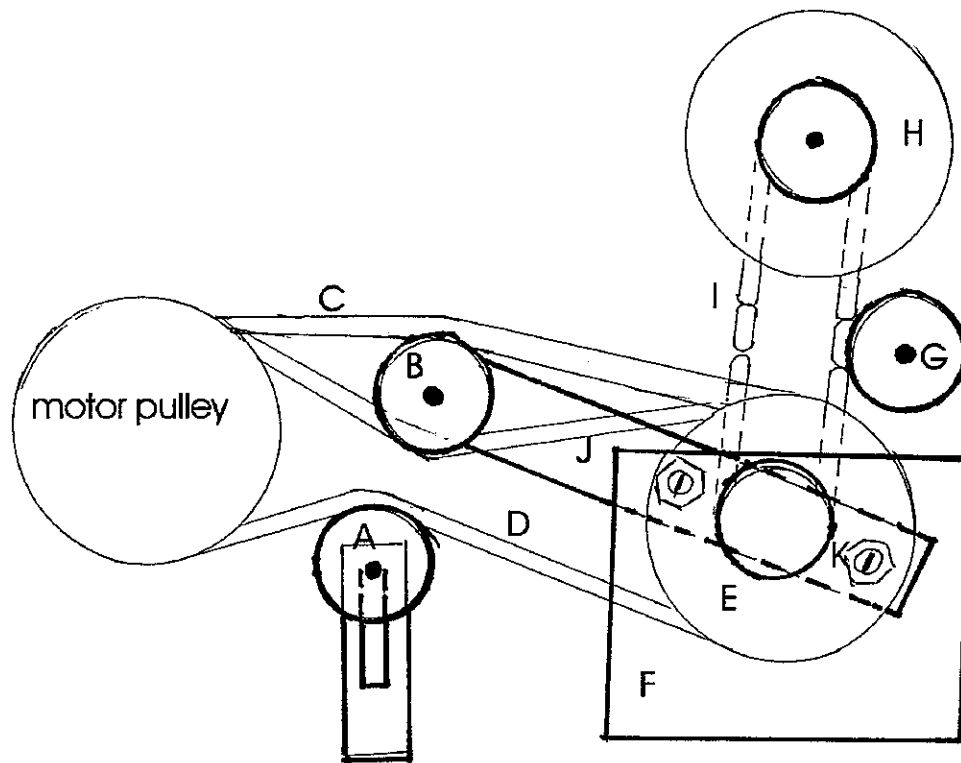
KEY TO PARTS
A. HIGH AND LOW SPEED BELT SUPPORT ROLLER
B.   HIGH AND LOW SPEED TENSION ROLLER
C.   LOW SPEED BELT
D.   HIGH SPEED BELT
E.   PRIMARY DRIVE PULLEY
F.   MOUNTING PLATE
G.   CHAIN TENSION SPROCKET
H.   SECONDARY DRIVE PULLEY
I.   DRIVE CHAIN

J.   ACTIVATION ARM
K.   BRAKE ADJUSTERS

OPERATION AND ADJUSTMENTS

Your High-low spindle and brake has 2 main functions.
1. Switching from High to Low spindle speeds while motor continues to run.
2. Stopping the spindle when in the neutral position.

The lathe motor has a double groove pulley driving 2 identical size belts to the primary drive pulley (**E**). When the activation arm (**J**) is in the neutral position, both belts are un-tensioned, allowing the motor to continue running while the spindle is stopped by the replaceable brake pads. The activation arm is controlled by a rod attached to the High-Low lever on the upper corner of the sheet metal housing . This lever has 3 positive detent positions for High, Low and Neutral . The activation arm has 2 cams which engage the brake adjusters (**K**) when the lever engages the Neutral position. These cams force the brake pads against the face of the primary drive pulley and stop the motion of the lathe spindle. When either High or Low speed is selected, the brake pads are released and a spring holds the arm away from the primary drive pulley to prevent the brake pads from dragging. The primary drive pulley drives the Secondary drive pulley (**H**) by means of a roller chain. The chain has an adjustable tensioner sprocket (**G**) to allow adjustment as time passes. The tensioner is held on a sliding bracket with 2 6MM screws tapped into the machine casting. You will note that the mounting plate (**F**) also has 2 adjustable slots with allen type screws. Because the shaft for the primary drive pulley is tapped into the machine casting, and the plate attaches to the sheet metal housing, these slotted holes allow the plate to be centered to the shaft.

ADJUSTMENTS

The belts from the motor to the primary drive pulley have 2 adjustments. The motor itself is on a moving mounting plate and is adjusted by a threaded adjuster rod coming off the rear of the lathe column. There is also a slotted bracket which holds the support roller (**A**) and allows it to move up and down. The motor should be adjusted so that the belts are loose in the neutral position. Once done, the nuts on the adjuster arm should be securely tightened to prevent the motor from vibrating them loose. The support roller should be adjusted up to hold the belts into position, so the belt not in tension does not tend to

come loose from the pulley groove. Care should be taken, so that when engaged in either High or Low speed, there is sufficient tension to drive the spindle without slippage, but not too much that the belts drag when in neutral. This would create heat and friction on the belts and cause a howling or squeaking sound in neutral.

The chain from the primary drive pulley to the secondary drive pulley should have about ¼" deflection om the side opposite the idler pulley. The idler can be moved by loosening the 2 allen bolts and sliding the bracket in the slots.

The brake adjusters should be adjusted, so that when in neutral, the spindle pulley will stop, but can still be turned by placing the chuck key in the scroll slot. Too much brake tension will make it hard to engage high or low speed. The brake pads are replaceable once they have worn away. To adjust the brakes, loosen the lock nut on the adjuster screw and turn them to the desired place and re-tighten the lock screw.

The engagement rod from the handle to the activation arm can be adjusted by loosening the lock nuts and adjusting the length so the brakes are engaged fully when the handle is in the neutral detent position.

CAUTION

The spindle brake is designed to allow you to stop the spindle and measure parts during operations. But it is not designed to allow you to change parts- always turn the motor off before attempting to loosen the chuck jaws.

32. The belt tension and speed selection for the lathe spindle is controlled by a sliding idler puller moved by a handle and acme screw thread. The handle is found in your accessories box and should be installed onto the square drive found on the rear of the sheet metal housing. The main drive belt system consists of 3 pulleys and 2 belts. The first pulley in line is mounted on a shaft threaded into the casting and riding on 2 roller bearings. These bearings should be cleaned and packed every 100 hours of use. This pulley is driven by the chain from the pulley described in the previous section. This primary pulley drives the center idler with a belt, and the center idler drives the main spindle pulley with the second belt. Tension and speed selection is accomplished by turning the adjuster crank. As the center idler moves on its sliding mount, it also has a second swing arm which allows both belts to be tensioned at the same time and to the same tightness. Simply turn the crank to release the belt tension, select the ratio of drive for the speed desired and re-tighten the crank. CAUTION: THE CRANK CAN PUT AN EXTREME AMOUNT OF PRESSURE ON THE SYSTEM IF OVERTENSIONED- USE COMMON SENSE

33. The TRI POWER is equipped with push button safety style switches for the lathe motor. The color markings are easy to remember, with green being forward , the black reverse and bright red for off. Should it become necessary to shut the machine down quickly, just push the red center button.

34. The mill switch is identical to the lathe switch.

35. The y axis power feed control is conveniently located on your left to allow you to use one hand for power feed operations and the other for manual control. The lever has 3 detent positions for forward, neutral and reverse.

36. This lever operates the high and low gearbox for your primary gearbox speeds. The lever to the left is the low range, straight is neutral and to the right is high range. There is a 2/1 ratio between high and low. **NOTE: The main spindle bearings are splash lubricated by the gearbox, therefore you must <u>ALWAYS have your gearbox in either high or low when running the lathe.</u>**

37. Your TRI POWER is equipped with a unique lathe spindle indexer. A degree wheel is fixed to the spindle and divided into 360 degree markings, with a detent hole each 10 degrees. Attached to the lathe body is a spring loaded pin which can be engaged into any of the detent holes to mark off the spindle rotation in 10 degree increments. The spring loaded pin is mounted on a swing away bracket for convenience.

38. Your machine comes equipped with a 5" 3 jaw chuck with a set of inner and outer jaws as well as a conventional chuck key. The chuck is mounted to the spindle flange by 3 bolts from the rear. Also included in your box of tools is the " auto key" for the 3 jaw chuck. This is a piece of angle with a hex piece and 2 detent screws, plus a long key with a spring attached. The angle piece mounts to the 2 allen bolts holding the front cover (#4) to the machine. You will see that after you bolt the angle piece to the cover and put the key through the hex piece that the key will align with the square holes on your 3 jaw chuck . The spring and detents will prevent the key from engaging the chuck while it is spinning.

39. This is your mill motor.

40. This is the Z axis drive plate. It consists of a 3 piece "sandwich" with a top plate around the quill, a center section and a lower plate. The 3 pieces are held together by bolts and when tight they clamp solidly around the quill. The plate has 3 " arms" – the one toward the front is for the mill / drill depth stop rod. The one pointing toward the tailstock attaches to the drive screw from your mill power feed gearbox and the one pointing to the

rear of the machine is for the DRO scale. There is also a small angle bracket in your box of tools which is used for the DRO mounting. CAUTION- your power feed, CNC and manual drives can generate a lot of force, and driving beyond the limits of the travel could bend or break this plate.

41. The TRI POWER machine has a unique design in which the steady rest and tailstock are combined. This offers some advantages over other designs in that the steady rest has a larger and more stable base and can be off set for taper turning of large diameter pieces. The tailstock barrel assembly is held to the assembly by 3 allen bolts for quick removal and replacement. The tailstock on the TRI POWER can be driven by your X axis power feed. At the end of the tailstock carriage you will find a large knob that is attached to a rod which passes through the base of the tailstock. In the X axis carriage there is a threaded hole into which this rod threads. In this way, the tailstock will now travel along when the X axis carriage is moving. When doing deep hole boring where a slow and steady feed rate is necessary, simply engage your power feed and leave your hands free to lubricate the drill etc. By using the auto stop mechanism, you can pre-set your drill depth for repeated passes.

42. This handle locks your Y axis carriage

43. Hidden behind and below the cross slide table is the CNC drive for your Y axis.

44. Behind the carriage you will find the lathe drive motor.

45. Your Shopmaster toolpost is a turret style with the unique feature of removable and adjustable height tool holders as well a a removable compound assembly.. The main base is held to the table with a long "T" bolt which fits into either of your table slots and can be positioned at any point along the length of the table. Simply loosening the handle allows the entire toolpost to be removed when operating the mill or drill press. The center toolpost section has 4 detent positions for rapid positioning at 90 degree points. The toolpost can be clamped at any angle between as well. 4 holders come with your machine. 2 are lathe tool holders designed for cutting tools up to 7/16" shank size. One is a combination holder which will accept lathe tools as well as round boring bars due to its "V" slot in the bottom. One is a parting tool holder designed to accept standard ½" parting tool blades. Each of the holders is adjustable for center height by loosening the main lock bolt and adjusting the allen bolt. Once the height is set, tightening the jam nut on the adjuster bolt will allow you to remove and replace the holder without the need of further adjustments. Your compound slide is removable to allow you to use the turret for heavy cuts, while leaving you the

compound function for the lighter work such as threading and bevel cutting. Extra tool holders may be purchased as spare parts from the parts section of this manual.

46. The TRI POWER use special double pre-loaded nuts to reduce the inherent backlash in the acme system. On both the X and Y tables, each acme screw has double nuts with a tension spring between them. The nuts are held in a bracket with a clamp lock. When the clamp lock is loosened, the spring automatically forces the nuts away from each other until they are tight against the threads of the lead screw. Because they are now contacting both the leading and training edges of the screw, the backlash is eliminated. As the machine is used and more wear begins to show, it is a simple operation to loosen the bracket and allow the nuts to re-adjust themselves automatically.

THREADING INSTRUCTIONS

Your TRI POWER machine uses a different style of threading system than most conventional lathes. This is due in part to the CNC drives being built into the machine. If you follow the instructions and experiment on some scrap stock, you will find that it is actually easier than the thread dial type machines. For you experienced machinists, however, you may have to make a mental note to "forget" the system you are used to before learning this one.

The principle of multiple pass threading consists of 2 important features;

1. You must always start and stop your carriage at the same point along the X axis of the machine and,
2. You must always start each threading pass in the same position of the chuck rotation.

If you miss either of these rules, you will not follow in the same path each time and end up "wiping" away your previous cuts.

In order to maintain your position along your carriage travel, you select your starting and stopping points and can simply set your X axis dial to 0 and count the turns, or if you have a Digital Readout system, set the 0 point and the stopping point. With your TRI POWER you have a more convenient way with the use of the auto stops on the X axis carriage. By adjusting the auto stops you can set the carriage to start and stop at the same point automatically. That establishes the first one of your 2 features.

Setting the rotational position of the chuck is as using the lathe spindle indexer to find a point in the chuck rotation. By always returning to this point, your multiple passes will always start on the same rotational position of your work piece.

Once the 2 main features are established, and assuming you have the proper threading tool and your center height is set etc., you are ready to make some test cuts.

CUTTING THREADS

1. Turn on your machine and allow the carriage to run in reverse until the auto stop engages at the beginning point. (Even though your dial may read 0 at this point, it's a good idea to manually back the handle a few turns more and then come back to 0 each time to remove any back lash in the lead screw assembly. It's a good idea to have your starting point just beyond the end of your part.
2. Place the hi-low spindle brake lever into neutral being sure it is fully in the detent position and with the motor still running. Your chuck will now be stopped.
3. Bring the chuck around until your reference points on the spindle indexer are lined up.
4. Engage your lead screw shifter into the forward travel position .
5. Set the depth of your first cut on the Y axis table. (Have your dial locked to 0 so that you can easily read the depth and always return to 0. If you have a Digital Readout system, 0 your display and read your depths from the display screen.
6. Now you are ready for your first pass, you will note that you are starting at the reference mark on your chuck and the 0 point on your X axis carriage.
7. Engage the low speed on your hi-low spindle and allow the carriage to travel until the auto stop disengages it.
8. Now back your Y axis away from the part beyond your 0 point.
9. Engage your lead screw lever in the reverse position and allow the carriage to return to the starting point and allow the auto stop to disengage the carriage. Back the handle up and return to 0 as explained before.
10. Set the Y axis to the depth of your second cut.
11. Put your hi-low spindle lever into the neutral position and when the chuck is stopped, bring it around until your reference marks are lined up.
12. Put your lead screw shifter into the forward travel position again. You will now see that you are ready to start your second pass at the same point of the x axis carriage and rotation of the chuck.

This insures that you will be cutting in the same "groove" as your first pass.

13. Engage your hi-low spindle and allow the carriage to make the second pass.
14. Continue repeating this routine until you have achieved the proper thread depth.

HELPFUL HINTS

Threading is a skill that must be learned and practiced, so do not be discouraged if you make some errors early on. It is important to have your tool at the proper height, and for smaller diameter parts use your tailstock with center or the follow rest to prevent deflection of the part. Always set your spindle to the lowest speed for threading. The "by the book" method is to use your compound set your tool at 29.5 degrees to the part, but for most everyday jobs this is not necessary.

MACHINE TROUBLESHOOTING

1. Too much backlash on table-
A. Check brass nuts on the lead screw for adjustment and tightness.
B. Check the set screws holding the lead screw nuts on the carriage and cross slide.
C. Check tightness of Cross Slide Handle.

2. Table loose on ways-
A. Adjust gibs.
    B. Check compound lock nuts for tightness.

3. Spindle works on low speed but stalls on high-
A. Check pre-load on spindle bearings.
B. Check bearings for proper lubrication.
C. Check belt tension.

LUBRICATION OF THE UNIT

For accurate work, machinery must be properly lubricated. To achieve this, it is important to use the proper oil (10W Machine oil) at the proper time intervals. The lubrication diagram gives the minimum requirements but might need some clarification. For example, ITEM 1 HEAD STOCK, is probably the most important as well as the most complicated. Take time to examine the CLEAR PLASTIC PORT located below the lathe spindle. It is called the GEAR BOX SIGHT GLASS. It is important to add only enough oil to become visible in the sight glass when the lathe is running. If needed, add oil by unscrewing the slotted plug that is located on the gearbox inspection plate which is just above the LATHE motor on the back of the machine. DO NOT OVERFILL. Another important item is to make sure the lathe bed ways are lubricated each time you use the unit. Oil all "button" oilers daily. Use

Oil Fill Plug

Allen
Screws (6

Lathe Motor
Mounting Stud
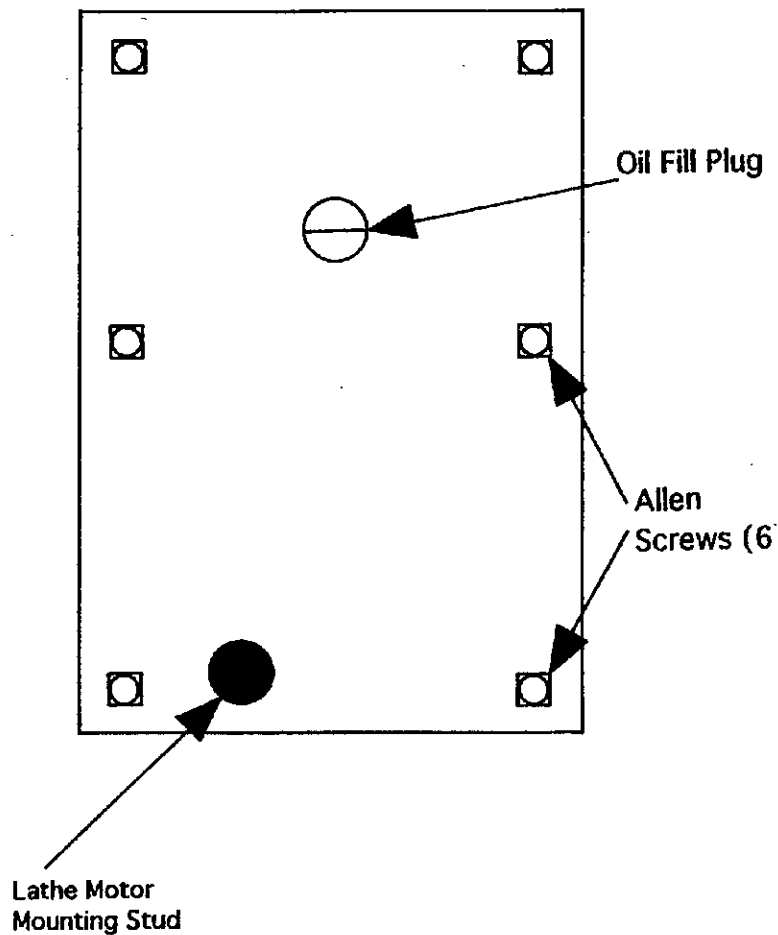
GEARBOX INSPECTION PLATE

During periodic maintenance you may want to inspect your internal drive gears and clean
The gearbox reservoir. On the back side of the main lathe column you will find the gearbox
Inspection plate. It is secured with 6 allen bolts and has a heavy gasket which can be re-used.
 Drain the oil by removing the drain plug below the 3 jaw chuck. Remove the lathe tension rod.
 Remove the 6 allen bolts and remove the cover. After your maintenance is completed, replace
The gasket and cover. Refill the gearbox with 10 weight oil (auto trans fluid will work fine).
Your oil level should be about ½ way on the sight glass.

NOTES ON THE THREE JAW CHUCK

Your TRI POWER comes with a conventional 3-jaw chuck. Some also come with a 4-jaw chuck as an option. See the notes on the 4-jaw chuck in the next section. The normal 3-jaw chuck has three inside jaws and three outside jaws. Be sure to take careful note that all bolts that hold the chuck to it's face plate are tight and that the chuck fits properly in the face-plate recess made for it. The various parts of the chuck are an integral part of that particular chuck and should always maintained as a unit. Each chuck is manufactured as a unit and is dialed in with the jaws that are provided with the chuck. The serial number of each individual chuck is stamped on the body and on each of the jaws (see following illustration). The order in which the jaws go into the chuck is also critical to maintain accuracy. Note that the jaws are numbered 1, 2 and 3 as well as stamped with the serial number.
THE NUMBER ON THE CHUCK JAW, BOTH INSIDE AND OUTSIDE, INDICATE THE POSITION THAT THEY SHOULD BE PLACED IN THE CHUCK BODY. Jaw NO. 1 must go in the slot stamped NO. 1 on the chuck body. The same NO. 1 slot will also typically have the chuck serial number stamped immediately after the slot number. Make certain you follow the instructions for installation exactly.

INSTALLATION OF THE CHUCK JAWS

1. Using the chuck key provided, scroll to where the beginning of the scroll thread is visible in the NUMBER ONE slot, then back the thread off until the beginning of the thread is no longer visible in the slot (one-half turn counter clockwise will usually do it).

2. Next, insert the jaw numbered NO. 1 in the slot and firmly push it toward the center of the chuck.

3. Scroll the chuck until the thread becomes visible in the second slot; at this point pull out on the previously installed jaw to ensure that the scroll has engaged the teeth on the back of the jaw. If the jaw comes out, repeat steps 1 & 2. If the jaw holds proceed to step 4.

4. With the beginning of the thread visible in the second slot, again back it off one-half turn and insert the jaw. Push it firmly toward the center of the chuck.

5. Scroll the chuck until the thread becomes visible in the third slot; pull out on 2nd jaw to ensure the scroll has engaged the teeth.

6. Repeat the steps for the third jaw.

WHEN ALL THE JAWS ARE INSTALLED AS INSTRUCTED ABOVE, THEY WILL MEET AT THE CENTER OF THE CHUCK SIMULTANEOUSLY.

TO RECAP THE PROCEDURE...

1. Jaws are inserted in numerical order 1-3.
2. Always begin with slot No. 1.

3. Scroll until the beginning of the thread is visible.
4. Install jaw, pushing it firmly toward center of chuck.
5. Scroll until the beginning of the thread is visible in the next slot.
6. Test the jaw just installed by pulling out.
7. Repeat from STEP 4 until all the jaws are firmly installed.
8. Scroll the chuck until all jaws meet in the center of the chuck.

IMPORTANT! IF ALL THE JAWS DO NOT MEET AT THE CENTER, RE-PEAT THE STEPS ABOVE AFTER REMOVING THE INCORRECTLY IN-STALLED JAWS.
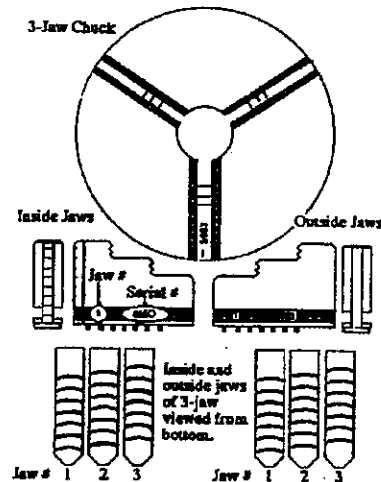
NOTE!

IF YOU LOSE THE JAWS YOU WILL HAVE TO BUY A COMPLETE NEW CHUCK-PARTS ARE NOT INTERCHANGABLE.

NOTES ON THE FOUR-JAW CHUCK

The 4-jaw chuck can be purchased as an option. Whether or not you need the extreme accuracy offered by a 4-jaw chuck is a decision that you need to make. Also, some units come with a machined installation plate while others come with plate which must be machined by you (this depends upon our suppliers). The diagram and instructions in-
cluded at the back of this owner's manual will tell you how the plate must be machined to fit properly. It is not a very difficult procedure and might well qualify for your first serious project after you get set up and take a few practice cuts to familiarize you with your machine.

FACEPLATE MODIFICATION FOR THE FOUR JAW CHUCK.

Due to factory specification changes, please modify your faceplate according to the following instructions. Please refer to the following diagram for assistance.

1. Remove the three jaw chuck from the spindle.
2. Bolt the 8" face plate that came with your standard accessories to the spindle.
3. Cut away the existing shoulder that exists on your faceplate. This was used as a centering boss for an old-style chuck that is no longer available.
4. Make a cut across the surface of the face plate to true it to the spindle. Be sure to work slow to attain a ultra-smooth surface.
5. Cut away the face plate on the outside edge to create a new shoulder 0.200" high and 4.920" (125 mm) in diameter.
6. Test the fit of the 4-Jaw chuck to the face plate.
7. When the fit is snug, remove the face plate from the spindle.
8. Clamp the chuck to the face plate and mark the position of the four mounting holes.
9. Drill and tap holes to accept 5/16"-18 bolts supplied or any of your choice.

As always, do not be afraid to call the technical line for assistance.

FACEPLATE MODIFICATION: SIDE VIEW

FACEPLATE MODIFICATION: SIDE VIEW

Area machined in Step No. 5

Existing Shoulder to be Removed
See Step No. 3

8 in.

4.920 in.

Area machined in Step No. 5
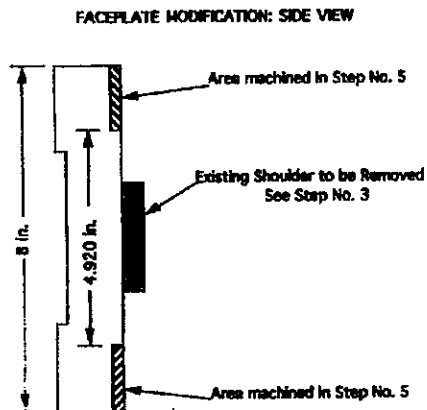
When performing any lathe work, please be sure to remove the chuck key from chuck BEFORE TURNING ON THE MACHINE! Serious injury can result if you carelessly leave the chuck key in the machine. It becomes a flying object of great speed due to the centrifugal force generated by the fast turning chuck.

A NOTE ON FEED RATES

For any machining exercise, certain parameters must first be calculated and set up on the machine, including RPM, FEED RATE, etc.. FEED is described as the

machine movement that causes a tool to cut into or along the surface of a work piece. The amount of FEED is usually measured in thousandths of an inch when cutting metal.

The most frequent recommendations regarding FEED RATES are .010 to .020 inches per revolution for rough machining and .003 to .005 inches per revolution for finish machining. Consultation of professional machinist manuals such as the Machinist's Ready Reference (ST 39) is highly recommended for detailed descriptions and tables that prove invaluable for nearly any machining operation. Contact the Shoptask technical line for any other additional support you may need. See appendix for feed rate charts.

APPENDIX 1

SELECTOR

POS'N 1   POS'N 2

TPI	TPI	GEAR A	GEAR B	GEAR C	GEAR D
20	10	60	30	50	27
22	11	60	33	50	27
24	12	60	36	50	27
26	13	60	39	50	27
28	14	60	42	50	27
30	15	56	42	50	27
32	16	60	48	50	27
34	17	60	51	50	27
36	18	50	54	60	27
38	19	50	57	60	27
40	20	50	60	60	27
42	21	50	63	60	27
44	22	60	33	50	54
46	23				
48	24	60	36	50	54
50	25	56	42	60	54
52	26	60	39	50	54
54	27	40	27	50	54
56	28	60	42	50	54
58	29				
60	30	56	42	50	54
62	31				

POS'N 1	POS'N 2	GEAR A	GEAR B	GEAR C	GEAR D
64	32	60	48	50	54
66	33	40	33	50	54
68	34	60	51	50	54

SELECTOR

POS'N 1	POS'N 2	GEAR A	GEAR B	GEAR C	GEAR D
70	35	40	42	60	54
72	36	50	54	60	54
74	37				
76	38	50	57	60	54
78	39				
80	40	50	60	60	54
82	41				
84	42	50	63	60	54
86	43				
88	44	50	33	30	54
90	45	40	27	30	54
92	46				
94	47				
96	48	50	36	30	54
98	49				
100	50	56	42	30	54
102	51	50	51	40	54
104	52	50	39	30	54
106	53				
108	54				
110	55	40	33	30	54
112	56	50	42	30	54

NOTE!! WITH THE USE OF OUR COARSE THREAD KIT, THREADS AS COARSE AS 4 TPI CAN BE CUT. WITH THIS KIT, YOU MAY FIND MANY SIZES AVAILABLE BY SIMPLY DIVIDING THE ABOVE NUMBERS BY 3.

EX: 24 TPI / 3 = 8 TPI USING THE SAME GEAR SET.

BLANK AREAS INDICATE THREAD STYLES NOT POSSIBLE.

APPENDIX 2

FEED RATES PER REVOLUTION

GEARS				LOWSPEED		HIGH SPEED	
A	B	C	D	FEED IN	FEED MM	FEED IN	FEED MM
30	60	27	63	.0029	.073	.0058	.147
30	57	27	63	.0030	.077	.0061	.155
33	60	27	63	.0032	.081	.0064	.162
33	57	27	63	.0033	.085	.0067	.170
36	60	27	63	.0035	.088	.0069	.176
36	57	27	63	.0037	.093	.0073	.186
39	60	27	63	.0038	.096	.0075	.191
36	56	27	60	.0039	.099	.0078	.198
42	60	27	63	.0041	.103	.0081	.206
39	60	30	63	.0042	.106	.0084	.212
42	56	27	63	.0043	.110	.0087	.220
42	60	30	63	.0045	.114	.0090	.229
39`	57	30	60	.0046	.117	.0092	.235
49	60	27	63	.0047	.120	.0095	.240
51	60	27	63	.0049	.125	.0098	.250
49	56	27	63	.0051	.129	.0101	.257
54	60	27	63	.0052	.132	.0104	.265
49	56	27	60	.0053	.135	.0106	.270
57	60	27	63	.0055	.140	.0110	.279
56	57	27	63	.0057	.144	.0114	.289
54	60	30	63	.0058	.147	.0116	.294
57	56	27	63	.0059	.150	.0118	.299
60	57	27	63	.0061	.155	.0122	.309

GEARS				LOW SPEED		HIGH SPEED	
A	B	C	D	FEED IN	FEED MM	FEED IN	FEED MM
60	56	27	63	.0062	.157	.0124	.315
56	57	30	63	.0063	.160	.0126	.321
60	54	27	63	.0064	.163	.0129	.327

A	B	C	D	FEED IN	FEED MM	FEED IN	FEED MM
57	56	30	63	.0065	.166	.0131	.332
63	57	27	60	.0067	.171	.0134	.341
63	56	27	60	.0068	.174	.0137	.347
57	56	32	63	.0070	.177	.0140	.355
63	54	27	60	.0071	.180	.0142	.360
63	56	27	57	.0072	.183	.0144	.365
60	56	32	63	.0073	.187	.0147	.373
63	57	30	60	.0075	.189	.0149	.379
63	56	30	60	.0076	.193	.0152	.386
56	54	33	60	.0077	.196	.0154	.391
63	49	27	60	.0078	.198	.0156	.397
63	57	32	60	.0080	.202	.0159	.404
63	56	32	60	.0081	.206	.0162	.411
63	57	33	60	.0082	.208	.0164	.417
63	56	33	60	.0084	.212	.0167	.424
63	56	32	57	.0085	.217	.0171	.433
63	54	33	60	.0087	.220	.0173	.440
63	56	33	57	.0088	.223	.0176	.447
63	57	36	60	.0090	.227	.0179	.455
63	56	36	60	.0091	.231	.0182	.463
63	54	33	56	.0093	.236	.0186	.471
63	54	36	60	.0095	.240	.0189	.480
63	56	36	57	.0096	.244	.0192	.487
63	57	39	60	.0097	.246	.0194	.493

GEARS				LOW SPEED		HIGH SPEED	
A	B	C	D	FEED IN	FEED MM	FEED IN	FEED MM
63	56	39	60	.0099	.251	.0197	.501
63	51	36	60	.0100	.254	.0200	.508
63	54	36	56	.0101	.257	.0203	.514
63	54	39	60	.0102	.260	.0205	.520
56	39	32	60	.0103	.263	.0207	.525

A	B	C	D	FEED IN	FEED MM	FEED IN	FEED MM
63	57	42	60	.0104	.265	.0209	.531
63	56	42	60	.0106	.270	.0213	.540
56	57	51	63	.0107	.273	.0215	.545
63	51	39	60	.0108	.275	.0217	.551
63	54	42	60	.0110	.280	.0221	.560
63	56	42	57	.0112	.284	.0224	.568
56	51	48	63	.0113	.287	.0226	.574
63	51	39	57	.0114	.290	.0228	.580
63	48	39	60	.0115	.293	.0230	.585
63	51	42	60	.0117	.297	.0233	.593
63	54	42	56	.0118	.300	.0236	.600
63	57	48	60	.0119	.303	.0239	.606
63	51	39	54	.0120	.306	.0241	.612
63	57	49	60	.0122	.310	.0244	.619
63	51	42	57	.0123	.312	.0246	.624
63	56	49	60	.0124	.315	.0248	.630
63	51	42	56	.0125	.318	.0250	.635
63	57	51	60	.0127	.322	.0254	.644
63	56	48	57	.0128	.325	.0256	.650
63	56	51	60	.0129	.328	.0258	.656

GEARS				LOW SPEED		HIGH SPEED	
A	B	C	D	FEED IN	FEED MM	FEED IN	FEED MM
63	56	49	57	.0131	.332	.0261	.663
63	42	39	60	.0132	.334	.0263	.669
63	54	48	57	.0133	.337	.0265	.674
63	57	54	60	.0134	.341	.0269	.682
63	54	49	57	.0135	.344	.0271	.688
63	56	54	60	.0137	.347	.0273	.694
63	54	49	56	.0138	.350	.0276	.700
63	57	56	60	.0139	.354	.0279	.707
63	54	51	57	.0141	.358	.0282	.716

63	51	48	56	.0143	.363	.0286	.726
63	56	57	60	.0144	.366	.0289	.733
63	51	49	56	.0146	.371	.0292	.741
63	54	56	60	.0147	.373	.0294	.747
63	51	48	54	.0148	.377	.0296	.753
63	54	57	60	.0150	.380	.0299	.760
63	30	32	60	.0151	.384	.0302	.768
63	48	49	57	.0152	.387	.0305	.774
63	49	48	54	.0154	.392	.0309	.784
63	51	56	60	.0156	.395	.0311	.791
60	32	39	63	.0157	.398	.0313	.796
63	51	57	60	.0158	.402	.0317	.805
63	56	60	57	.0160	.406	.0320	.812
57	30	32	51	.0161	.409	.0322	.818
63	49	56	60	.0162	.411	.0324	.823
63	51	56	57	.0164	.416	.0328	.832
63	54	60	57	.0166	.421	.0332	.842

GEARS				LOW SPEED		HIGH SPEED	
A	B	C	D	FEED IN	FEED MM	FEED IN	FEED MM
63	49	54	56	.0167	.425	.0335	.850
63	54	60	56	.0169	.429	.0338	.857
63	49	56	57	.0171	.433	.0341	.866
63	33	36	54	.0172	.436	.0344	.873
63	51	56	54	.0173	.439	.0346	.879
63	48	56	57	.0174	.442	.0348	.884
63	51	60	57	.0176	.446	.0351	.892
63	49	57	56	.0177	.449	.0353	.897
63	51	60	56	.0179	.454	.0357	.908
63	48	57	56	.0180	.458	.0361	.916
60	49	56	51	.0182	.461	.0363	.922
63	49	60	57	.0183	.464	.0365	.928
63	48	56	54	.0184	.467	.0368	.933

A	B	C	D	FEED IN	FEED MM	FEED IN	FEED MM
63	51	60	54	.0185	.471	.0371	.941
63	48	60	57	.0187	.474	.0373	.947
63	48	60	57	.0188	.477	.0375	.953
60	33	30	39	.0189	.480	.0378	.959
63	48	60	56	.0190	.482	.0380	.964
63	42	54	57	.0192	.487	.0384	.975
63	49	60	54	.0193	.490	.0386	.980
63	49	57	51	.0194	.493	.0388	.985
63	42	54	56	.0195	.496	.0391	.992
63	48	60	54	.0197	.500	.0394	1.000
63	48	57	51	.0198	.503	.0396	1.006
63	32	42	56	.0199	.506	.0399	1.013
63	36	51	60	.0201	.510	.0402	1.020
63	48	56	49	.0203	.514	.0405	1.029
63	49	60	51	.0204	.519	.0408	1.037

GEARS				LOW SPEED		HIGH SPEED	
A	B	C	D	FEED IN	FEED MM	FEED IN	FEED MM
63	42	57	56	.0206	.524	.0412	1.047
63	39	57	60	.0207	.526	.0414	1.052
63	48	60	51	.0208	.529	.0417	1.059
63	42	56	54	.0210	.533	.0420	1.067
63	36	51	57	.0211	.537	.0423	1.074
63	42	60	57	.0213	.541	.0426	1.083
63	39	56	57	.0214	.544	.0429	1.088
63	27	39	57	.0216	.547	.0431	1.095
63	42	60	56	.0217	.551	.0434	1.102
57	30	51	60	.0218	.554	.0436	1.108
63	33	51	60	.0219	.556	.0438	1.113
63	36	56	60	.0221	.560	.0441	1.120
63	39	57	56	.0222	.564	.0444	1.128
63	36	54	57	.0224	.568	.0448	1.137
63	42	60	54	.0225	.572	.0450	1.143
63	42	57	51	.0226	.575	.0453	1.150

A	B	C	D	FEED IN	FEED MM	FEED IN	FEED MM
63	36	54	56	.0228	.579	.0456	1.157
63	39	60	57	.0230	.583	.0459	1.166
63	39	54	51	.0231	.586	.0462	1.173
63	36	56	57	.0232	.590	.0464	1.179
63	39	60	56	.0234	.593	.0467	1.187
63	42	57	49	.0236	.598	.0471	1.197
60	33	54	56	.0237	.601	.0473	1.202
63	42	60	51	.0238	.605	.0476	1.210
63	39	56	51	.0239	.608	.0479	1.216
63	36	57	56	.0240	.611	0481	1.222
63	39	60	54	.0242	.615	.0485	1.231

GEARS				LOW SPEED		HIGH SPEED	
A	B	C	D	FEED IN	FEED MM	FEED IN	FEED MM
63	39	57	51	.0244	.619	.0487	1.238
63	33	57	60	.0245	.622	.0490	1.244
63	36	51	49	.0246	.625	.0492	1.249
63	33	49	51	.0248	.629	.0495	1.258
63	36	60	57	.0249	.632	.0497	1.263
63	36	54	51	.0250	.635	.0500	1.271
63	32	54	57	.0252	.640	.0504	1.279
63	36	60	56	.0253	.643	.0506	1.286
63	39	56	48	.0254	.646	.0509	1.292
60	33	51	49	.0255	.649	.0511	1.298
63	39	60	51	.0257	.652	.0513	1.303
60	32	57	56	.0258	.654	.0515	1.309
63	39	57	48	.0259	.658	.0518	1.316
56	27	39	42	.0260	.660	.0520	1.321
63	32	56	57	.0261	.663	.0522	1.326
63	36	60	54	.0263	.667	.0525	1.333
63	36	57	51	.0264	.671	.0528	1.341
63	36	54	48	.0266	.675	.0532	1.350
63	39	60	49	.0267	.678	.0534	1.357
63	33	51	49	.0268	.681	.0536	1.363

A	B	C	D	FEED IN	FEED MM	FEED IN	FEED MM
63	30	57	60	.0269	.684	.0539	1.368
63	33	60	57	.0271	.689	.0543	1.378
63	39	60	48	.0273	.692	.0545	1.385
63	36	57	49	.0275	.698	.0550	1.396
63	33	60	56	.0276	.701	.0552	1.403
63	36	60	51	.0278	.706	.0556	1.412
63	32	60	57	.0280	.711	.0560	1.421

	GEARS			**LOW SPEED**		**HIGH SPEED**	
A	**B**	**C**	**D**	**FEED IN**	**FEED MM**	**FEED IN**	**FEED MM**
63	32	54	51	.0281	.715	.0563	1.430
63	33	56	51	.0283	.719	.0566	1.438
63	32	60	56	.0285	.723	.0570	1.447
63	33	60	54	.0286	.727	.0573	1.455
63	33	57	51	.0288	.732	.0576	1.463
63	36	60	49	.0289	.735	.0579	1.470
63	39	56	42	.0291	.739	.0582	1.477
63	32	56	51	.0292	.741	.0584	1.483
63	32	54	49	.0293	.744	.0586	1.488
63	27	56	60	.0294	.747	.0588	1.494
63	32	60	54	.0295	.750	.0591	1.500
63	32	57	51	.0297	.755	.0594	1.509
63	30	60	57	.0298	.758	.0597	1.516
63	33	57	49	.0300	.762	.0600	1.523
63	30	51	48	.0301	.765	.0602	1.530
63	27	49	51	.0303	.769	.0605	1.537
63	30	60	56	.0304	.772	.0607	1.543
57	33	51	39	.0305	.775	.0610	1.549
63	33	57	48	.0306	.777	.0612	1.555
63	30	39	36	.0307	.780	.0614	1.560
63	32	57	49	.0309	.785	.0618	1.571
63	39	60	42	.0312	.791	.0623	1.583
63	32	60	51	.0313	.794	.0625	1.588
51	27	48	39	.0314	.797	.0628	1.594

A	B	C	D	FEED IN	FEED MM	FEED IN	FEED MM
63	30	60	54	.0315	.800	.0630	1.600
63	30	57	51	.0317	.805	.0634	1.610
63	30	54	48	.0319	.810	.0638	1.620

		GEARS			LOW SPEED		HIGH SPEED
A	B	C	D	FEED IN	FEED MM	FEED IN	FEED MM
63	27	57	56	.0321	.814	.0641	1.629
63	33	60	48	.0322	.818	.0644	1.637
63	30	56	49	.0324	.823	.0648	1.646
63	32	60	49	.0325	.827	.0651	1.653
63	27	56	54	.0327	.830	.0653	1.659
63	27	51	49	.0328	.833	.0656	1.666
63	30	57	49	.0330	.838	.0660	1.675
63	27	60	57	.0332	.842	.0663	1.684
63	30	60	51	.0334	.847	.0667	1.694
63	27	51	48	.0335	.850	.0669	1.700
63	27	32	30	.0336	.853	.0672	1.707
63	27	60	56	.0338	.857	.0675	1.715
63	36	56	39	.0339	.862	.0678	1.723
57	32	51	36	.0341	.865	.0681	1.731
63	32	54	42	.0342	.868	.0683	1.736
63	33	56	42	.0344	.873	.0687	1.746
63	36	57	39	.0345	.877	.0691	1.754
63	30	60	49	.0347	.882	.0694	1.763
63	30	48	39	.0349	.886	.0698	1.773
63	27	50	54	.0350	.889	.0700	1.778
54	27	39	30	.0351	.892	.0702	1.783
63	27	57	51	.0352	.894	.0704	1.788
60	30	51	39	.0353	.897	.0706	1.794
63	30	60	48	.0354	.900	.0709	1.800
63	33	54	39	.0357	.906	.0714	1.813
60	33	57	39	.0359	.911	.0717	1.822
63	32	57	42	.0361	.916	.0721	1.832

GEARS				LOW SPEED		HIGH SPEED	
A	B	C	D	FEED IN	FEED MM	FEED IN	FEED MM
63	32	49	36	.0362	.919	.0724	1.838
63	36	60	39	.0363	.923	.0727	1.846
63	30	54	42	.0365	.926	.0729	1.852
63	27	57	49	.0366	.931	.0733	1.861
63	33	60	42	.0368	.935	.0736	1.870
60	27	48	39	.0369	.938	.0738	1.876
63	27	60	51	.0371	.941	.0741	1.883
63	30	42	32	.0372	.945	.0744	1.890
63	27	57	48	.0374	.950	.0748	1.900
54	30	51	33	.0376	.954	.0751	1.908
63	33	57	39	.0377	.957	.0753	1.914
63	30	56	42	.0378	.960	.0756	1.920
63	32	60	42	.0380	.964	.0759	1.929
63	32	56	39	.0832	.969	.0763	1.939
63	27	39	32	.0384	.975	.0768	1.950
63	27	60	49	.0386	.980	.0771	1.959
54	30	51	32	.0387	.984	.0775	1.967
63	32	57	39	.0388	.987	.0777	1.973
60	27	39	30	.0390	.991	.0780	1.981
60	32	51	33	.0391	.994	.0782	1.987
63	30	54	39	.0393	.997	.0785	1.994
63	27	60	48	.0394	1.000	.0788	2.000
63	33	60	39	.0397	1.007	.0793	2.014
63	32	54	36	.0399	1.013	.0797	2.025
63	33	56	36	.0401	1.018	.0802	2.037
57	27	51	36	.0404	1.026	.0808	2.051
63	30	60	42	.0405	1.029	.0810	2.057

GEARS				LOW SPEED		HIGH SPEED	
A	B	C	D	FEED IN	FEED MM	FEED IN	FEED MM
63	30	56	39	.0407	1.034	.0814	2.068

A	B	C	D	FEED IN	FEED MM	FEED IN	FEED MM
63	32	60	39	.0409	1.039	.0818	2.077
63	32	51	33	.0411	1.043	.0822	2.087
63	27	51	39	.0412	1.046	.0824	2.093
63	30	57	39	.0414	1.052	.0829	2.105
60	27	54	39	.0415	1.055	.0831	2.110
60	30	51	33	.0417	1.060	.0835	2.120
57	30	54	33	.0420	1.066	.0839	2.132
63	32	57	36	.0421	1.069	.0842	2.138
57	27	49	33	.0423	1.075	.0846	2.150
63	30	54	36	.0425	1.080	.0851	2.160
63	27	57	42	.0428	1.086	.0855	2.172
63	33	60	36	.0430	1.091	.0859	2.182
60	27	56	39	.0431	1.094	.0862	2.188
57	30	54	32	.0433	1.099	.0866	2.199
63	32	54	33	.0435	1.105	.0870	2.209
63	30	60	39	.0436	1.108	.0872	2.216
63	30	51	33	.0438	1.113	.0876	2.226
63	30	56	36	.0441	1.120	.0882	2.240
63	32	60	36	.0443	1.125	.0886	2.250
63	27	51	36	.0446	1.133	.0893	2.267
63	30	57	36	.0449	1.140	.0898	2.280
63	27	60	42	.0450	1.143	.0900	2.286
63	32	56	33	.0451	1.146	.0902	2.291
63	27	56	39	.0452	1.149	.0905	2.298
57	27	51	32	.0454	1.154	.0908	2.307
60	30	54	32	.0456	1.157	.0911	2.315

	GEARS				LOW SPEED	HIGH SPEED	
A	B	C	D	FEED IN	FEED MM	FEED IN	FEED MM
56	27	49	30	.0457	1.162	.0915	2.323
63	32	57	33	.0459	1.166	.0918	2.332
63	27	57	39	.0460	1.169	.0921	2.339
63	30	54	33	.0464	1.178	.0928	2.357
60	30	57	33	.0466	1.185	.0933	2.369

A	B	C	D	FEED IN	FEED MM	FEED IN	FEED MM
63	27	49	33	.0468	1.188	.0935	2.376
63	30	60	36	.0473	1.200	.0945	2.400
60	27	57	36	.0475	1.206	.0950	2.413
56	27	51	30	.0476	1.209	.0952	2.418
63	30	54	32	.0478	1.215	.0957	2.430
60	27	48	30	.0480	1.219	.0960	2.438
63	30	56	33	.0481	1.222	.0962	2.444
63	32	60	33	.0483	1.227	.0966	2.455
63	27	60	39	.0485	1.231	.0969	2.462
63	27	51	33	.0487	1.237	.0974	2.473
63	30	57	33	.0490	1.244	.0979	2.488
60	27	54	33	.0491	1.247	.0982	2.494
63	30	56	32	.0496	1.260	.0992	2.520
63	27	57	36	.0499	1.267	.0998	2.534
63	27	51	32	.0502	1.275	.1004	2.550
63	30	57	32	.0505	1.283	.1010	2.565
60	27	54	32	.0506	1.286	.1013	2.572
60	27	56	33	.0509	1.293	.1018	2.586
57	27	54	30	.0513	1.303	.1026	2.606
63	30	60	33	.0515	1.309	.1031	2.619
60	27	57	33	.0518	1.316	.1036	2.632
63	27	60	36	.0525	1.333	.1050	2.667

GEARS				LOW SPEED		HIGH SPEED	
A	B	C	D	FEED IN	FEED MM	FEED IN	FEED MM
63	30	60	32	.0532	1.350	.1063	2.700
63	27	56	33	.0535	1.358	.1069	2.715
60	27	54	30	.0540	1.372	.1080	2.743
63	27	57	33	.0544	1.382	.1088	2.764
63	27	56	32	.0551	1.400	.1103	2.800
60	27	56	30	.0560	1.422	.1120	2.845
63	27	57	32	.0561	1.425	.1122	2.850
63	27	54	30	.0567	1.440	.1134	2.880
60	27	57	30	.0570	1.448	.1140	2.896
63	27	60	33	.0573	1.455	.1145	2.909

63	27	56	30	.0588	1.494	.1176	2.987
63	27	60	32	.0591	1.500	.1181	3.000
63	27	57	30	.9599	1.520	.1197	3.040
63	27	60	30	.0630	1.600	.1260	3.200

NOTE!! TO CALCULATE FEED RATE WHEN USING THE ST85 (COARSE THREAD
KIT), MULTIPLY THE ABOVE RATES BY 3.

EX: .0630 X 3 = 0.190

FOR FEED RATE PER MINUTE, MULTIPLY BY RPM.

EX: .0630 X 120 = 7.560 INCHES PER MINUTE.

ELECTRICAL TROUBLESHOOTING

!!!When Checking Electrical System,
Always Disconnect Unit From The Power Source!!!

1. Neither motor will run-
A. Be sure unit is plugged in.
B. Check your outlet with an electrical tester to be sure it is "hot".
C. Ensure electrical breaker hasn't been tripped.
D. Check the cord connections to the machine.
E. Check the connections from the junction block to the switches.

2. Only one motor runs-
A. Check all connections on inoperable motor junction block both top and bottom
sides.
B. Check connections of wires on switch.
C. Check connections of wires from switch to cord junction block.

3. Motor runs only one direction-
A. Check all connections on junction box.
B. Check connections from switch to motor.
C. Check switch contacts.

4. Motor runs slowly-
A. Check capacitor connections. If all are secure, switch capacitors from other
motor. If this solves the problem, then the capacitors are faulty and should be
replaced. Call the technical line for assistance.

5. Motor hums but does not turn-
A. Check capacitor connections.

6. Motor starts and stops constantly-
A. Check capacitor connections.
B. Check capacitor for damage, if all appears fine, switch capacitors from other motor. If this solves the problem, then the capacitors are faulty and should be replaced. Call technical line for assistance.
C. Check spindle pre-load. Loosen if it appears too tight. Remember it works on the same principle a car wheel bearing does.

!!!CAUTION!!!
Do not allow motor to run slowly or intermittently. This can cause windings to burn out and then the motor must be returned toShopmaster for repair.

7. Motor runs but makes noise-
 A. Check housing around the cooling fan for looseness or dents.
 B. Check drive pulley and belts for tightness.
 C. Check motor mount and bolts for tightness.

8. Motor runs fine, but seems too hot-
Note! Motors are designed for 110V current. In normal systems, the current can very from 105 to 125 volts. If your line is on the "high" side (over110V) then the motor will run hotter.

ILLUSTRATION A-4

WIRING DIAGRAM FOR POWER CORD

CORD TO
MILL MOTOR

MILL SWITCH

CORD TO
LATHE MOTOR

LATHE SWITCH

TERMINAL BLOCK

MOUNTING SCREW

GREEN

WHITE

POWER
CORD

BLACK
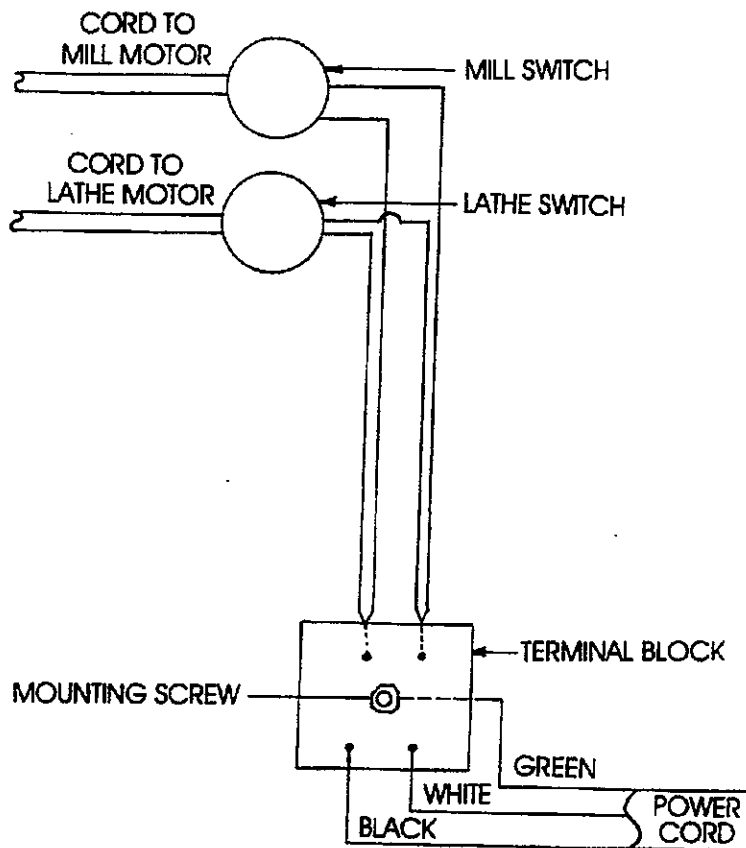
CAUTION ON MOTORS !!!!

THE MOST COMMON FAILURE OF AN INDUCTION MOTOR IS
THE START CAPACITOR. THIS IS EASILY FIXED, BY
REPLACING THE CAPACITOR. HOWEVER, ALLOWING THE
MOTOR TO RUN SLOWLY DUE TO CAPACITOR FAILURE WILL
OVERHEAT THE WINDINGS AND BURN THEM OUT. THIS WILL
VOID YOUR WARRANTY. THEREFORE, IF YOU HAVE A MOTOR
PROBLEM, STOP AND CALL FOR ASSISTANCE IMMEDIATELY.

TRI POWER MOTOR WIRING

MOTOR
SHAFT

Terminal block

Start capacitor
300 uf

Run capacitor
60 uf

TERMINAL BLOCK

SHAFT
END

BLANK

Z1 W1 or
Sometimes
U 1

U 2

V 1

Z2 W2

U 1

SWITCH WIRING DIAGRAM

U 2

LINE2-NEUTRAL

V 1

JUMPER

Z2W2   U 1   LINE 1-HOT

SWITCH VIEWED FROM
REAR ARROW POINTS UP
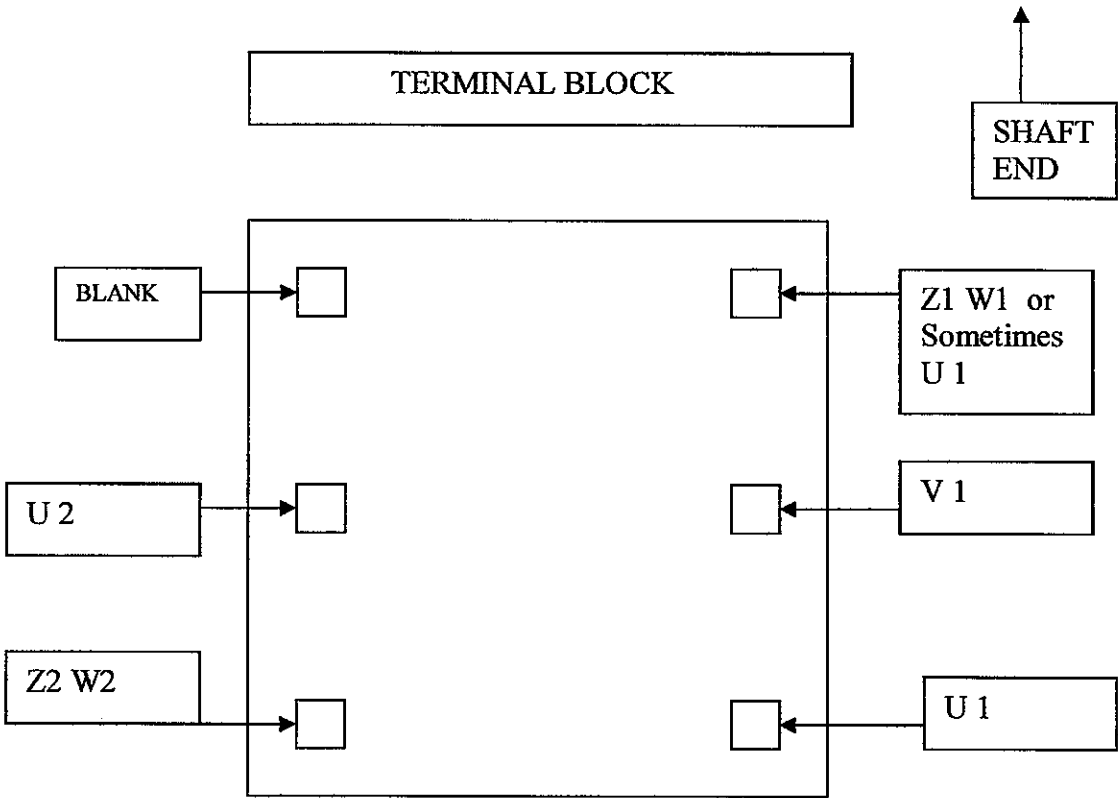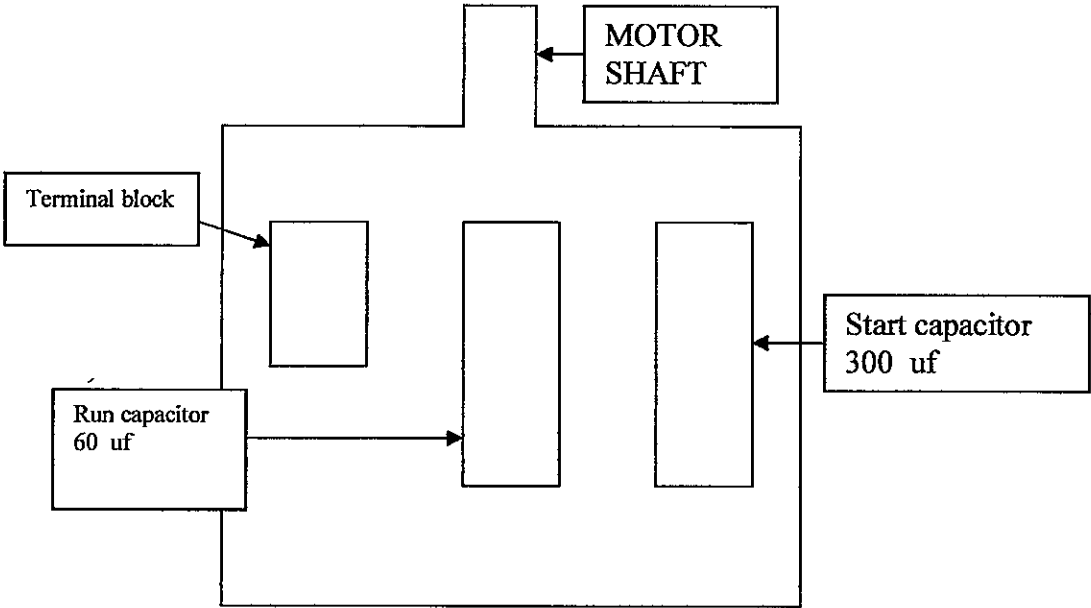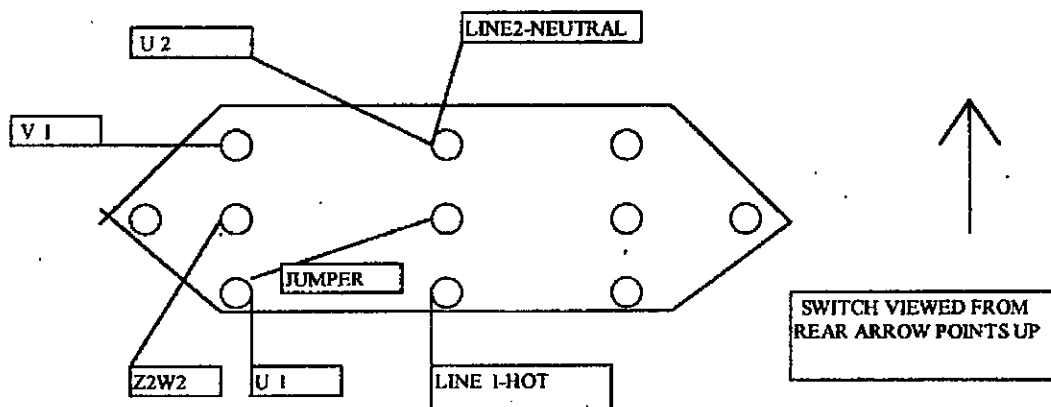
**NOTE: THIS VIEW IS FROM THE REAR OF
SWITCH.**

**LINE 1 IS YOUR BLACK WIRE
LINE 2 IS YOUR WHITE WIRE**

**THE 2 SWITCHES ARE CONNECTED BY JUMPER
WIRES AND CONNECTED TO THE POWER CORD
TERMINAL BLOCK.**

SPARE PARTS

1. **MAIN LATHE BED AND GEARBOX**

2. **LATHE SPINDLE DRIVE AND THREADING GEAR ASSEMBLY**

3. **LATHE SPINDLE AND COLUMN**

4. **MILL HEAD ASSEMBLY**

5. **MILL SPINDLE**

6. **MILL POWER FEED GEARBOX**

7. **MILL MOTOR AND SUPPORT ARM**

8. **TAILSTOCK**

9. **BENCH**

Please note that there were some changes after the first few production runs in the X and Y axes gearbox drives. Please call our technical line at 800 343 5775 for any questions. Please have your machine serial number available.

NOTES
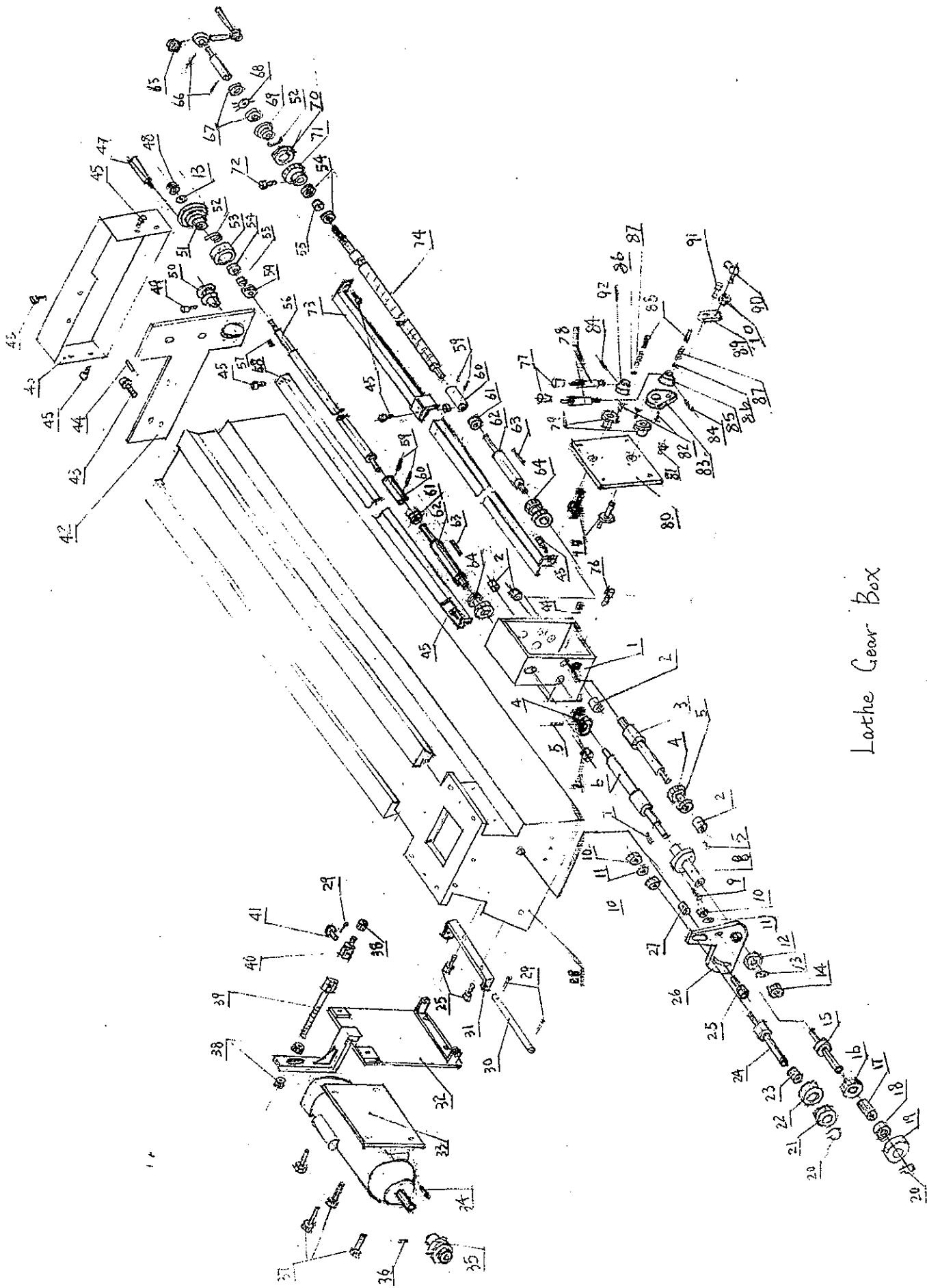
Lathe Gear Box

Lathe Gear Box

序号	图号 Part No.	名 称	Part Name	Specification	Quantity
1	DG800-01-103	走刀变速箱箱体	Gear box		1
2	DG800-01-106	轴套	Shaft sleeve		5
3	DG800-01-99	中间被动轴	Middle shaft		1
4	DG800-01-94	ST 齿轮组	ST gear set		2
5		开槽锥端紧定螺钉	Lock screw	M5×8	7
6	DG800-01-98	中间主动轴	Middle shaft		1
7		普通平键	Flat key	5×9	1
8	DG800-01-100	中间主动轴左端盖	Middle shaft left cover		1
9		十字槽沉头螺钉	Sank screw	M5×8	3
10		六角螺母	Hexagon screw	M8	4
11		平垫圈	Flat washer	Φ8	2
12	DG800-01-92	Q 齿轮	Q gear		1
13		平垫圈	Flat washer	Φ12	2
14		六角螺母	Hexagon screw	M12	1
15	DG800-01-67	VI 轴	VI shaft		1
16	DG400-01-68	M 齿轮	M gear		1
17	DG400-01-65	VI 轴花键套	VI shaft key		1
18	DG400-01-64	VI 轴套	VI shaft sleeve		1
19	DG400-01-66	L 齿轮	L gear		1
20		轴向弹性挡圈	Spring lock ring	Φ10	2
21	DG400-01-61	K 挂齿轮	K hanging gear		1
22	DG400-01-60	J 齿轮	J gear		1
23	DG400-01-62	V 轴花键套	V shaft key		1
24	DG400-01-59	V 轴	V shaft		1
25		内六角圆柱头螺钉	Inner hexagon screw	M8×16	3
26	DG800-01-63	挂轮板	Hanging gear plate		1
27	DG400-01-18	挂轮板垫套	Plate cushion		1
28	DG400-01-14	床身	Chassis		1
29		开口销	Open pin	Φ2×26	3
30	DG400-01-16	电机铰接轴	Motor connection rod		1

31	DG400-01-17	电机铰接板	Motor connection plate		1
32	DG400-01-76	电机座	Motor seat		1
33		电机	Motor	8024	1
34		普通平键	Flat key	6×45	1
35	DG400-01-36	电机皮带轮	Motor pulley		1
36		开槽锥端紧定螺钉	Lock screw	M5×15	1
37		六角螺栓	Hexagon screw	M8×30	4
38		六角螺母	Hexagon screw	M10	3
39	DG400-01-15	电机张紧螺钉	Motor tension adjusting screw		1
40	DG400-01-04	电机调节座	Motor adjusting seat		1
41	DG400-01-05	铰接小轴	Hinge shaft		1
42	DG800-01-22-02	导轴支架	Shaft support		1
43		内六角圆柱头螺钉	Inner hexagon screw	M8×15	4
44		圆锥销	Round pin	Φ5×20	4
45		内六角圆柱头螺钉	Inner hexagon screw	M8×8	14
46	DG800-01-22-03	床尾步进电机盖板	Step motor cover		1
47		转动手柄	Turning handle	M8×63	1
48		自锁六角螺母	Lock screw	M10	1
49		内六角圆柱螺钉	Inner hexagon screw	M5×20	1
50	DG400-03-14	被动带轮	Teeth wheel		1
51	DG800-01-80	横拖板手柄	Handle for carrier		1
52	DG800-01-23	弹簧片	Spring plate		2
53	DG800-01-81	刻度盘	Dial		1
54		推力球轴承	Bearing	51102	4
55	DG800-01-22-01	轴套	Sleeve		2
56	DG800-01-28	丝杆	Screw bar		1
57		普通平键	Flat key	5×14	1
58	DG800-01-82	光杆盖板	Bar shield		1
59		圆锥销	Round pin	Φ4×18	4
60	DG800-01-102	连接套	Connection sleeve		2
61	DG800-01-96	光杆连接轴套	Connection sleeve for bar		2
62	DG800-01-97	光杆连接轴	Bar connection shaft		2
63		普通平键	Flat key	6×45	2
64	DG800-01-93	R齿轮	R gear		2

65		单重手柄	Handle	Φ12	1
66		圆锥销	Round pin	Φ5×20	2
67		圆螺母	Round nut	M14×1.5	2
68		圆螺母止动垫圈	Lock washer	Φ14	1
69	DG400-01-24	摩擦套	Friction sleeve		1
70	DG800-01-81	刻度盘	Dial		1
71	DG400-03-14	被动带轮	Teeth wheel		1
72		内六角圆柱头螺钉	Inner hexagon screw	M5×25	1
73	DG800-01-72	丝杆盖板	Screw bar shield		1
74	DG800-01-28	丝杆	Screw bar		1
75	DG800-01-95	拨叉	Fork		1
76		内六角圆柱头螺钉	Inner hexagon screw	M8×22	4
77		手柄套	Handle cap	M6	2
78	DG800-04-37-02	手柄	Handle		2
79	DG800-01-105	拨叉定位盖	Fork position cap		2
80	DG800-01-104	走刀变速箱盖板	Cover for gear box		1
81		沉头螺钉	Screw	M6×12	4
82		沉头螺钉	Screw	M4×8	9
83	DG800-01-57	关节轴承连接板	Connection plate for Joint bearing		1
84		内六角圆柱端螺钉	Inner hexagon screw	M5×10	2
85	DG800-01-101	丝杆离合手柄座	Switch handle seat for screw bar		1
86		钢球	Steel ball	Φ6	2
87	DG400-01-74	定位小弹簧	Position spring		2
88		内六角平端紧定螺钉	Hexagon lock screw	M8×12	2
89	DG800-01-57-01	铰接板	Hinge connection plate		1
90		关节轴承	Joint bearing	M8	1
91	DG800-01-57-02	铰接螺杆	Hinge screw bar		1
92	DG400-01-01	拨叉手柄座	Fork handle seat		1
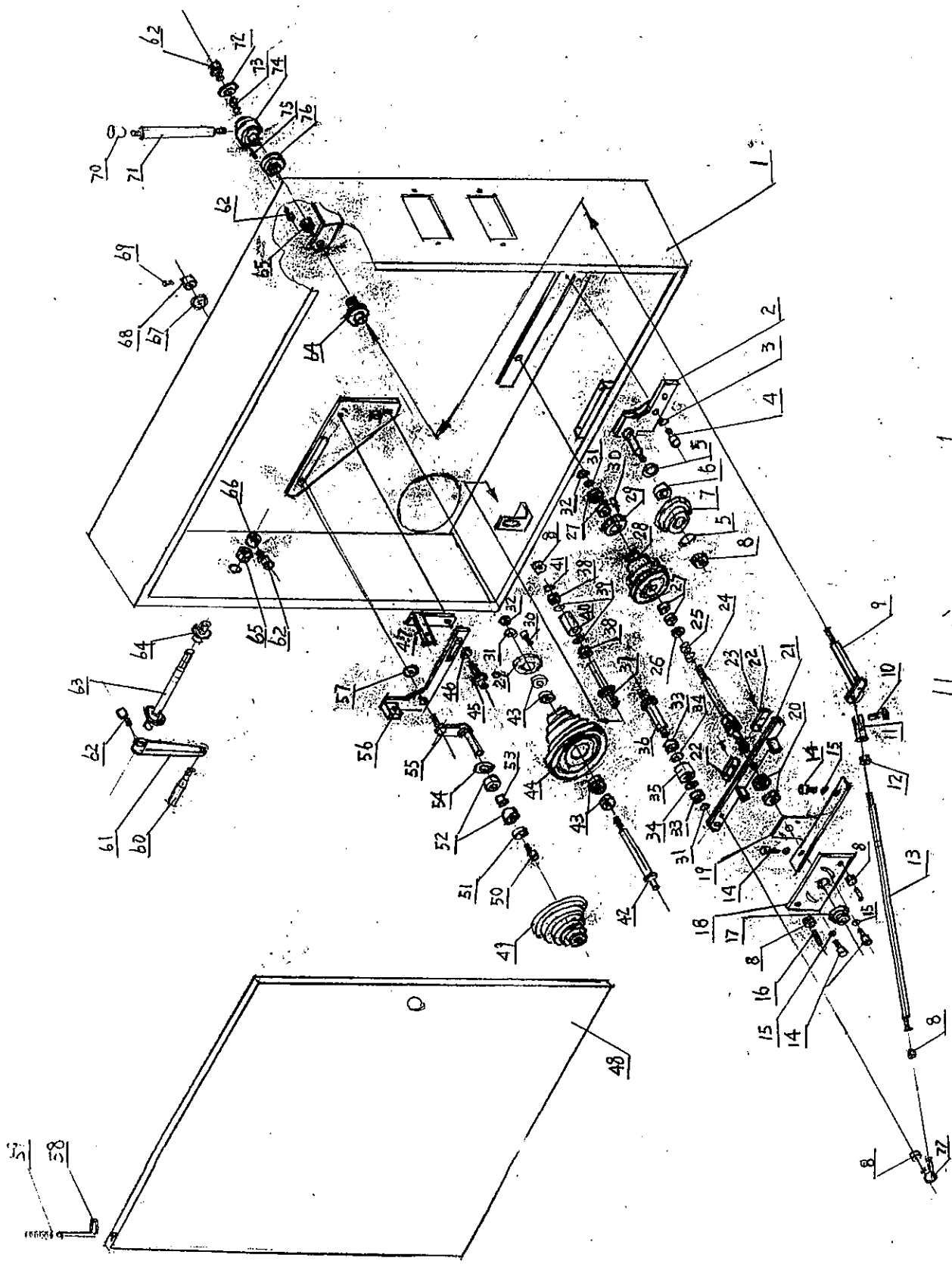
Hanging gear box

Hanging gear box

序号	图号 Part No.	名　称	Part Name	Specification	Quantity
1	DG400-05-02	挂轮箱	Hanging gear box		1
2	DG400-05-44	小链轮架	Small chain wheel support		1
3		平垫圈	Flat washer	Φ5	2
4		内六角圆柱头螺钉	Inner hexagon screw	M5×20	2
5		孔用弹性卡圈	Open spring ring	Φ32	2
6		球轴承	Ball bearing	6201	1
7	DG400-05-45	小链轮	Small chain wheel		1
8		六角螺母	Hexagon nut	M8	6
9	DG 400-05-09	板手轴	Handle shaft		1
10	DG 400-05-11	拉杆销钉	Pin for draw bar		1
11	DG 400-05-12	拉杆连接套	Draw bar connection sleeve		1
12		六角螺母	Hexagon nut	M8(left)	1
13	DG 400-05-13	变速拉杆	Draw bar for speed changing		1
14		内六角圆柱头螺钉	Inner hexagon screw	M8×12	4
15		平垫圈	Flat washer	Φ6	4
16		内六角平端紧定螺钉	Inner hexagon lock screw	M8×25	2
17	DG 400-05-17	I 轴锁紧螺母	I shaft lock nut		1
18	DG 400-05-18	刹车调整板	Brake adjustment plate		1
19	DG 400-05-20	I 轴支架	I shaft support		1
20	DG 400-05-19	圆螺母	Round nut		2
21	DG400-05-27	刹车板	Brake plate		1
22	DG400-05-26	刹车片	Brake belt		2
23		十字槽沉头螺钉	Sank screw	M4×10	4
24	DG400-05-24	I 轴	I shaft		1
25	DG400-05-21	I 轴弹簧	I shaft spring		1
26	DG400-05-23	隔套	Spacer		1
27		球轴承	Ball bearing	6901	4
28	DG400-05-22	I 轴皮带轮	I shaft pylley		1
29	DG400-05-39	大链轮	Large chain wheel		1
30		内六角圆柱头螺钉	Inner hexagon screw	M4×12	12

31		轴用弹性卡圈	Shaft spring lock ring	Φ12	3
32	DG400-05-15	垫圈	Washer		2
33		球轴承	Ball bearing	6001	2
34		孔用弹性卡圈	Spring lock ring	Φ28	2
35	DG400-05-41	III 轴滚筒	III shaft rolling tube		1
36	DG400-05-40	III 轴	III shaft		1
37	DG400-05-48	IV 轴	IV shaft		1
38		球轴承	Ball bearing	6800	2
39		孔用弹性卡圈	Spring lock ring	Φ19	2
40	DG400-05-47	IV 轴滚筒	IV shaft rolling tube		1
41		轴用弹性卡圈	Spring lock ring	Φ10	1
42	DG400-05-14	II 轴	II shaft		1
43		球轴承	Ball bearing	6901	4
44	DG400-05-16	II 轴皮带轮	II shaft pulley		1
45	DG400-05-43	张紧轮架导向轴	Tension wheel guiding shaft		1
46	DG400-05-42	垫圈	Washer		1
47	DG400-05-25	支架	Support		1
48	DG400-05-01-09	挂轮箱门	Door of hanging wheel box		1
49	DG400-05-32	张紧皮带轮	Tension pulley		1
50		内六角圆柱头螺钉	Inner hexagon screw		1
51	DG400-05-34	张紧轮轴承压盖	Bearing cover for tension wheel		1
52		球轴承	Ball bearing	6302	2
53	DG400-05-33	张紧轮轴承隔套	Spacer of tension wheel bearing		1
54		孔用弹性卡圈	Spring lock ring	Φ42	1
55	DG400-05-36	张紧皮带轮轴	Tension pulley shaft		1
56	DG400-05-28	张紧皮带轮架	Tension pulley support		1
57	DG400-05-31	张紧轮内垫	Inner cushion for tension whel		1
58	DG400-05-01-01	活动插销	Pin		1
59	DG400-05-01-02	弹簧	Spring		1
60		手柄	Handle	M8×55	1
61	DG400-05-38	摇把	Handle		1
62		内六角圆柱头螺钉	Inner hexagon screw	M5×8	8
63	DG400-05-29	张紧螺杆轴	Screw bar of tension wheel		1
64	DG400-05-10	螺母套	Nut sleeve		2

65		六角螺母	Hexagon screw	M24	2
66	DG 400-05-30	定位套	Position sleeve		1
67	DG 400-05-35	张紧轮外垫	Outer cushion for tension wheel		1
68	DG 400-05-37	六角螺母	Hexagon nut		1
69		内六角平端紧定螺钉	Inner hexagon screw	M5×6	1
70		手柄套	Handle cap	M8×25	1
71	DG800-04-37-04	手柄	Handle		1
72	DG400-05-03	弹簧压盖	Spring cover		1
73	DG400-05-04	板手弹簧	Spring for switch		1
74	DG400-05-05	板手盘	Switch disk		1
75	DG400-05-07	定位销	Position pin		1
76	DG400-05-08	板手轴座	Switch bar seat		1
77		关节轴承	Joint bearing	M8	1
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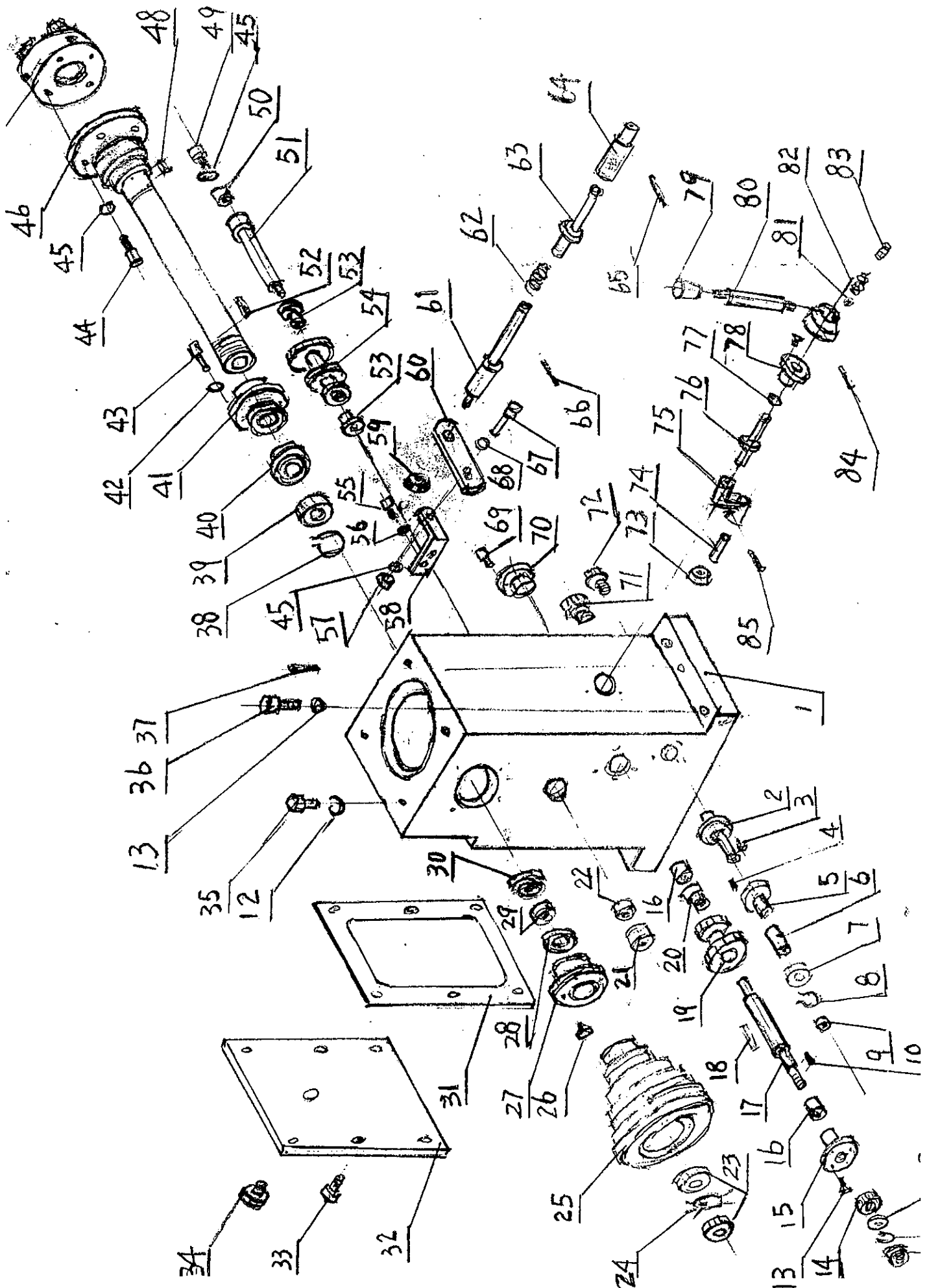
Gear Box for Main Shaft

序号	图号 Part No.	名　称	Part name	Specification	Quantity
1	DG400-01-40	齿轮箱	Gear box		1
2	DG400-01-56				1
3		十字槽沉头螺钉	Cross head screw	M5×10	6
4		平端紧定螺钉	Flat head screw	M4×8	2
5	DG400-01-53	H 齿轮	H gear		1
6	DG400-01-54	IV 轴轴套	IV shaft sleeve		1
7	DG400-01-55	I 挂齿轮	I hanging gear		1
8		轴用弹性挡圈	Spring washer	Φ12	1
9		压配或压注油杯	Pressure oil filler	Φ6	1
10		平键	Flat key	4×8	1
11		六角螺母	Hexagon screw	M10	1
12		弹簧垫圈	Spring washer	Φ10	5
13		平垫圈	Flat washer	Φ10	3
14	DG400-01-38	G 齿轮	G gear		1
15	DG 400-01-37	III 轴左端盖	III shaft left end cover		1
16	DG 400-01-31	III 轴轴套	III shaft sleeve		2
17	DG 400-01-35	III 轴	III shaft		1
18		平键	Flat key	6×45	1
19	DG 400-01-33	EF 齿轮	EF gear		1
20	DG 400-01-32	III 轴隔套	III shaft spacer		1
21		内六角平端紧定钉	hexagon lock screw	M24×20	1
22	DG400-01-39	II 轴左轴套	II shaft left sleeve		1
23		圆螺母	Round screw	M35×1.5	2
24		圆螺母止动垫圈	Lock washer	Φ35	1
25	DG400-01-06	主轴皮带轮	Pulley for main shaft		1
26		十字槽沉头螺钉	Sank screw	M6×20	4
27	DG400-01-07	I 轴左端盖	I shaft left end cover		1
28		密封圈	Rubber seal		1
29	DG400-01-42	皮带轮隔套	Pulley spacer		1
30		圆锥滚子向心推力轴承	Bearing	32007	1

31	DG400-01-01	密封垫	Seal		1
32	DG400-01-02	后盖	Back cover		1
33		内六角圆柱螺钉	Inner hexagon screw	M6×10	6
34	DG400-01-03	注油孔螺钉	Screw for oil filler		1
35		六角头螺栓	Hexagon screw	M10×40	4
36		内六角圆术头螺钉	Inner hexagon screw	M10×40	4
37		圆锥销	Round pin	Φ8×40	2
38		轴用弹性卡圈	Open lock ring	Φ35	1
39	DG400-01-08	A齿轮	A gear		1
40		圆锥滚子向心轴承	Bearing	32008	1
41	DG400-01-09	I轴右端盖	I shaft right cover		1
42		弹簧垫圈	Spring washer	Φ6	4
43		内六角圆柱头螺钉	Inner hexagon screw	M6×20	4
44		内六角圆柱头螺钉	Inner hexagon screw	M8×25	3
45		平垫圈	Flat washer	Φ8	6
46	DG400-01-10	主轴	Main shaft		1
47		三爪卡盘	Three jaw chuck	Φ130	1
48		普通平键	Flat key	6×8	1
49		内六角圆柱头螺钉	Inner hexagon screw	M8×30	1
50	DG400-01-13	锥涨套	Sleeve		1
51	DG400-01-34	II轴	II shaft		1
52		普通平键	Flat key	8×20	1
53	DG400-01-12	II轴法兰轴套	II shaft flange		2
54	DG400-01-11	BCD齿轮	BCD gear		1
55		内六角圆柱头螺钉	Inner hexagon screw	M6×14	2
56		平垫圈	Flat washer	Φ6	2
57		六角螺母	Hexagon screw	M8	1
58	DG400-01-84	连接角铁	Connection angle metal		1
59		圆螺母	Round screw	M16×1.5	1
60	DG800-01-85	铰接板	Hinge connection plate		1
61	DG800-01-89	拉杆	Draw bar		1
62	DG800-01-87	弹簧	Spring		1
63	DG800-01-90	前拉杆套	Front draw bar cap		1
64	DG800-01-88	后拉杆套	Rear draw bar cap		1

65		圆柱销	Round pin	3×18	1
66		圆锥销	Round pin	3×12	1
67		内六角圆柱头螺钉	Inner hexagon screw	M8×25	1
68		弹簧垫圈	Spring washer	Φ8	1
69		内六角圆柱头螺钉	Inner hexagon screw	M5×12	3
70	DG400-01-30	III 轴右端盖	III shaft right end cover		1
71		油镜	Oil level glass	M14	1
72		密封螺钉	Seal screw	M10×10	1
73	DG400-01-49	拨叉滚轮	Fork wheel		1
74	DG400-01-50	拨叉滚轮轴	Fork wheel rod		1
75	DG400-01-51	拨叉臂	Fork arm		1
76	DG400-01-48	拨叉轴	Fork shaft		1
77		密封圈	Rubber seal	Φ15	1
78	DG400-01-47	拨叉定位盖	Fork position cover		1
79		手柄套	Handle sleeve	M6	1
80	DG800-04-37-2	手柄	Handle		1
81		钢球	Steel ball	Φ6	1
82	DG400-01-74	定位小弹簧	Small position spring		1
83		内六角平端贤定螺钉	Inner hexagon screw	M8×16	1
84		圆锥销	Round pin	Φ5×50	1
85		圆锥销	Round pin	Φ4×25	1
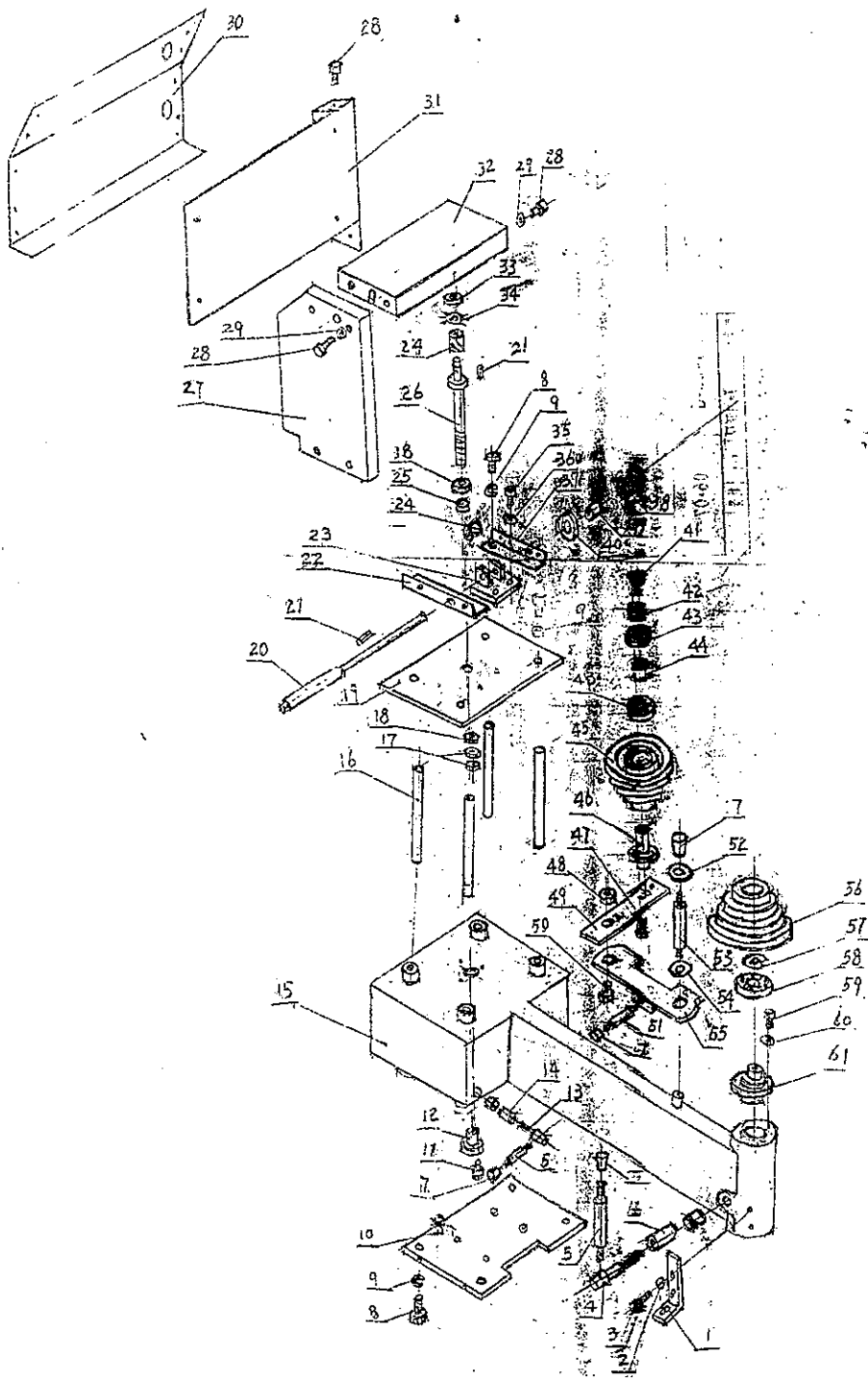
SWING ARM

Swing arm

序号	图号 Part code	名　称	Part name	Specification	Quantity
1	DG400-04-35	限位角铁	Limit angle metal		1
2		平垫圈	Flat washer	Φ6	2
3		内六角园柱头螺钉	Inner hexagon screw	M6×15	2
4	DG800-04-90-63	锁紧手柄	Lock handle		1
5	DG800-04-37-3	手柄	Handle		1
6	DG800-04-90-62	锁紧套	Lock sleeve		1
7		手柄套	Handle cap	M10×32	4
8		六角螺栓	Hexagon bolt	M10×40	8
9		弹簧垫圈	Spring washer	Φ10	8
10	DG400-04-18	主机连接板	Connection board		1
11		内六角圆柱头螺钉	Inner hexagon screw	M5×16	3
12	DG400-04-08	升降螺母	Lifting nut		1
13	DG800-04-64	锁紧螺钉	Lock screw		1
14	DG800-04-63	锁紧套	Lock sleeve		1
15	DG800-04-27	摇臂	Swing arm		1
16	DG400-04-30	导柱	Guide column		4
17		圆螺母	Round nut	M18×1.5	2
18		单向推力球轴承	Bearing	51104	2
19	DG800-04-07	上连接板	Upper connection board		1
20	DG800-04-90-51	升降主动轴	Main lifting shaft		1
21		平键	Flat key	5×15	2
22	DG800-04-10	角钢	Angle metal		1
23	DG800-04-90-48	齿轮座	Gear seat		1
24	DG800-04-90-49	斜齿轮	Gear		2
25	DG400-04-90-01	轴套	Shaft sleeve		1
26	DG800-04-09	升降螺杆	Lifting screw		1
27	DG800-04-01	左前盖板	Left front cover		1
28		内六角圆柱头螺钉	Inner hexagon screw	M5×8	14
29		平垫圈	Flat washer	Φ5	14

30	DG800-04-01-01-02	电器箱前盖	Front cover for electrical		1
31	DG800-04-01-01-01	电器箱后盖	Rear cover for electrical		1
32	DG800-04-90-54	上连板盖板	Cover for upper connection plate		1
33		圆螺母	Round nut	M14×1.5	1
34		圆螺母止动垫圈	Lock washer for round nut	Φ14	1
35		内六角圆柱头螺钉	Inner hexagon screw	M8×20	2
36		平垫圈	Flat washer	Φ8	2
37	DG800-04-10-01	角钢	Angle metal		1
38	DG800-04-90-58	调整螺母	Adjusting nut		1
39	DG800-04-90-60	主动轴轴套	Sleeve for main shaft		1
40		圆螺母	Round nut	M22×1.5	1
41		沉头螺钉	Sank screw	M5×15	1
42	DG400-04-13	轴承顶盖	Bearing cover		1
43		单例向心球轴承	Ball bearing	6004	2
44	DG400-04-12	中间带轮轴套	Sleeve for middle teeth-belt wheel		1
45	DG400-04-03	中间皮带轮	Middle pulley		1
46	DG400-04-25	中间皮带轮轴	Shaft for middle pulley		1
47		内六角圆柱头螺钉	Inner hexagon screw	M5×10	2
48		尼龙锁紧螺母	Plastic lock nut	M10	1
49	DG400-04-11	中间皮带固定板	Lock plate for middle belt		1
50		六角头螺栓	Hexagon bolt	M10×10	1
51	DG800-04-37-4	手柄	Handle		1
52	DG400-04-15	顶盖垫圈	Washer for top cover		1
53	DG400-04-14	顶盖支撑杆	Support rod for top cover		1
54	DG400-04-24	顶盖支撑杆垫圈	Washer for support rod		1
55	DG400-04-26	张紧轮架	Stand for tension wheel		1
56	DG800-04-04	主轴皮带轮	Pulley for main shaft		1
57		轴用弹性挡圈	Spring lock ring for shaft	Φ42	1
58		单例向心球轴承	Bearing	6008	1
59		内六角圆柱头螺钉	Inner hexagon screw	M5×15	4
60		弹簧垫圈	Spring washer	Φ5	4
61	DG400-04-16	主轴轴承座	Bearing seat for main shaft		1

D9800-04-27

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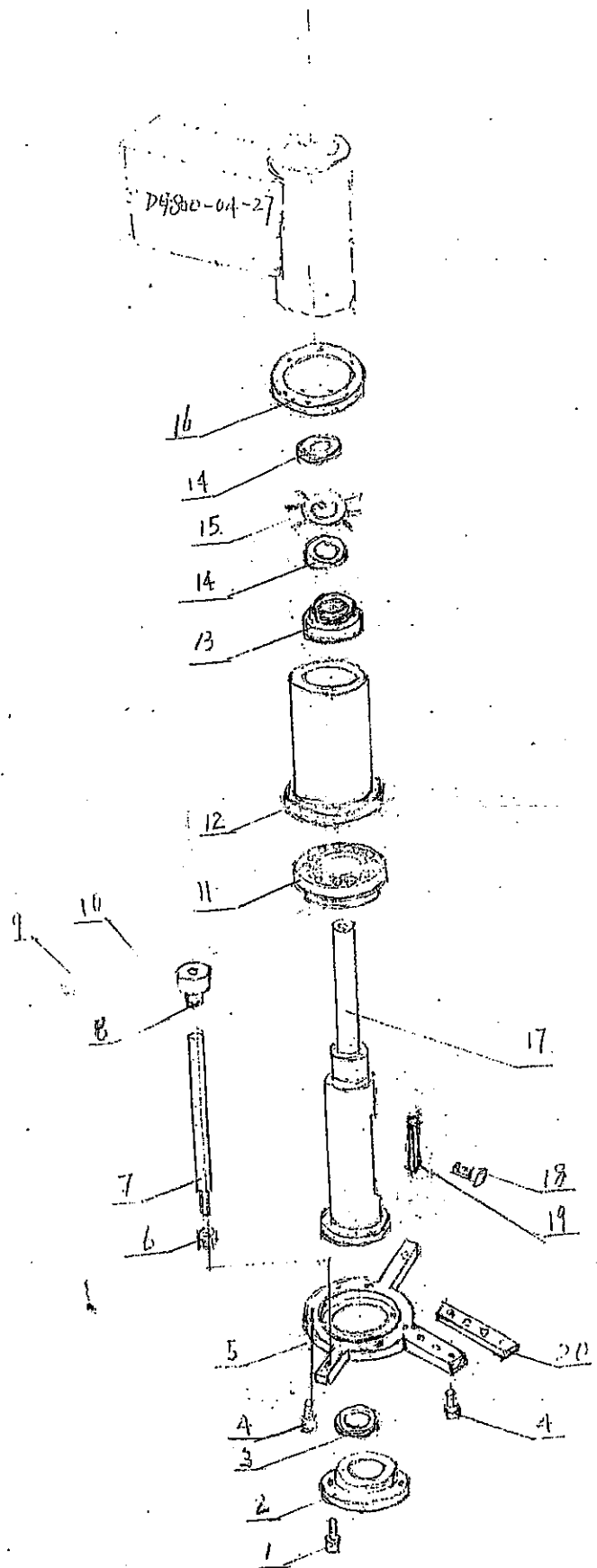
DRILLING SPINDLE

Drilling spindle

序号	图号 Part No.	名 称	Part name	Specification	quantity
1		圆柱头螺钉	Round-head screw	M5×8	2
2	DG800-04-20	轴承盖	Bearing seal		1
3	DG400-04-19	防尘盖	Dust-proof cover		1
4		内六角圆柱头螺钉	Inner hexagon screw	M5×20	8
5	DG800-04-22	升降板	Lifting board		1
6		六角螺母	Hexagon nut	M8	1
7	DG400-04-36	限位螺杆	Limit screw bar		1
8	DG400-04-33	限位刻度盘	Limit calibration		1
9	DG400-04-32	快动螺母	Nut		1
10	DG400-04-34	快动螺母压簧	Compression spring		1
11		单例圆锥滚子轴承	Bearing	32007	1
12	DG800-04-62	主轴套	Spindle sleeve		1
13		圆锥滚子轴承	Bearing	32006	1
14		园螺母	Round nut	M30×1.5	2
15		园螺母止动垫圈	Lock washer for nut	30	1
16	DG800-04-23	上压板	Upper compression board		1
17	DG800-04-61	主轴	Spindle		1
18		圆柱头螺钉	Round-head screw	M4×6	2
19	DG400-04-61-1	导向键	Guide key		1
20	DG800-04-18	上板	Upper board		1
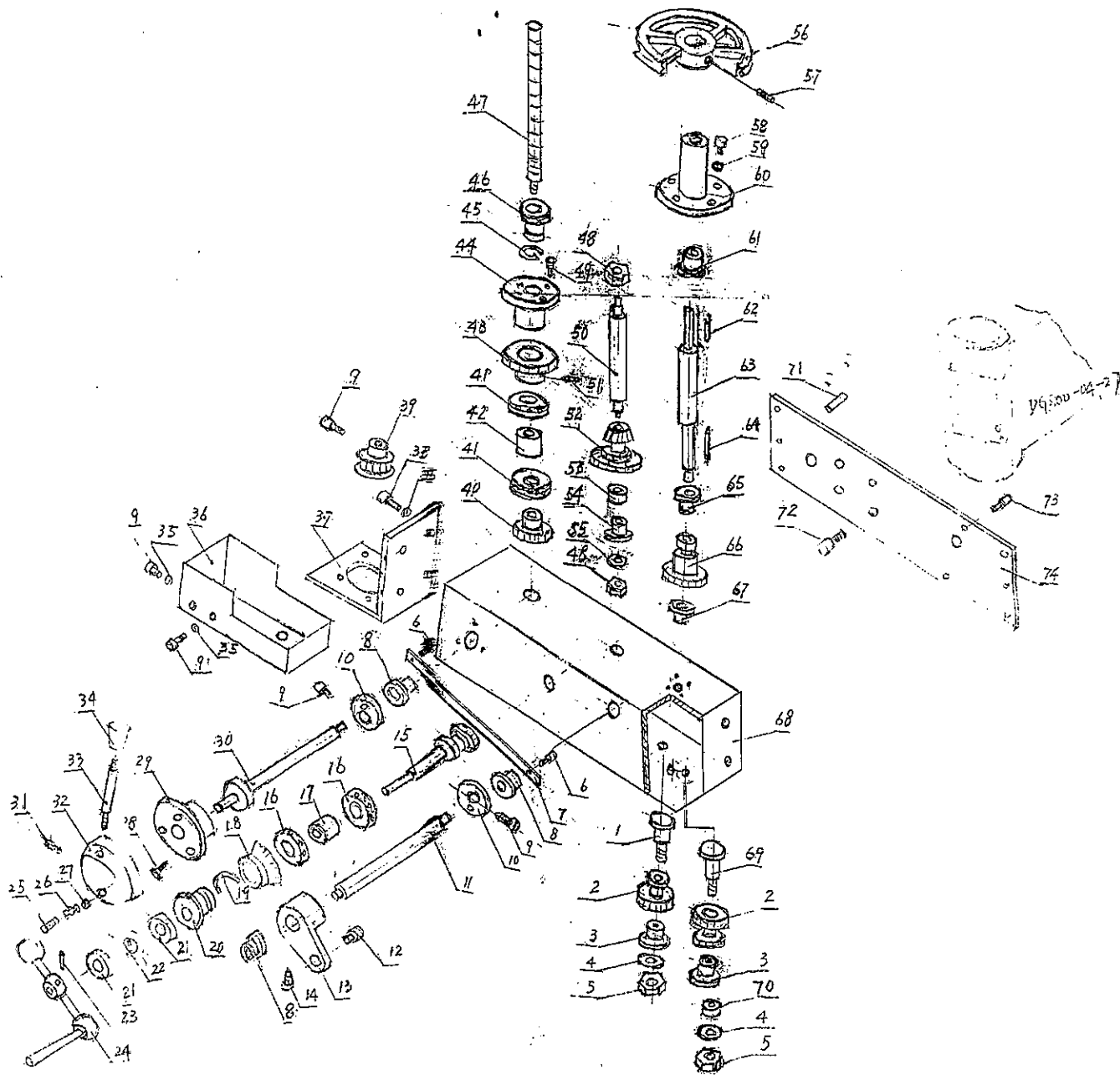
SMALL GEARBOX

Small gear box

序号	图号 Part code	名 称	Name of part	Specification	Quantity
1	DG800-04-90-31	短齿轮轴	Short-teeth gear shaft		1
2	DG400-01-71	ON 齿轮组	ON gear set		2
3	DG400-01-70	ON 齿轮轴套	ON gear shaft sleeve		2
4		平垫圈	Flat washer	Φ8	2
5		自锁螺母	Self-locked nut	M8	2
6	DG800-04-90-39-01	螺钉	Screw		2
7	DG800-04-90-39	摆臂连杆	Swing-arm connecting rod		1
8	DG800-04-90-16	拨叉轴法兰套	Flange for fork rod		3
9		内六角圆柱头螺钉	Inner hexagon screw	M5×10	9
10	DG800-04-90-37	摆臂	Swing arm		2
11	DG800-04-90-13	离合轴	Clutch shaft		1
12	DG800-04-90-18	拨叉滚轴	Ball bearing for fork		1
13	DG800-04-90-14	拨叉	Fork		1
14		内六角锥端紧定钉	Inner hexagon screw	M5×6	1
15	DG800-04-90-28	手动齿轮轴	manual gear shaft		1
16		单向推力球轴承	Ball bearing	51102	2
17	DG800-04-90-29	手动齿轮轴铜套	Brass sleeve for manual gear		1
18	DG400-04-51	刻度盘	Calibration		1
19	DG400-04-53	弹簧片	Spring piece		1
20	DG800-04-90-61	摩擦套	Friction sleeve		1
21		圆螺母	Round nut	M14×1.5	2
22		止动垫圈	Lock washer	Φ14	1
23		圆锥销	Pin	Φ5×22	1
24		单重手柄	Handle	Φ12×65	1
25		平端紧定螺钉	Flat-head screw	M8×8	1
26	DG400-01-74	定位小弹簧	Small spring for location		1
27		钢球	Steel ball	Φ6	1
28		十字槽沉头螺钉	Cross-head screw	M4×12	4

	400-01-47	拨叉定位盖	Location cover for fork		1
30	DG800-04-90-34	前轴	Front shaft		1
31		锥端紧定螺钉	Lock screw	M5×10	1
32	DG400-01-01	拨叉手柄座	Handle seat for fork		1
33	DG800-04-37-2	手柄	Handle		1
34		手柄套	Handle cap	M6	1
35		平垫圈	Flat washer	Φ5	8
36	DG800-04-90-03	步进电机盖板	Shield for step motor		1
37	DG800-04-90-02	步进电机安装架	Mount for step motor		1
38		内六角圆柱头螺钉	Inner hexagon screw	M5×18	4
39	DG400-08-01-03	小同步带轮	Small teeth-belt wheel		1
40	DG800-04-90-23	V轴带轮	Teeth-belt wheel for V shaft		1
41		平面滚针轴承	Bearing	889105	2
42	DG800-04-90-10	V轴下轴套	Lower shaft sleeve for V shaft		1
43	DG800-04-90-24	V轴齿轮	Gear for V shaft		1
44	DG800-04-90-25	V轴螺母法兰	Flange for V shaft		1
45		轴用弹性挡圈	Spring ring for shaft	20	1
46	DG800-04-90-26	V轴铜套	Brass sleeve for V shaft		1
47	DG800-04-90-27	V轴	V shaft		1
48		六角螺母	Hexagon nut	M8	2
49		圆柱头螺钉	Round-head screw	M5×10	4
50	DG800-04-90-19	IV轴	IV shaft		1
51		内六角锥端紧定钉	Inner hexagon lock screw M5×6		1
52	DG800-04-90-20	IV轴齿轮组	Gear set for IV shaft		1
53	DG800-04-90-21	IV轴轴套	Sleeve for IV shaft		1
54	DG800-04-90-22	IV轴法兰轴套	Flange for IV shaft		1
55		平垫圈	Flat washer	Φ8	2
56	DG800-04-90-12	I轴带轮	Teeth-belt wheel for I shaft		1
57		内六角锥端紧定钉	Inner hexagon lock pin M6×10		1
58		内六角圆柱头螺钉	Inner hexagon screw	M6×15	4
59		弹簧垫圈	Spring washer	Φ6	4
60	DG800-04-90-05	支座	Support		1
61	DG800-04-90-09	I轴上轴套	Upper sleeve for I shaft		1
62		平键	Flat key	5×25	1

63	DG800-04-90-06	I 轴	I shaft		1
64		平键	Flat key	5×40	1
65	DG800-04-90-08	I 轴中间轴套	Sleeve for middle shaft		1
66	DG800-04-90-11	挂挡齿轮	Gear for speed change		1
67	DG800-04-90-78	I 轴下轴套	Lower sleeve for I shaft		1
68	DG800-04-90-00	齿轮箱	Gear box		1
69	DG800-04-90-30	长齿轮轴	Long gear shaft		1
70	DG400-01-69	VIII 轴轴套	Sleeve for VIII shaft		1
71		圆锥销	Pin	Φ5×20	2
72		内六角圆柱头螺钉	Inner hexagon screw	M8×12	4
73		内六角圆柱头螺钉	Inner hexagon screw	M5×15	6
74	DG800-04-90-01	齿轮箱盖板	Cover for gear box		1
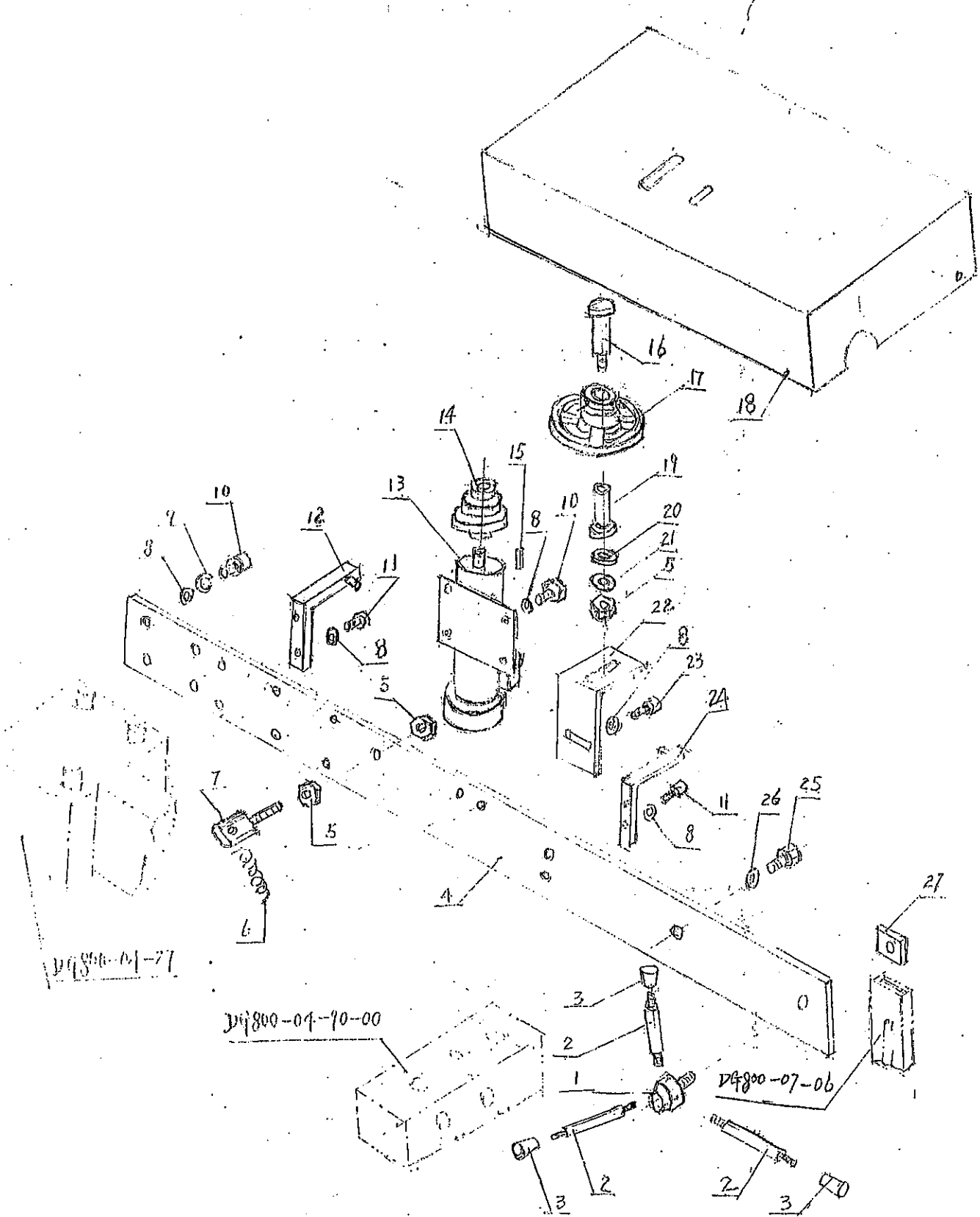
MOUNTING PLATE FOR MOTOR

Mount plate for motor

序号	图号 Part code	名 称	Part name	Specification	Quantity
1	DG400-04-40	锁紧盘	Lock disk		1
2	DG800-04-37-3	手柄	Handle		3
3		手柄套	Handle cap	M10×32	3
4	DG800-04-05	电机安装板	Mount plate for motor		1
5		六角螺母	Hexagon nut	M10	3
6	DG400-04-42	皮带张紧拉簧	Spring for belt tension		1
7	DG400-04-56	弹簧拉钉	Spring hook		1
8		平垫圈	Flat washer	Φ8	14
9		弹簧垫圈	Spring washer	Φ8	4
10		内六角圆柱头螺钉	Inner hexagon screw	M8×25	8
11		内六角圆柱头螺钉	Inner hexagon screw	M8×10	4
12	DG800-04-90-46	顶罩右支架	Right support for top cover		1
13		电机	Motor	8024	1
14	DG400-04-06	电机皮带轮	Motor pulley		1
15		平健	Flat key	6×35	1
16	DG800-04-90-40	中间带轮轴	Shaft for middle teeth-belt wheel		1
17	DG800-04-90-38	中间大带轮	Middle large teeth-belt wheel		1
18	DG800-04-02	顶罩	Top cover		1
19	DG800-04-90-42	中间长轴承	Middle long bearing		1
20	DG800-04-90-41	中间轴垫圈	Washer for middle shaft		1
21		平垫圈	Flat washer		1
22	DG800-04-90-44	中间带轮支架	Middle support for teeth-belt wheel		1
23		内六角圆柱头螺钉	Inner hexagon screw	M8×20	2
24	DG800-04-90-45	顶罩左支架	Left support for top cover		1
25		六角螺栓	Hexagon bolts	M12×20	1
26		平垫圈	Flat washer	Φ12	1
27	DG400-04-39	锁紧螺母	Lock nut		1
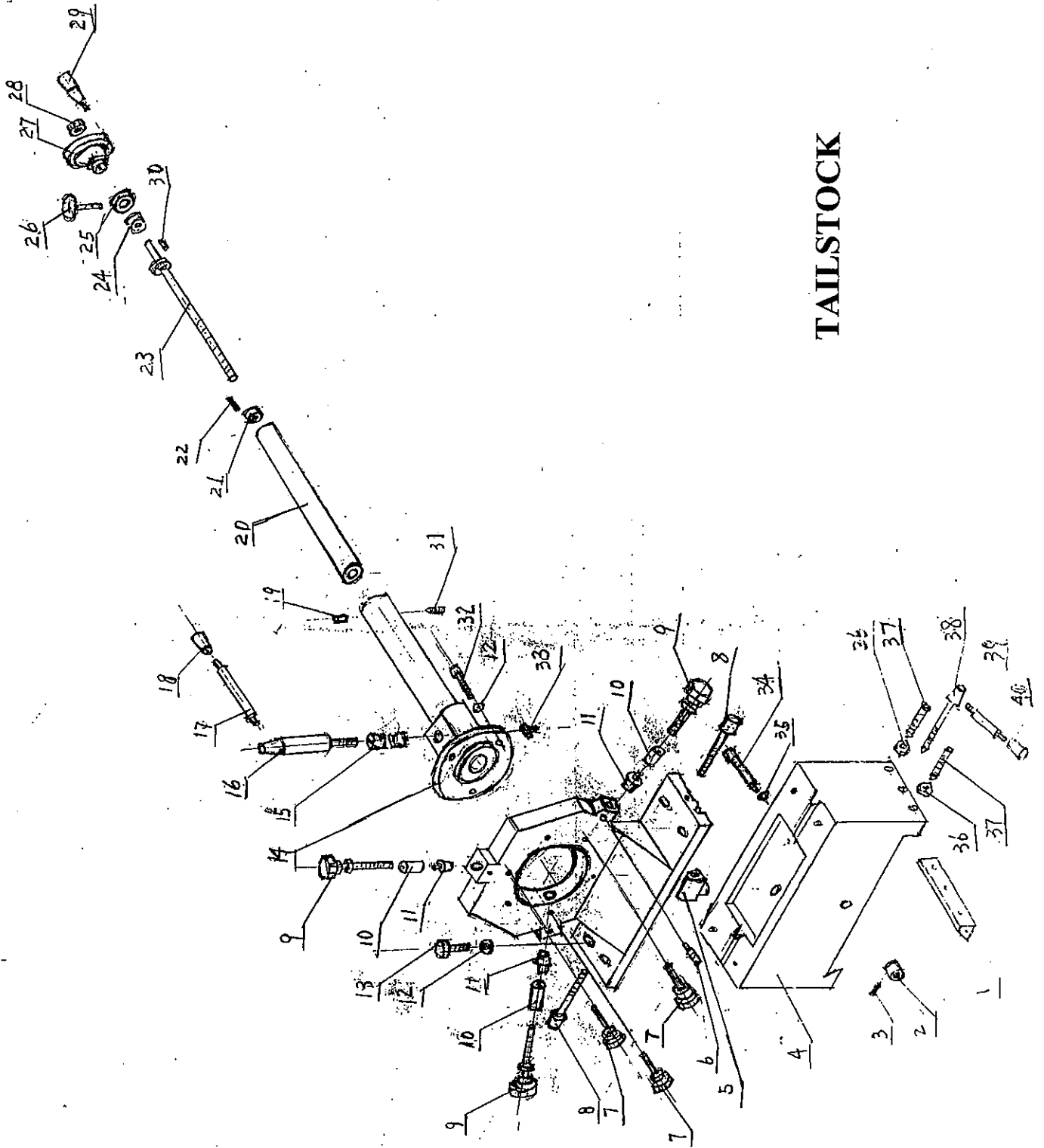
TAILSTOCK

Tailstock

序号	图号 Part code	名 称	Part name	Specification	Quantity
1	DG400-02-02	导轨调隙螺板	Track adjusting plate		1
2	DG800-02-09-01	定位套	Position sleeve		1
3		锥端紧定螺钉	Lock screw	M5×5	1
4	DG400-02-04	尾座导轨	Track for tailstock		1
5	DG400-02-03	连接座	Connection seat		1
6		内六角圆柱端螺钉	Inner hexagon screw	M6×12	3
7	DG400-02-10	导向螺钉	Guide screw		3
8		内六角圆柱头螺钉	Inner hexagon screw	M10×90	2
9	DG400-02-13	调整螺钉	Adjustment screw		3
10	DG400-02-12	螺母套	Nut sleeve		3
11	DG400-02-11	摩擦铜帽	Friction brass cap		3
12		平垫圈	Flat washer	Φ8	7
13		六角头螺钉	Hexagon screw	M8×40	4
14	DG400-02-16	尾座轴套	Shaft sleeve for tailstock		1
15	DG400-02-06	锁紧套	Lock sleeve		1
16	DG400-02-08	锁紧螺钉	Lock screw		1
17	DG800-04-37-03	手柄	Handle		1
18		手柄套	Handle cap	M10	1
19		压配式油杯	Oil cup	Φ6	2
20	DG400-02-17	尾座主轴	Shaft for tailstock		1
21	DG400-02-18	T形螺母	T type nut		1
22		开槽锥端紧定螺钉	Lock screw	M3×10	2
23	DG400-02-15	T形螺杆	T type screw bar		1
24	DG400-02-19	定位套	Position sleeve		1
25	DG400-02-21	刻度盘	Dial		1
26	DG400-02-20	蝶形螺钉	Screw		1
27	DG400-02-22	手轮	Hand wheel		1

Tailstock

序号	图号 Part code	名 称	Part name	Specification	Quantity
28		六角螺母	Hexagon nut	M10	1
29		转动手柄	Rotating handle	M8×63	1
30		平键	Flat key	4×10	1
31		内六角圆头螺钉	Inner hexagon screw	M6×16	1
32		内六角圆柱头螺钉	Inner hexagon screw	M8×30	3
33	DG400-02-14	主轴导向钉	Guide screw for shaft		1
34	DG800-02-09	跟刀螺杆	Tracing screw bar		1
35		平垫圈	Flat washer	Φ12	1
36		六角螺母	Hexagon screw	M8	2
37		开槽锥端紧定螺钉	Lock screw	M8×45	2
38		导轨调隙螺钉	Track adjusting screw		1
39		手柄	Handle		1
40		手柄套	Handle eap	M6	1

Bench

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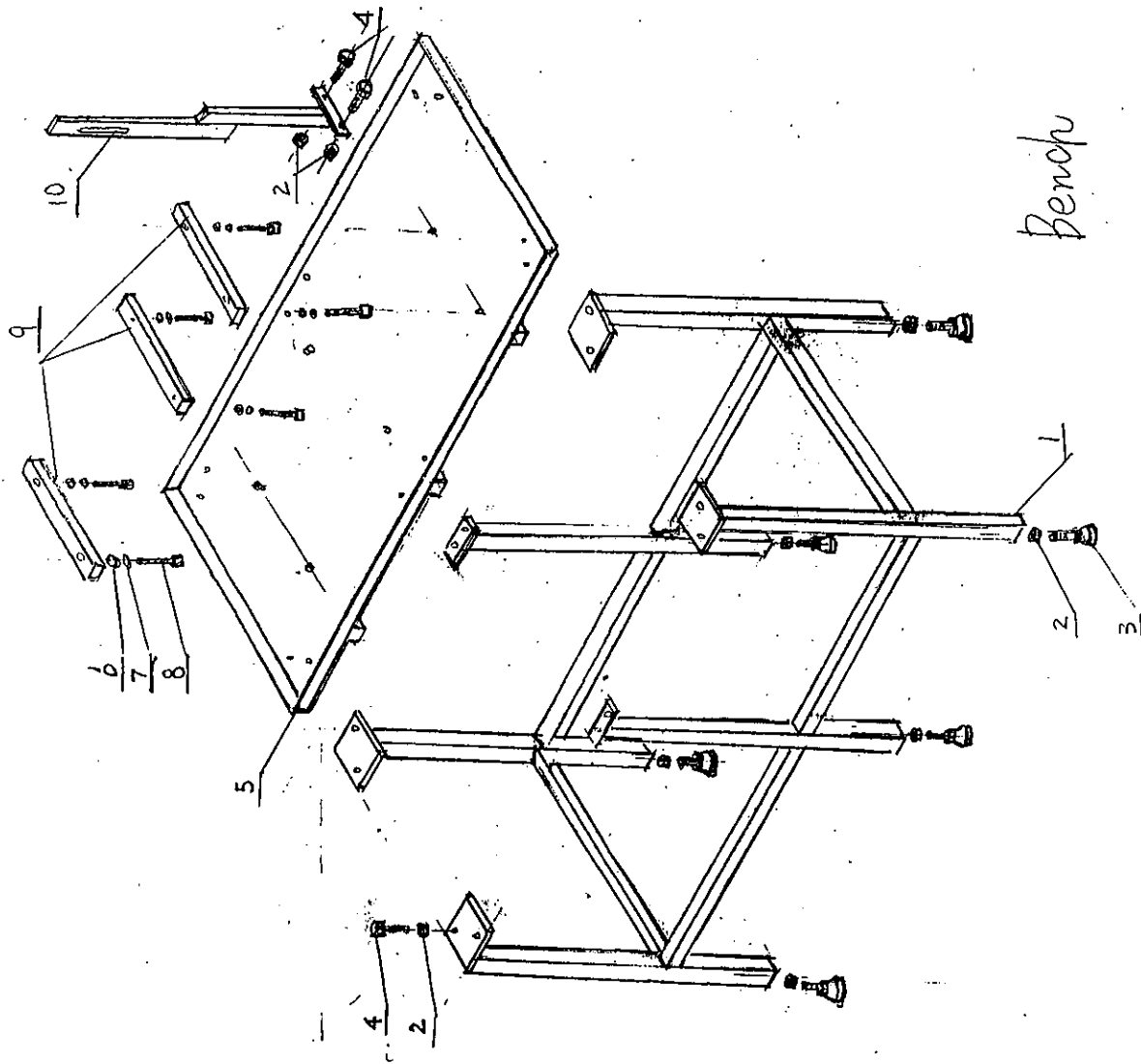
Bench

序号	图号 Part No.	名 称	Part Name	Specification	Quantity
1	DG800-07-04	脚架	Bench		1
2		六角螺母	Hexagon screw	M10	20
3	DG400-07-02	调节螺钉	Adjustment screw		6
4		六角螺钉	Hexagon screw	M10×25	14
5	DG800-07-05	托盘	Tray		1
6		平垫圈	Flat washer	Φ10	6
7		弹簧垫圈	Spring washer	Φ10	6
8		内六角圆柱头螺钉	Inner hexagon screw	M10×80	6
9	DG800-07-01	垫高方管	Square tube		3
10	DG800-07-06	支撑架	Support		1