OLYMPUS BIOLOGICAL MICROSCOPE

# SERIES CH2
# REPAIR MANUAL

OLYMPUS

## CONTENTS

# 1. OUTLINE OF THE PRODUCT

## CONTENTS

## 1. Outline of the product

Name of product: OLYMPUS Biological microscope for education and laboratory use.

Model name for internal use: CH2 Series

CHS-F
(With built-in Halogen lamp, 6V 20W)
CHT-F
(With built-in Tungsten lamp, 100V 30W)
CHD-F
(Mirror or attachable substage illuminator LSK can be mounted.)

## 2. Specifications

Common items with models CHS-F, CHT-F and CHD-F

(1) Body tube mounting: Circular dovetail/groove system.
Analyzer can be accomodated at inside of the dovetail groove.

(2) Nosepiece: Quadruple

(3) Stage: Fixed plane stage
Attachable mechanical stage can be mounted.

(4) Focusing: Common axle for coarse and fine focus adjustments.
Stroke: 25 mm (Coarse and fine adjustments)
Fine focus adjustment gradation: 2.5 $\mu$m/division
Tension adjustment for coarse focus knobs
Stopper for coarse focus adjustment

(5) Condenser carrier: Rack and pinion hight displacement
Sleeve type condenser mount, precentered

Common items with models CHS-F and CHT-F

(1) Filter: Cobalt filter (32.5C-2), mounted on a standard filter carrier and then inserted in the condenser carrier.
45 mm dia filter can be used on the light exit window in the base.

(2) Field diaphragm: Field diaphragm is available for mounting on the light exit window.
Auxiliary lens is located below the condenser carrier.

(3) Dimensions: 180 mm (W) x 223 mm (D) x 281 mm (H)*
* 389 mm (H) with binocular tube

(4) Maximum power consumption: 32VA 100V/110V
32VA 200V/240V

CHS-F

| | |
|---|---|
| (1) Light source: | 6V 20W Halogen lamp<br>In-base transformer<br>Light adjustment with resistor coil.<br>Fuse holder<br>Detachable main cord |
| (2) Weight: | 6.2 kg |

CHT-F

| | |
|---|---|
| (1) Light source: | 100V 30W Tungsten lamp<br>Light adjustment with resistor coil<br>Fuse holder<br>Detachable main cord |
| (2) Weight: | 5.8 kg |

CHD-F

| | |
|---|---|
| (1) Mirror: | 50 mm dia mirror is available<br>Plug-in type mount<br>Mounting hole: 5 mm $^{+0.03}_{-0}$ mm |
| (2) Illuminator: | Attachable substage illuminator (LSK) is available<br>Plung-in type mount<br>Mounting hole: 5 mm $^{+0.03}_{-0}$ mm |
| (3) Dimensions: | 180 mm (W) x 223 mm (D) x 262 mm (H)*<br>* 370 mm (H) with binocular tube |
| (4) Weight: | 4.9 kg |

CH2-CD (Two lens condenser for CH2)

| | |
|---|---|
| (1) Mounting onto the microscope: | Condenser is inserted into substage sleeve and clamped. |
| (2) Numerical aperture: | NA1.25 (immersed) |
| (3) Iris diaphragm: | Iris opening from 1.7 mm ~ 29 mm, variable |
| (4) Type of illumination: | Bright field illumination.<br>Dark field illumination is available if an optional dark field stop is used.<br>Phase contrast illumination is also available with optional ring slits. |
| (5) Filter: | Cobalt filter is available with a filter holder or auxiliary lens. |
| (6) Special accessories: | (Snap-in type)<br>1. Filter holder<br>2. Auxiliary lens<br>3. Ring slit |

CH-2FH (Filter holder for CH2)

| | |
|---|---|
| (1) Mounting onto the condenser: | Filter holder is mounted on the condenser with snap-in type spring design. |
| (2) Filter size: | 32.5 mm dia cobalt filter |
| (3) Accessory: | Dark field stop |

CH-2FS (Field iris diaphragm for CH2)

(1) Mounting onto the base: Field iris diaphragm is mounted on the light exit of the base with snap-in type groove and spring.
Auxiliary lens is mounted on the condenser with snap-in type groove and spring.

(2) Centering of field iris diaphragm: With two centering knobs on the auxiliary lens.

(3) Objectives which the field iris diaphragm which can be focused:
10X ~ 40X (At 40X the field number can be reduced to 15.)
Iris opening: 1.7 mm dia ~ 32 mm dia.

(4) Available filter: Auxiliary filter accepts cobalt filter of 32.5 mm dia.

(5) Available accessory: Dark field stop is available to fit on the auxiliary lens.

CH2-DS (Dark field stop for CH2)

(1) Mounting onto the condenser: Drop into auxiliary lens CH2-AL or filter holder CH2-FH and snap into condenser.

(2) Objectives which can be used for dark field illumination:
4X ~ 40X. (NA 0.65 max)

(3) Numerical aperture of condenser with CH2-DS attached:
0.75/0.95

CH2-RS10 (10X Ring slit for CH2)
CH2-RS40 (40X Ring slit for CH2)

(1) Mounting on the condenser: Snap-in type

(2) Centering of the ring slit: Two centering knobs.

(3) Objectives: PCDA 10X
PCDA 40X

CH2-PCD (Universal condenser for CH2)

(1) Mounting on the substage: Insert into condenser sleeve and clamp with clamping knob.

(2) Numerical aperture: NA1.25 (immersed, brightfield)

(3) Turret: 4 hole turret.
Bright field . . . With aperture iris diaphragm (iris dia: 1.7 mm ~ 29 mm)
Dark field . . . . Dark field illumination for objectives of 10X ~ 40X.
10X ring slit
40X ring slit

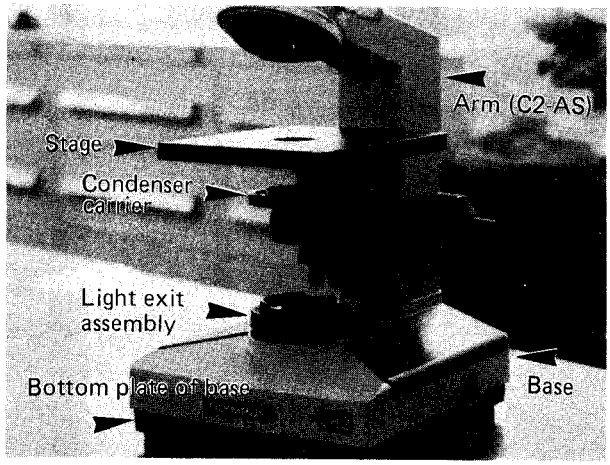
(4) Centering of ring slit: Centering with two removable centering keys.

(5) Objectives: Long barrel objectives (DAch and EDAch)
Phase contrast objectives (PCDAch 10X and PCDAch 40X)

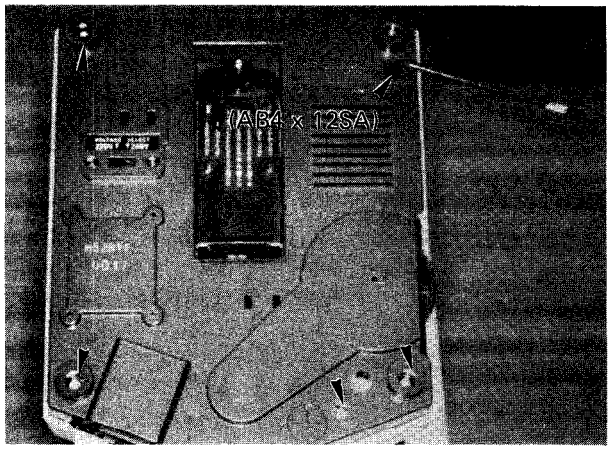
(6) Filter: Green filter and cobalt filter are provided. To be placed on the light exit on the base.

## 2. DISASSEMBLING PROCEDURE

### CONTENTS




## 1. Disassembly of bottom plate of base

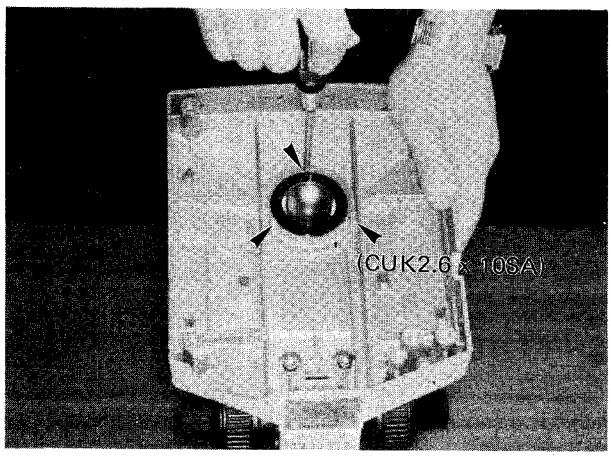



1-1. Place the microscope upside down and remove 4 screws (AB4 x 12SA).

1-2. Remove screw (AB4 x 12SA) which clamps the ground wire.

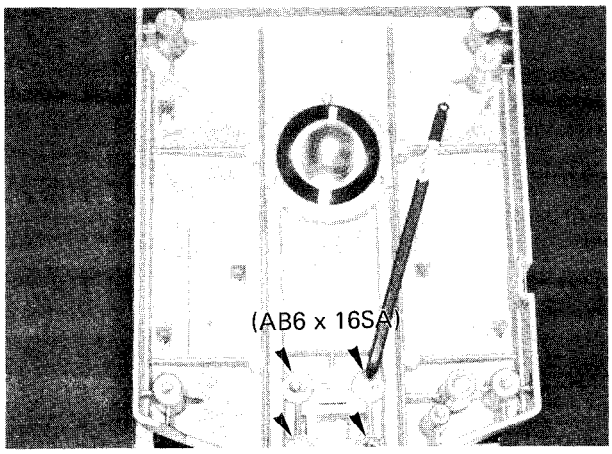
1-3. Pull up the bottom plate and remove it from the main frame.

## 2. Disassembly of light exit unit



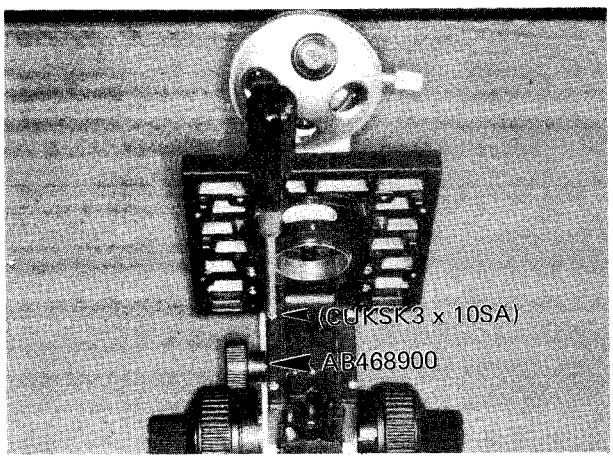

2-1. Remove 3 screws (CUK2.6 x 10SA) which are clamping the light exit unit.

## 3. Disassembly of condenser carrier, stage and focusing unit

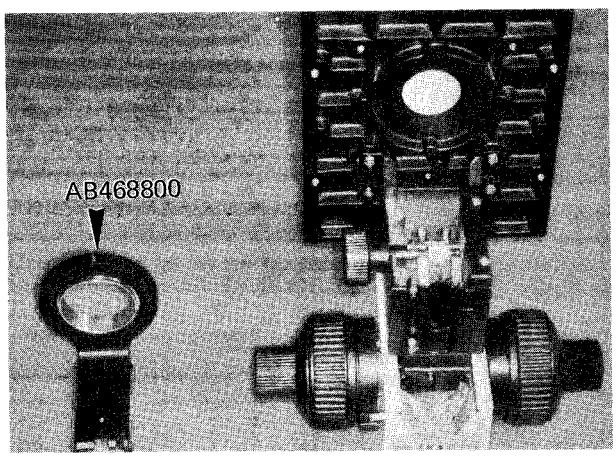



3-1. Remove the arm (C2-AS) from the base (C2-BS) by removing 4 screws (AB6 x 16SA).

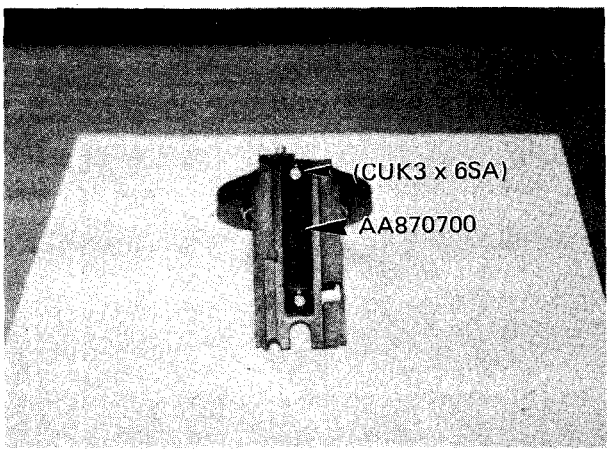
*Mark the installing position before removal.



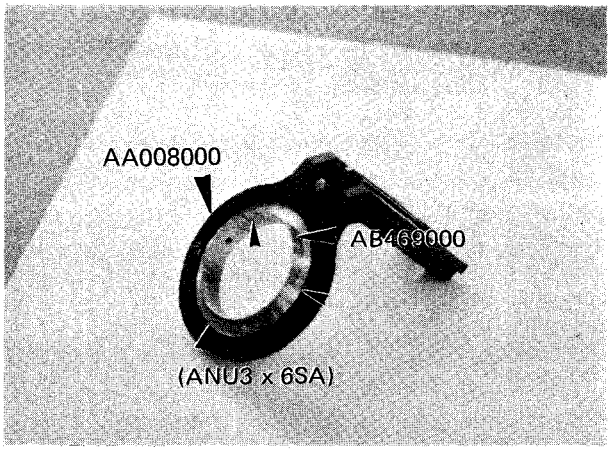

3-2. Remove the left outer guide (AB468900) of the condenser carrier (C2-CH) by removing screw (CUKSK3 x 10SA).




3-3. Remove the condenser carrier (AB468800).




3-4. Remove condenser rack (AA870700) by unscrewing 2 screws (CUK3 x 6SA).



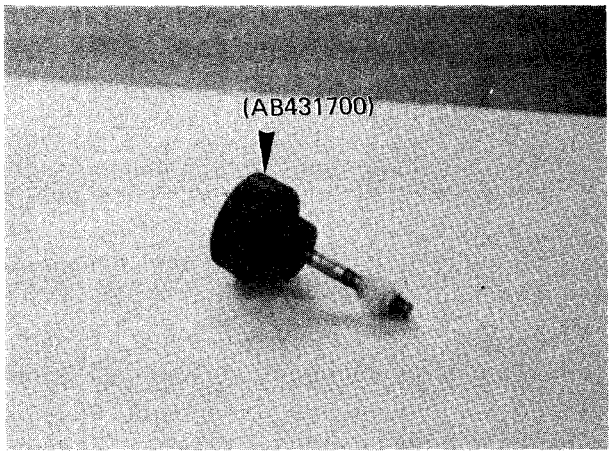

3-5. Remove the sleeve (AB469000).

*Disassemble the sleeve only when it has a problem such as poor centration of the condenser or it is damaged.

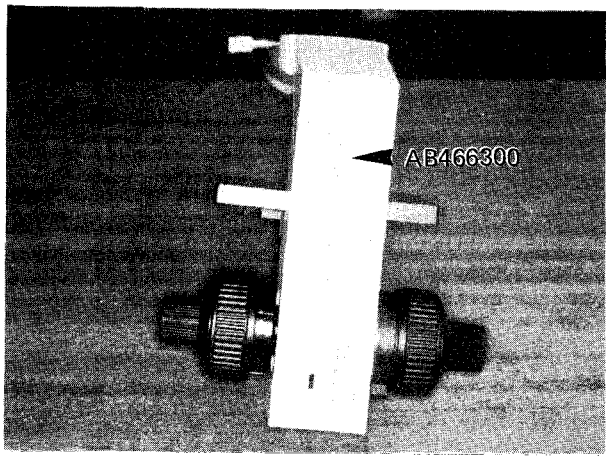
3-5-1. Remove condenser clamping screw (AA-008000).

3-5-2. Loosen 3 screws (ANU3 x 6SA).

3-5-3. Remove sleeve (AB469000).



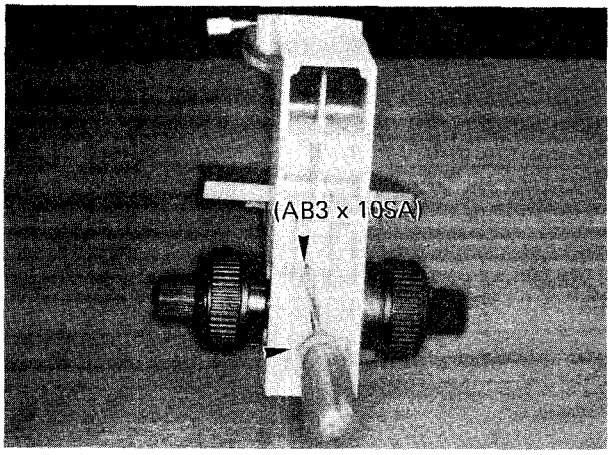

3-6. Remove substage knob assembly (AB431700).



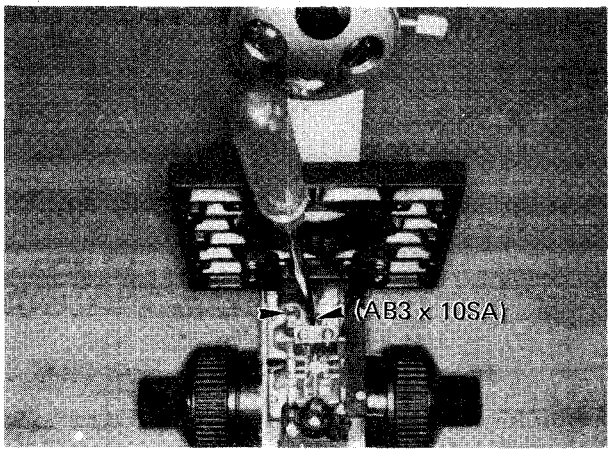

3-7. Remove back cover (AB466300) from the Arm (C2-AS).

3-7-1. Pull out 6 plastic rivets (AB435500).

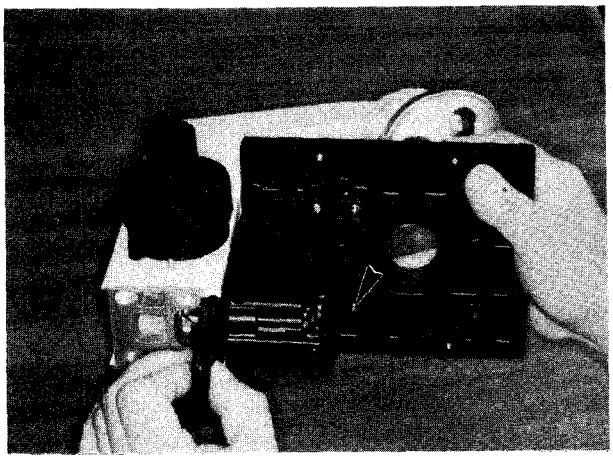
*Rivets are set as indicated in the following sketch and will be easily released by pulling on their heads.




3-8. Remove the rack for coarse focus adjustment (AB469300) by removing 2 screw (AB3 x 10SA) from the back of the arm.



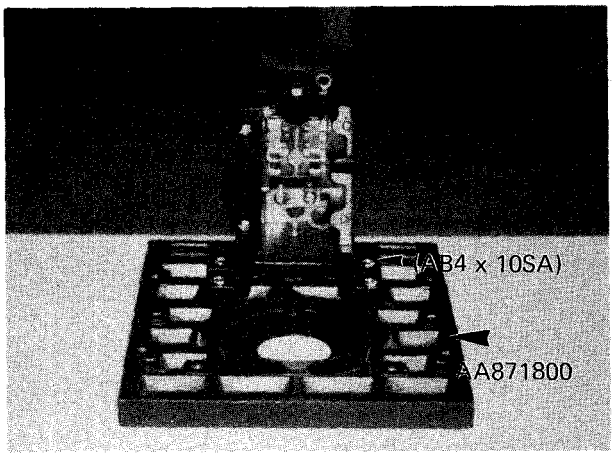

3-9. Remove 4 screws (AB3 x 10SA) from underneath the condenser carrier (AB468800) and release the guide (AB468600) and the block (AB009700).



3-10. Remove the condenser carrier (C2-CH) from the arm (C2-AS).

Note: Do not loose the balls (B4) of the condenser carrier.

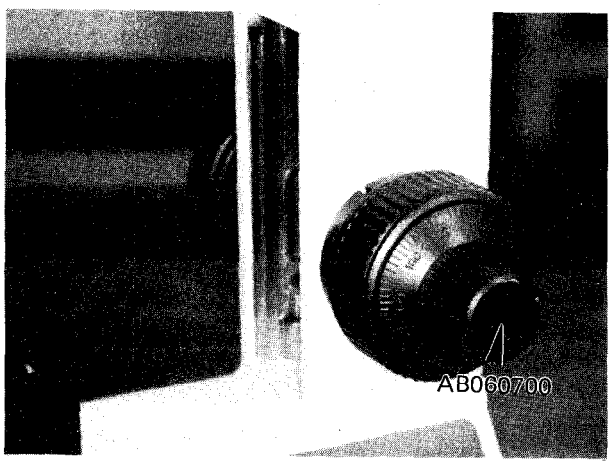

3-11. Release the leaf spring (AB469500) by removing 2 screws (CUK3 x 6SA).




3-12. Release the stage (AA871800) by removing 4 screws (AB4 x 10SA).

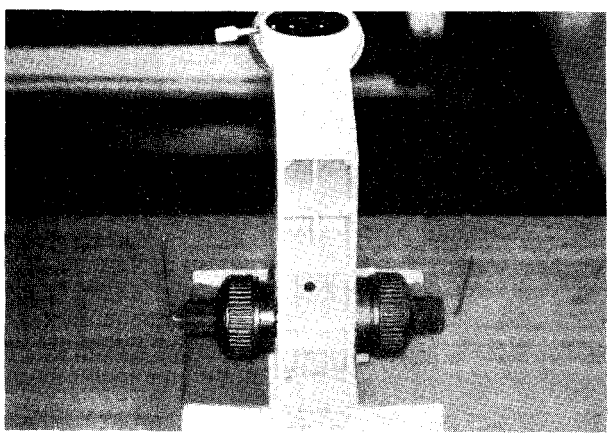
*Disassemble the stage only when you have a problem such as a damaged stage or poor alignment to the optical axis.

## 4. Disassembly of focusing knobs



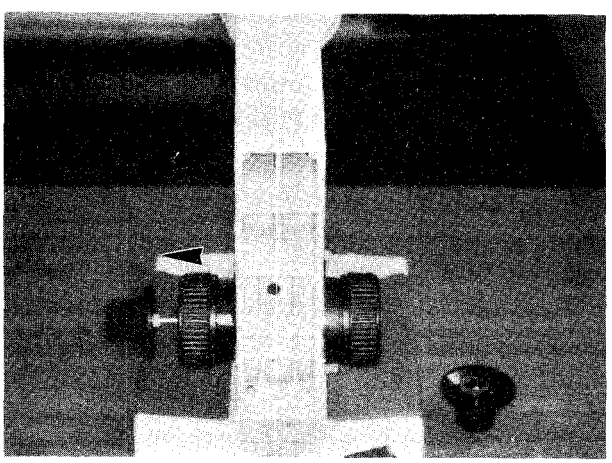

4-1. Remove the left and right cover plates (ABB-060700).

*Jimmy the plate at the cutout and it will easily come off.

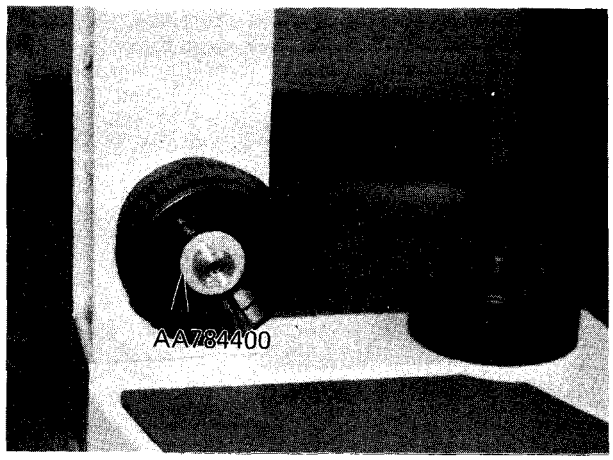


4-2. Remove the screws (AB3 x 8SA) which are holding the left and right knobs for the fine focus adjustment (AB059300/AB467500).

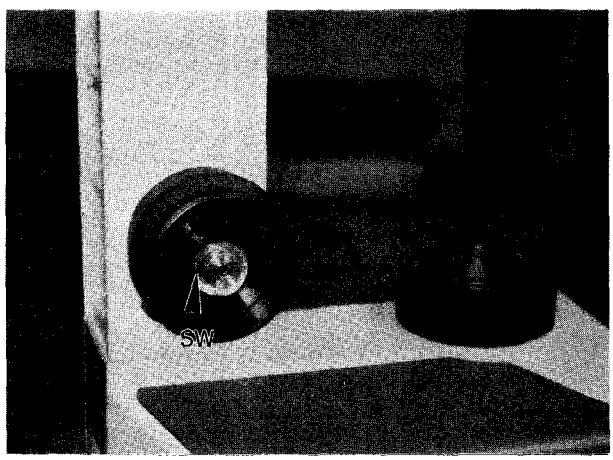
*Insert wrenches into the hexagonal holes of the knobs and rotate them counterclockwise.



4-3. Pull out the fine focus knobs.

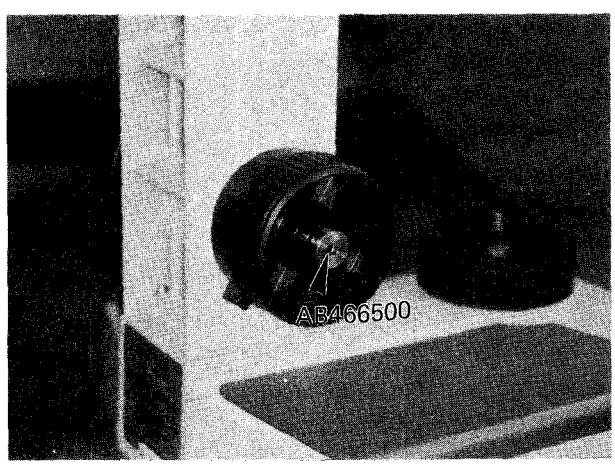



4-4. Remove washer (AA7784400).



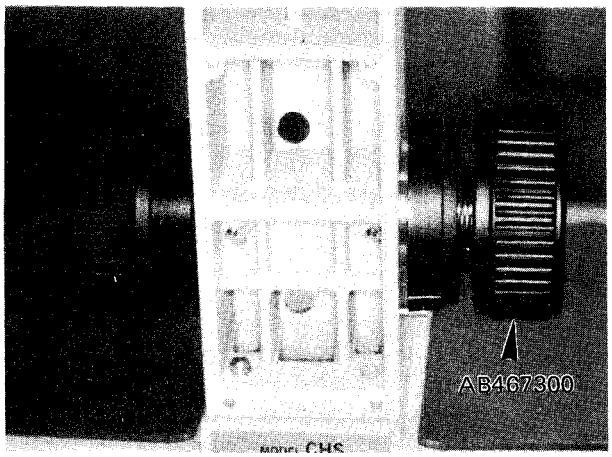

4-5. Remove the spring washer.

*Either AB021700 or AB022600, whichever is the most suitable, is used there.



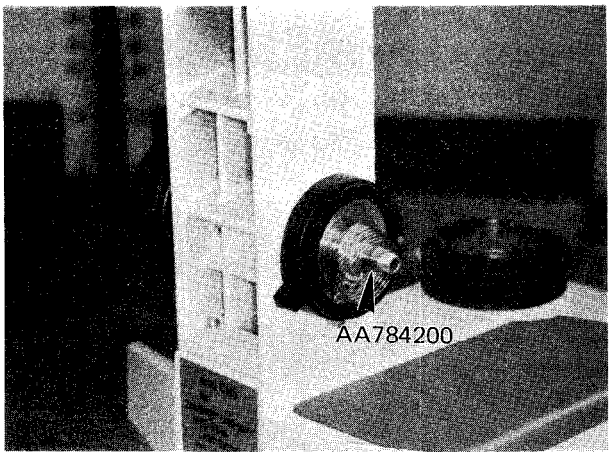

4-6. Remove nut (AB466500).

*The threaded part is coated with adhesive, so dip it in a mixed solution, and remove it using an eye wrench (KKAB4665).

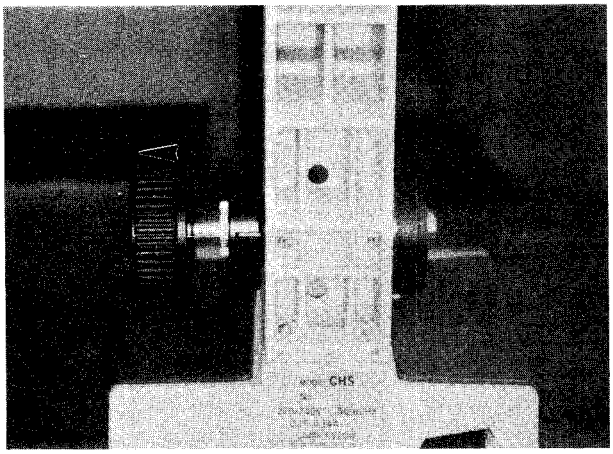



4-7. Remove the left coarse focus knob (AB-467300).

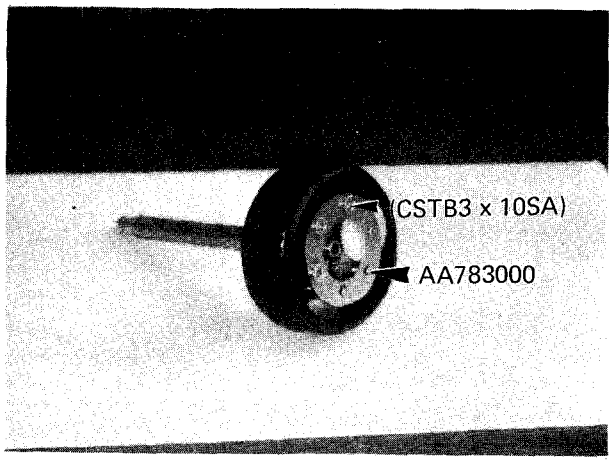
*Hold the right coarse handle with your hand, and pull it out in the arrow direction.



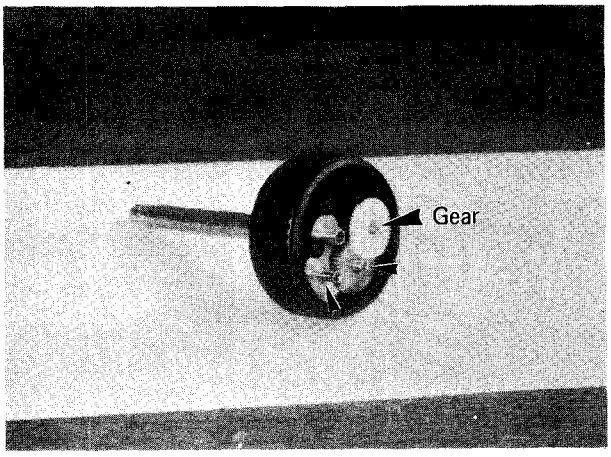

4-8. Remove spring (AA784200).



4-9. Pull out the right coarse focus knob in the direction of the arrow.



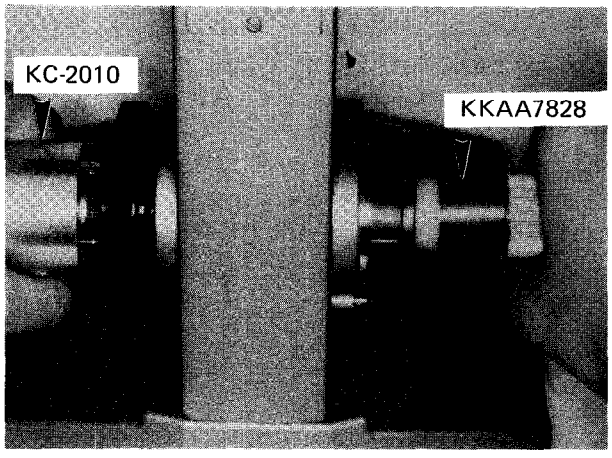

4-10. Remove plate (AA783000) by removing 3 screws (CSTB3 x10SA).




4-11. Remove the gears.

- AA783300
  AA783400
- AA783400
  AB467000
- AA787800
  AA787900

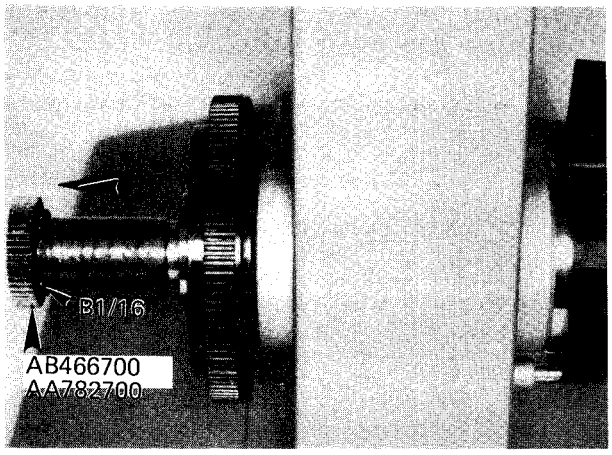
## 5. Disassembly of rack and pinion



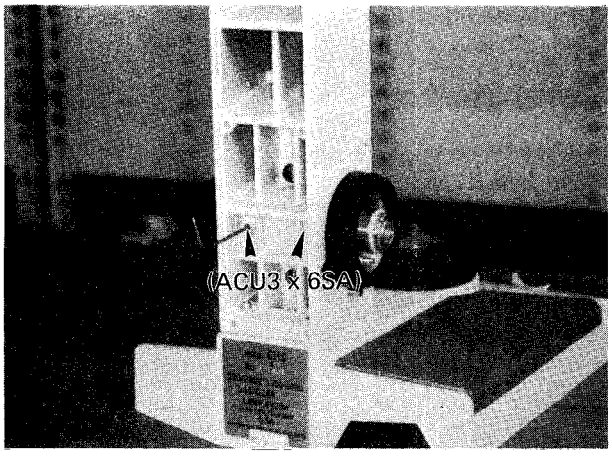

5-1. Place tools KC-2010 and KKAA7828 on the right gear (AA782700) and the left nut (AA782800) respectively, then rotate them counter-clockwise and remove the nut.

*The nut is fixed with glue.

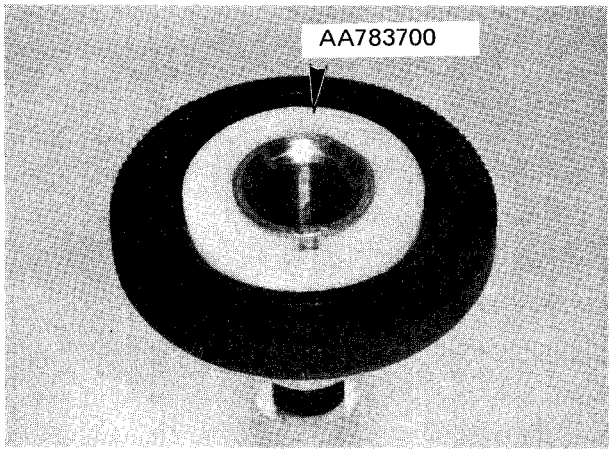
*Balls B1/16 are held in the bearing, be carefull not to lose them.



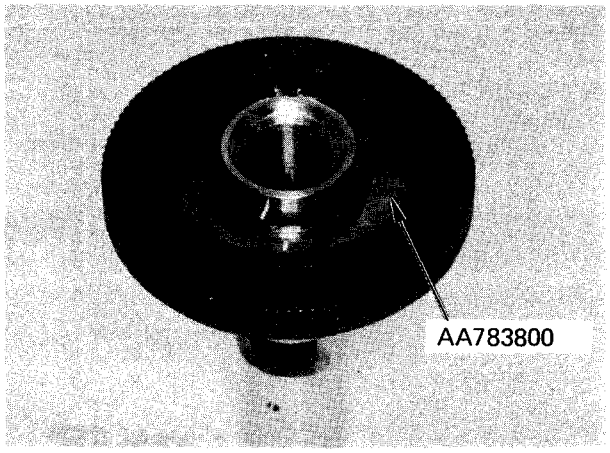

5-2. Pull out pinion asssembly (pinion AB466700 and gear AA782700) in the direction of the arrow and remove balls B1/16.



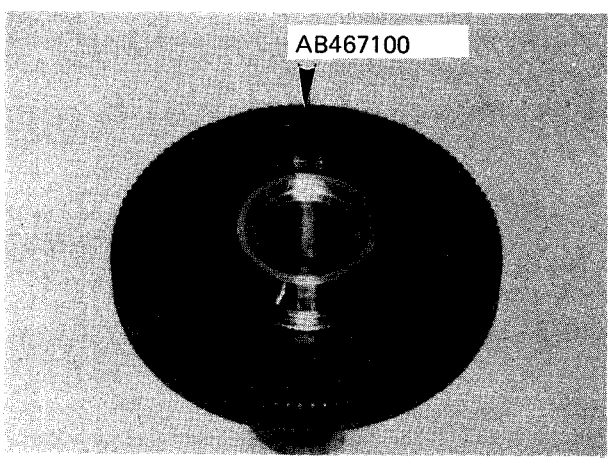

5-3. Remove the pinion bearing. Remove 2 screws (ACU3 x 6SA) and pull the bearing in the direction of the arrow.



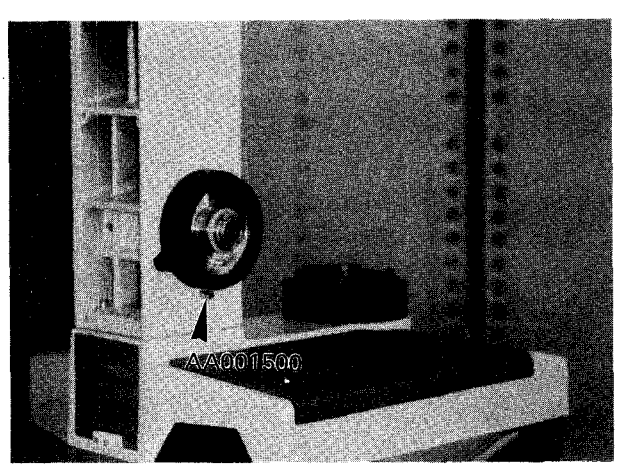

5-4. Remove washer (AA783700).



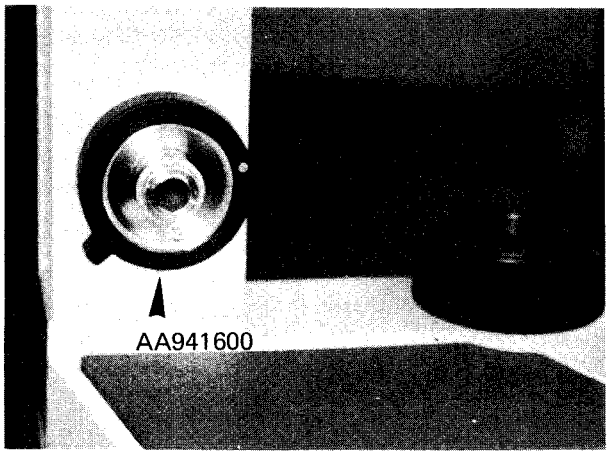

5-5. Remove spring (AA783800).



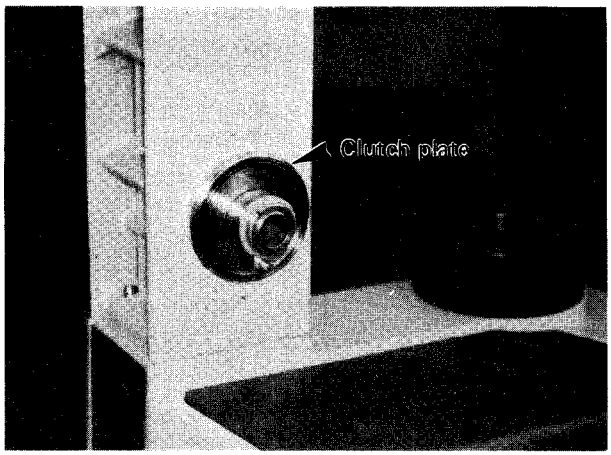

5-6. Remove knob (AB467100) by rotating it clockwise (direction of the arrow).




5-7. Remove stopper (AA001500).




5-8. Remove knob (AA941600) by rotating it counterclockwise.

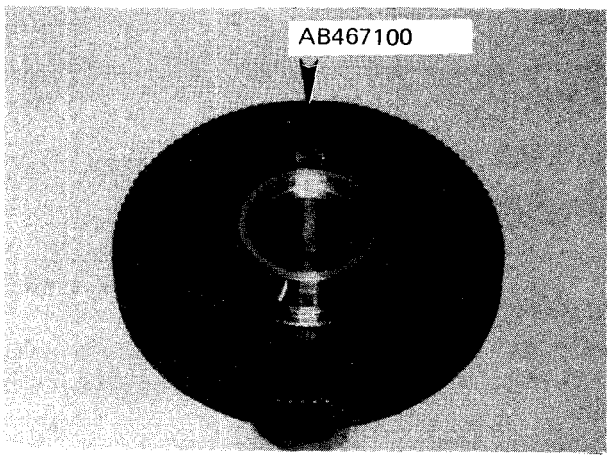



5-9. Remove the clutch plate.

# 3. REASSEMBLY AND ADJUSTMENT

## CONTENTS

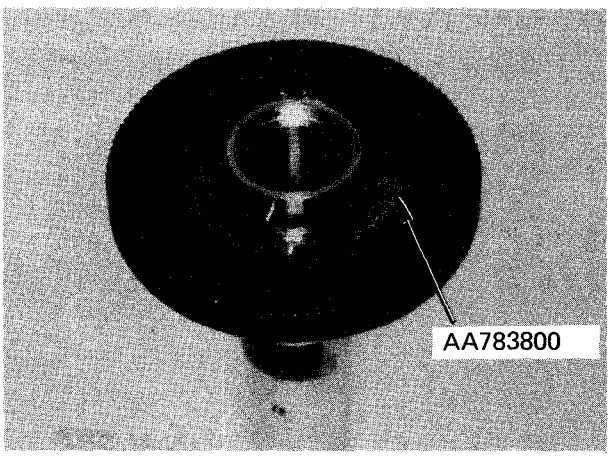
## 1. Assembling the pinion assembly



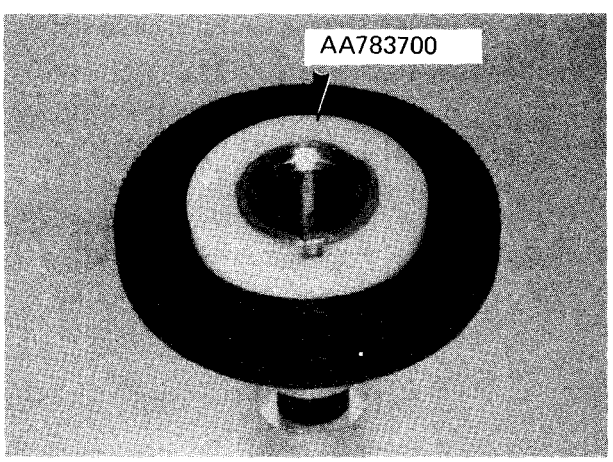

1-1. Assemble the pinion bearing.

1-1-1. Mount knob (AB467100) on Bearing (AB-466600).

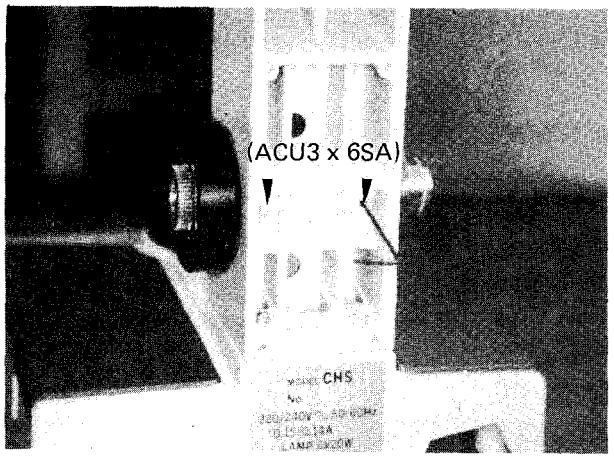
*Apply grease (OT2006) on threads.



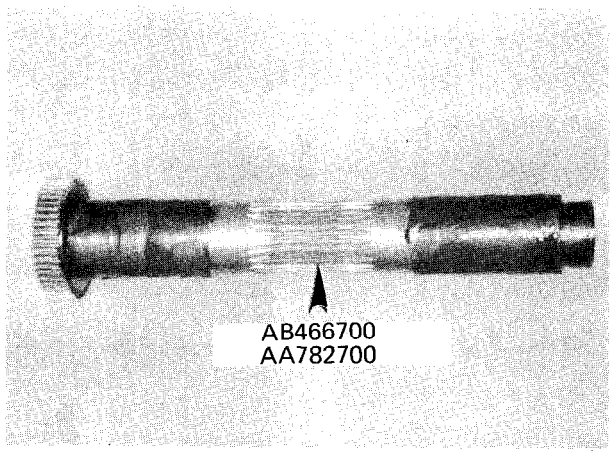

1-1-2. Apply grease (OT2006) on the folds of spring (AA783800).




1-1-3. Apply grease (OT2006) on washer (AA-783700) and place it on the knob.



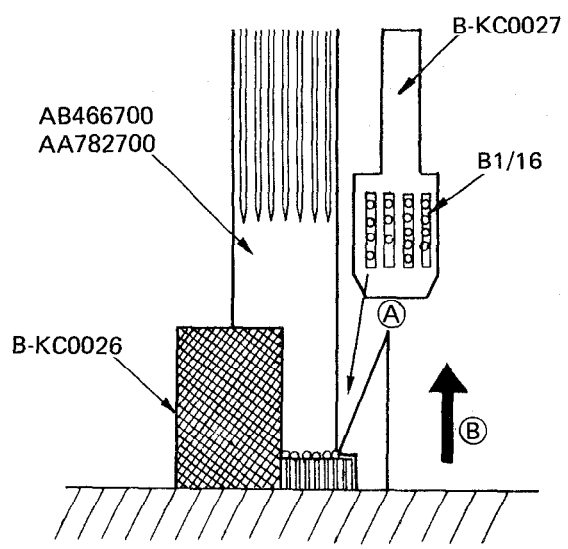

1-1-4. Clamp the pinion bearing assembly on the arm with 2 screws (ACU3 x 6SA).




1-2. Put together the pinion shaft assembly (pinion AB466700 and gear AA782700).

1-2-1. Apply grease (OT2012) on the pinion shaft.

*Never apply grease on the threaded portion.

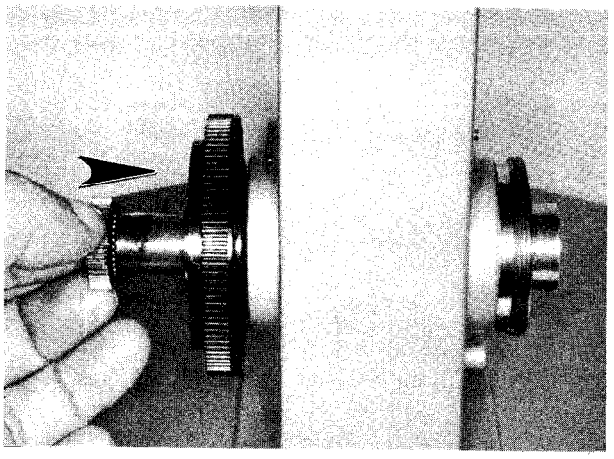



1-2-2. Fit 30 balls B1/16 around the pinion shaft.

1. Place pinion

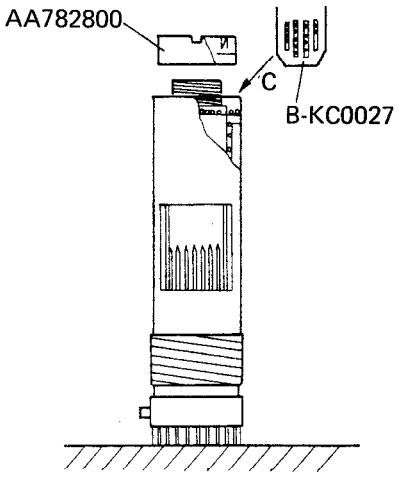
1-2-2. Fit 30 balls B1/16 around the pinion shaft.

1. Place pinion shaft on jig (B-KC0026).
2. Apply grease (OT2012) on the balls and put all 30 balls on jig (B-KC0027).
3. Fit balls around the shaft. →Ⓐ
4. Remove jig (B-KC0026) by pulling it in the direction of "B".



1-2-3. Assemble the pinion shaft.

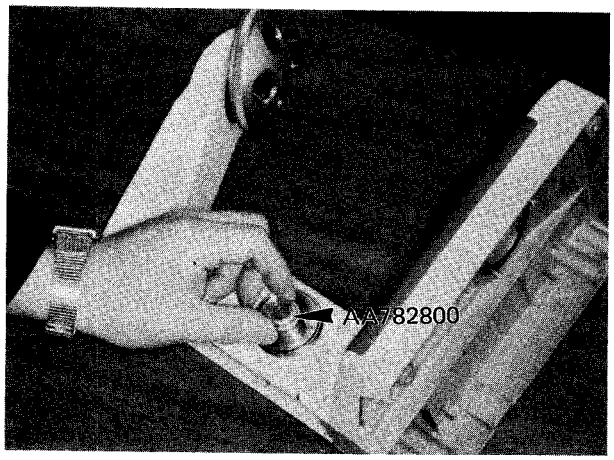
1. Hold the arm upright and insert the pinion shaft assembly gently without dropping the balls.
2. Lay down the arm on its side while holding the arm and shaft with your hands in order not to drop the balls.




1-2-4. Fit 30 more balls B1/16.

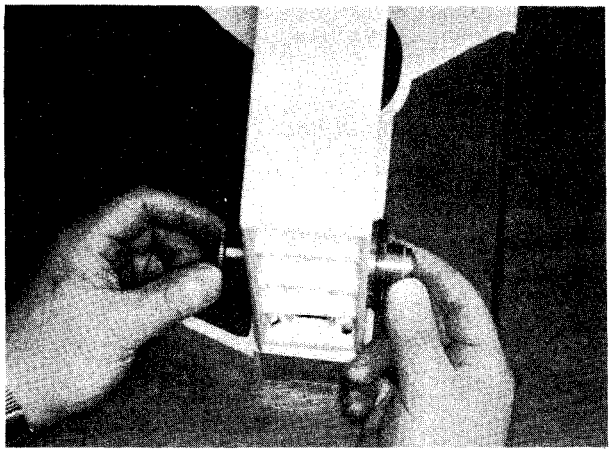
1. Put 30 balls B1/16 on jig (B-KC0027).
2. Drop the balls in the direction of "C" with tweezers so as not to smear the threads of the pinion shaft.

*Be careful to avoid greasing the threads of the pinion shaft.



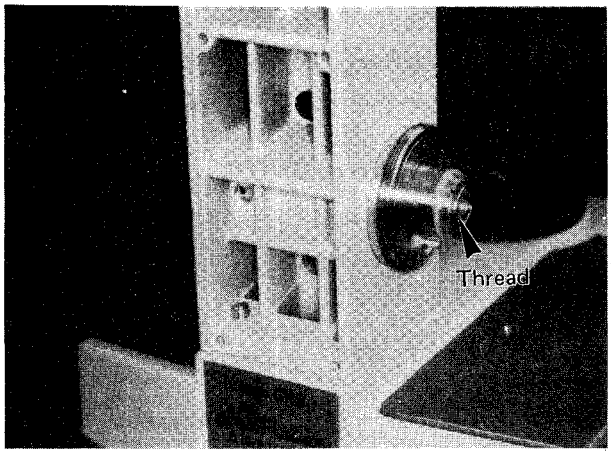

1-2-5. Thread nut (AA782800) on the shaft.

*Keep the nut just tight enough to hold the balls there.



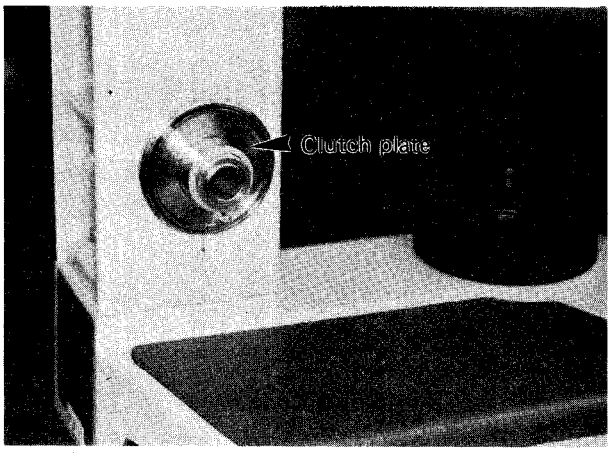
1-2-6. Put the arm in its original upright position and adjust the pinion shaft and the nut.

1. Gradually tighten the nut while confirming that there is no excess friction, uneven movement or play in the thrust direction.
2. If the nut is tightened too much it may cause excess friction. Be careful.



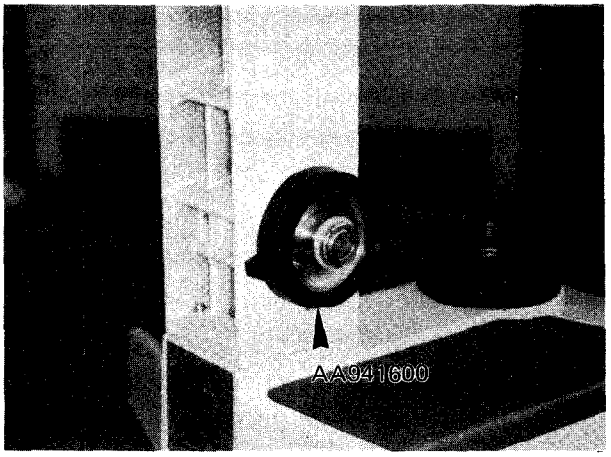

1-2-7. Apply glue (OT1027) on the threads of the nut.

## 2. Assembling the upper stopper of coarse focusing unit

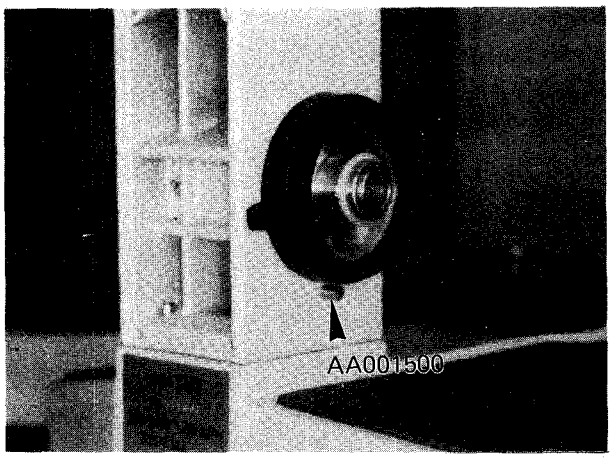



2-1. Mount the clutch plate on the pinion assembly.

*Confirm that the plate is free of grease and undamaged.

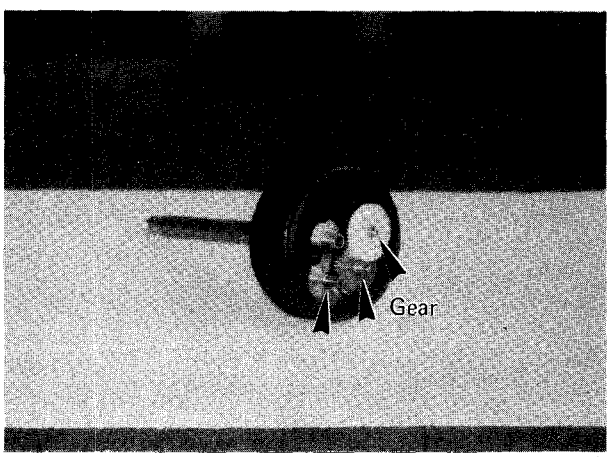



2-2. Screw on knob (AA941600) clockwise until it stops.




2-3. Mount the stopper (AA001500) on the arm.

## 3. Assembling the coarse and fine focus adjustment unit.




3-1. Assemble the right hand knob assembly of the coarse focus unit.

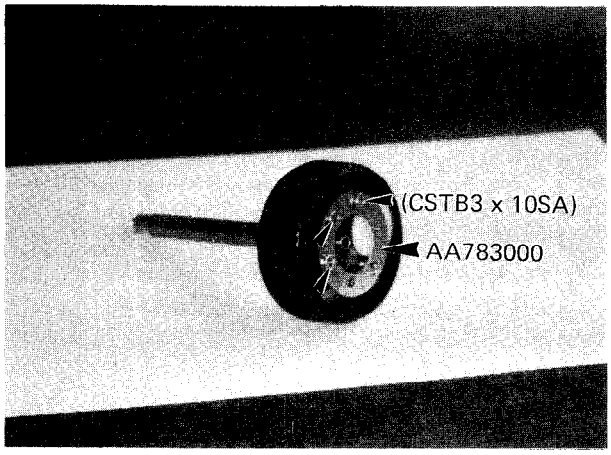
3-1-1. Assemble the gears.

- AA783300
- AA783400

- AA787800
- AA787900

- AA783400
- AB467000

*Apply grease (OT2012) on the shaft and teeth.

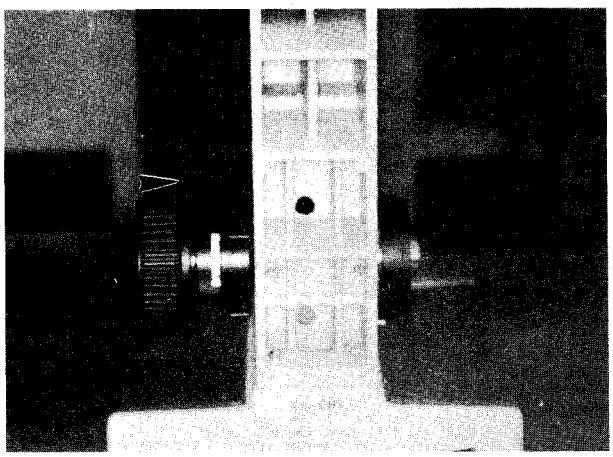



3-1-2. Mount plate (AA783000) with 3 screws (CSTB3 x 10SA).

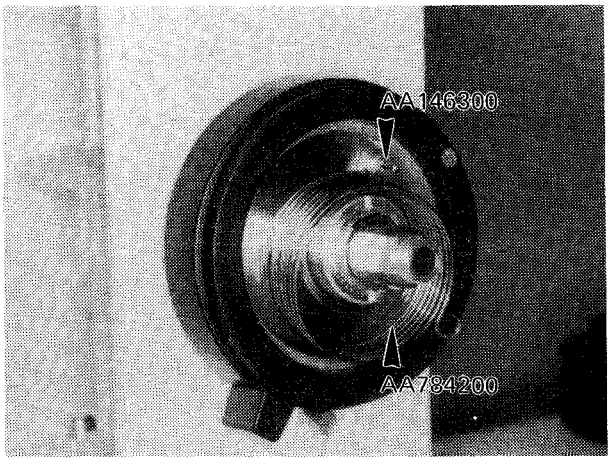
3-1-3. Check the gear movement.

1. Lightly rotate the gears with your finger and confirm that there is no excess friction, uneven movement or noise.
2. If malfunctions are observed check the following and adjust or replace component(s), if necessary:

- ○ Mounting of the plate (AA783000).
- ○ Damage or foreign particles on gear teeth.
- ○ Damage or burrs around bearing hole of plate (AA783000).



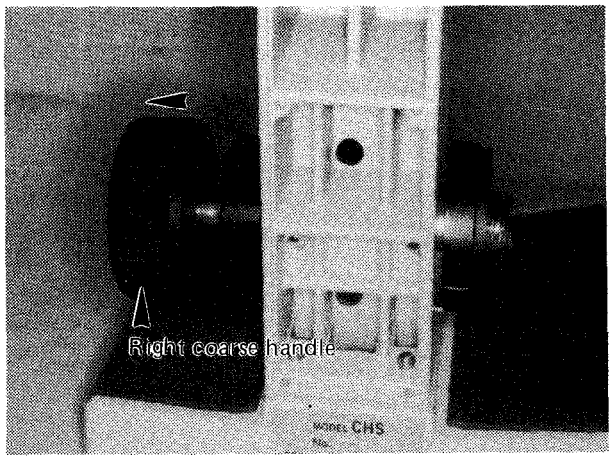
3-1-4. Affix the right hand knob assembly on the microscope arm.




3-2. Assemble the left hand knob assembly of the coarse focus unit.

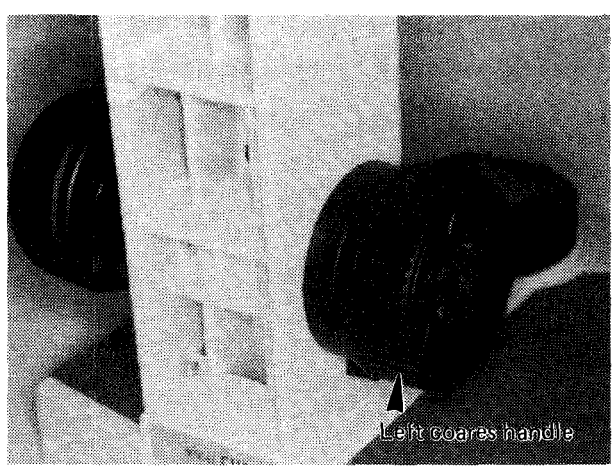
3-2-1. Place spring (AA784200) on the shaft.

*Hook the circular part at the tip of the spring to HK screw AA146300.



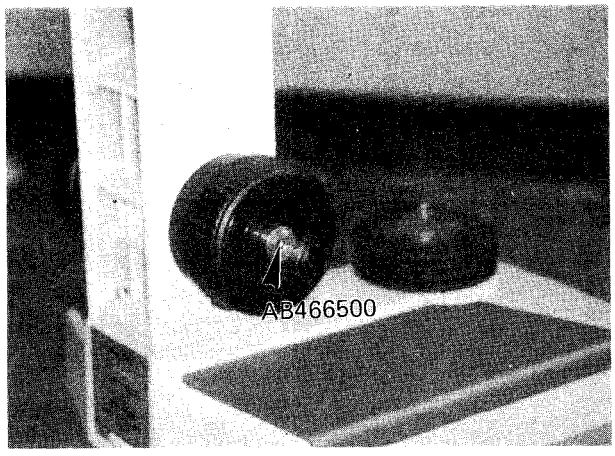

3-2-2. Slightly pull out the right coarse handle.


3-2-3. Insert the stopper pin that is installed in left coarse handle AB467300 into the other circular part of spring AA784200, and push the left coarse handle in the arrow direction.



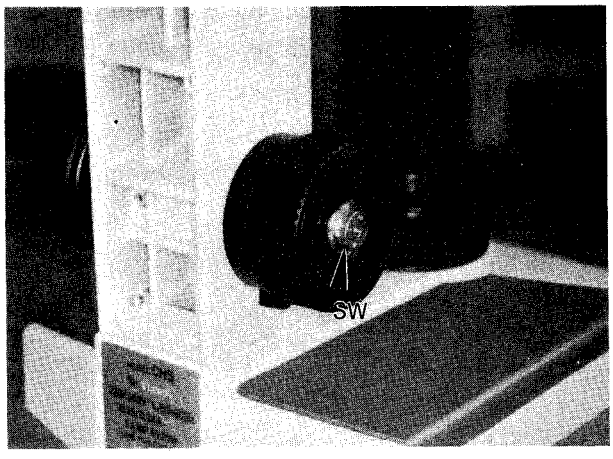

3-2-4. Turn the left coarse handle AB467300 clockwise until it stops, move the left coarse handle a little away from the body, and pass it over HK screw AA146300.


3-2-5. While holding left coarse handle AB467300 still with your hand, push the right coarse handle in the arrow direction.




3-2-6. Mount nut (AB466500) on the shaft.

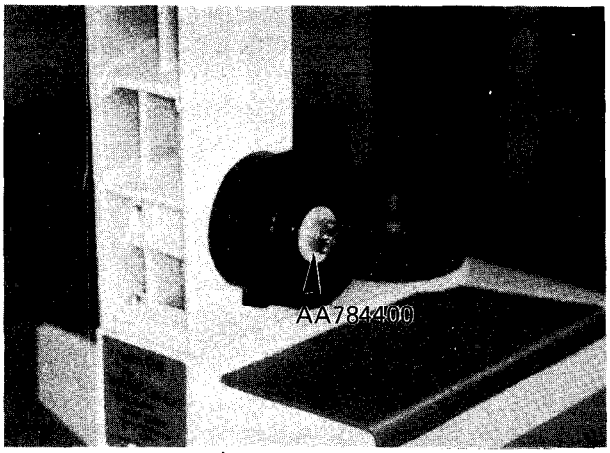
*Apply adhesive OT1126 to the threaded parts of the screws.




3-2-7. Place the spring washer on the shaft.

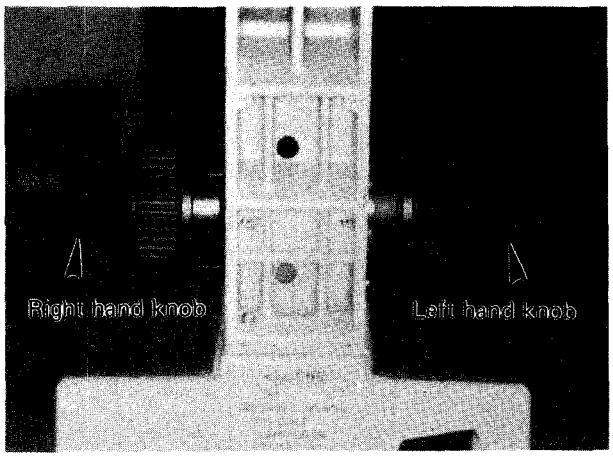
*Use either AB021700 or AB022600.

*Apply grease (OT2008) on the folds of the spring washer.




3-2-8. Place washer (AA784400) on the shaft.

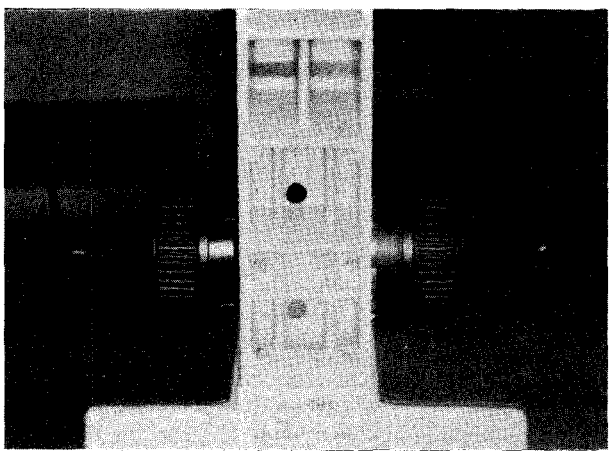
*Put grease (OT2008) on the washer.




3-3. Mounting the fine focus knobs.

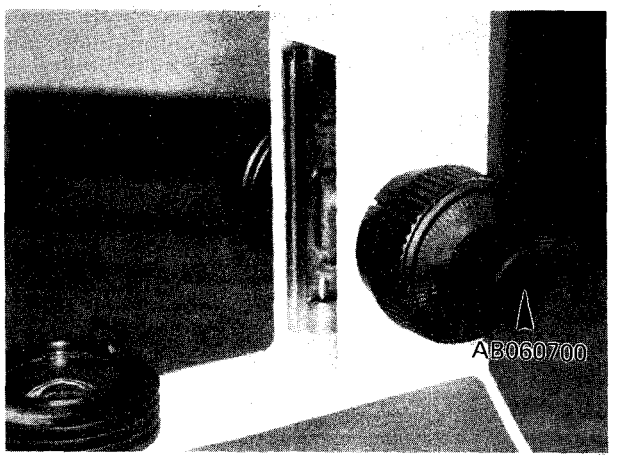
3-3-1. Affix the right hand knob assembly on the microscope arm. Knob (AB467500), shaft (AB466900) and gear (AA782600).

3-3-2. Mount left hand fine focus knob (AB-059300).



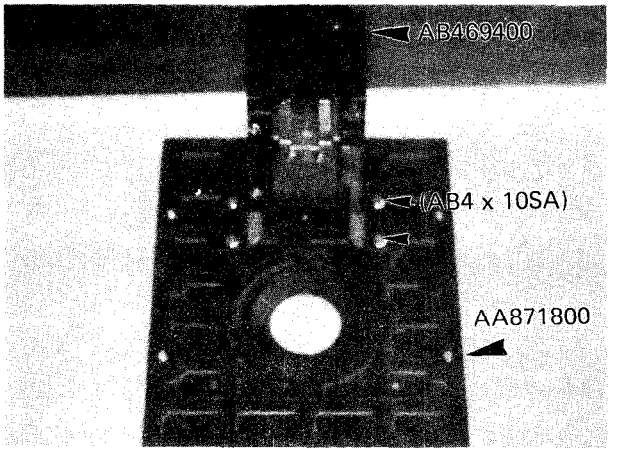
3-3-3. Tighten screw (AB3 x 8SA) which holds right and left hand focusing knobs.

*Apply adhesive OT1131 to the threaded parts of the screws.

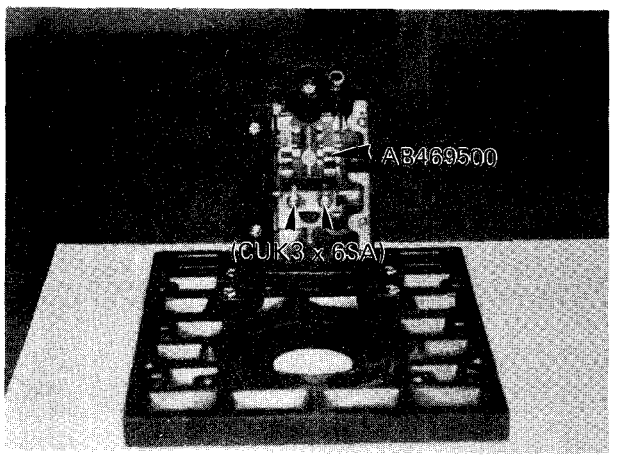



3-3-4. Mount the left and right hand cover plates (AB060700) on the knobs.

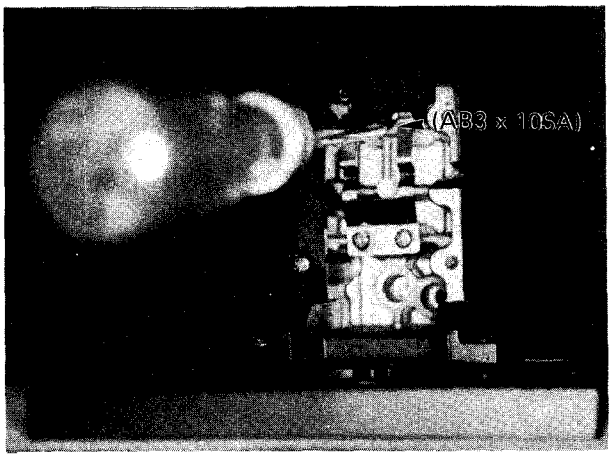
## 4. Assembling the condenser carrier, stage and ball guide for coarse focus adjustment




4-1. Mount the stage (AA871800) on the stage bracket (AB469400) with 4 screws (AB4 x 10SA).

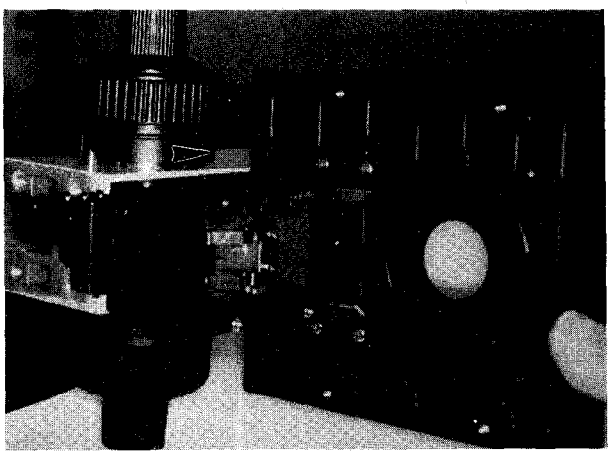



4-2. Mount the leaf spring (AB469500) on the stage bracket with 2 screws (CUK3 x 6SA).




4-3. Fix block (AB009700) with 2 screws (AB3 x 10SA) located under the condenser carrier (AB468800).

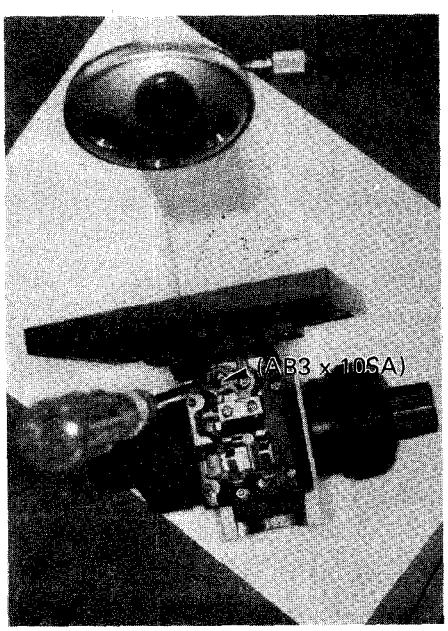
*Do not tighten them completely but let the block have some play.



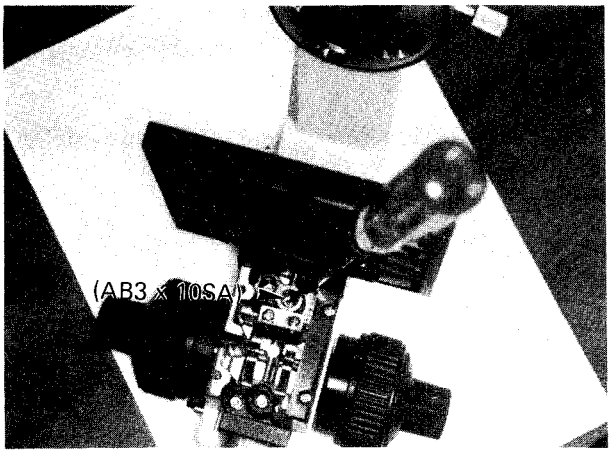
4-4. Lay down the microscope frame on its side and mount the condenser carrier following the direction of the arrow.

*Be careful not to drop the balls B4.

*Apply grease (OT2010) on the balls.



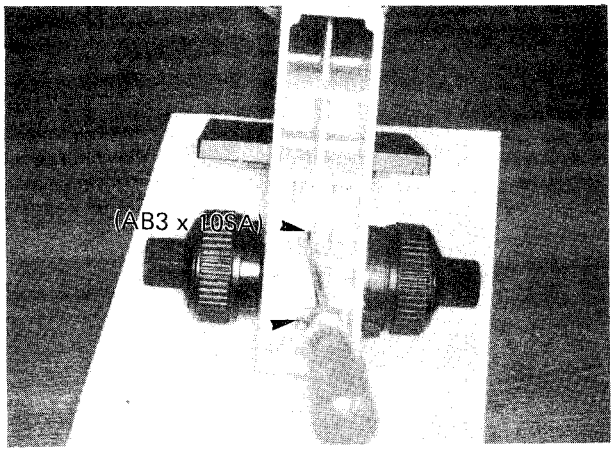

4-5. Mount the guide (AB468600) with 2 screws (AB3 x 10SA) while holding the condenser carrier with your fingers.



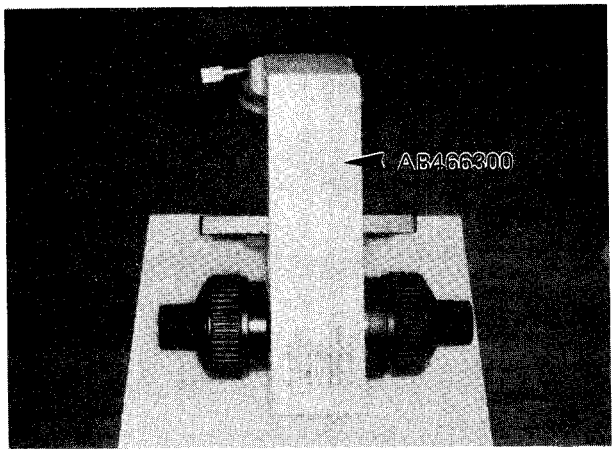

4-6. Check vertical movement of the coarse focus adjustment guide.

4-6-1. Move the coarse focus adjustment guide vertically and confirm that there is no excess friction, uneven movement or play.

4-6-2. If excess friction, uneven movement or play is observed, adjust them by either tightening or loosining 2 screws (AB3 x 10SA) which hold the block (AB009700).

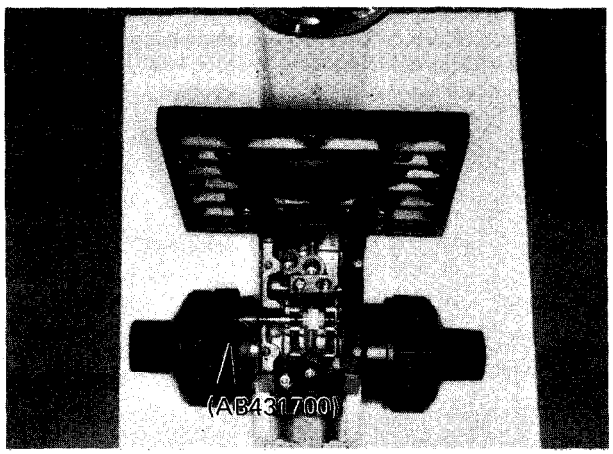



4-7. Mount the coarse focus rack (AB469300) from the back of the arm with 2 screws (AB3 x 1000SA).

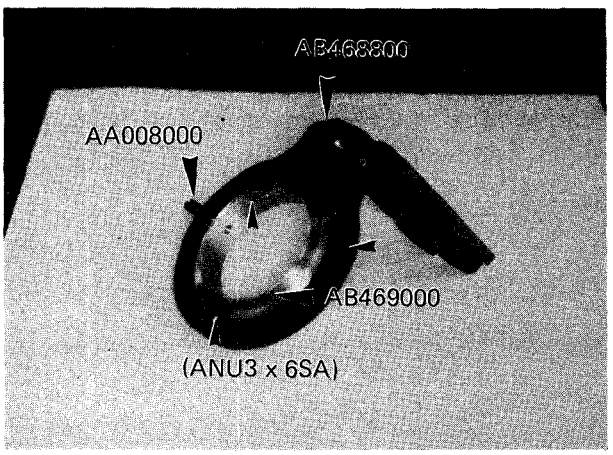



4-8. Place the back cover (AB466300) on the arm.

4-8-1. Push 6 rivets (AB435500) into the holes.



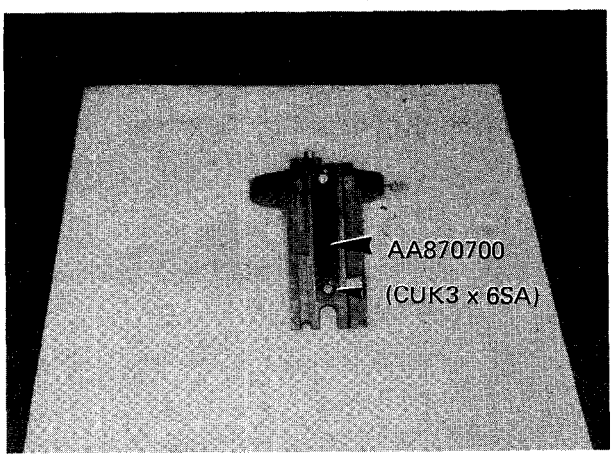

4-9. Place the knob assembly (AB431700) in the sub-stage block.



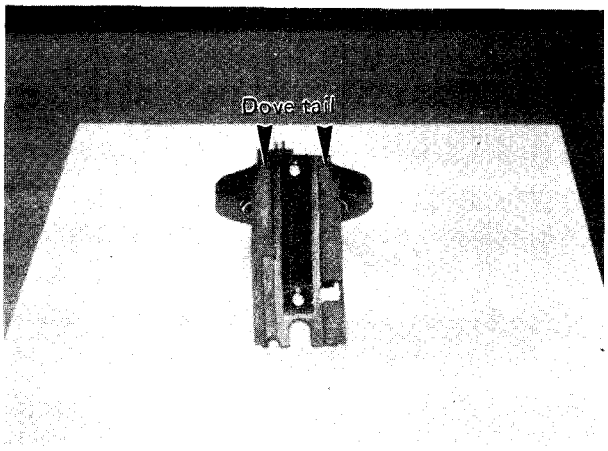

4-10. Mount the sleeve (AB469000).

4-10-1. Place the sleeve (AB469000) in the condenser carrier and clamp with 3 screws (ANU3 x 6SA).

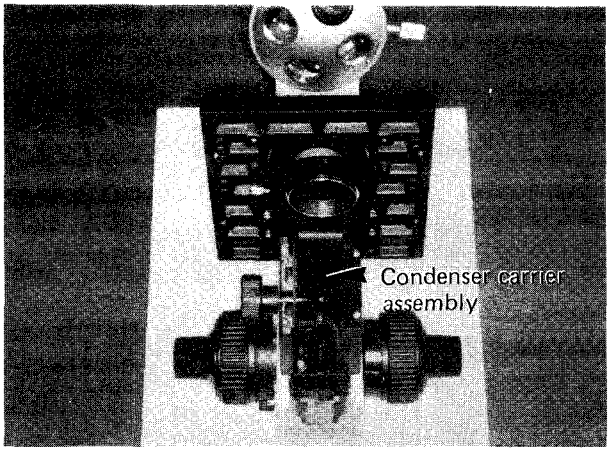
4-10-2. Mount the condenser clamping screw (AA008000).



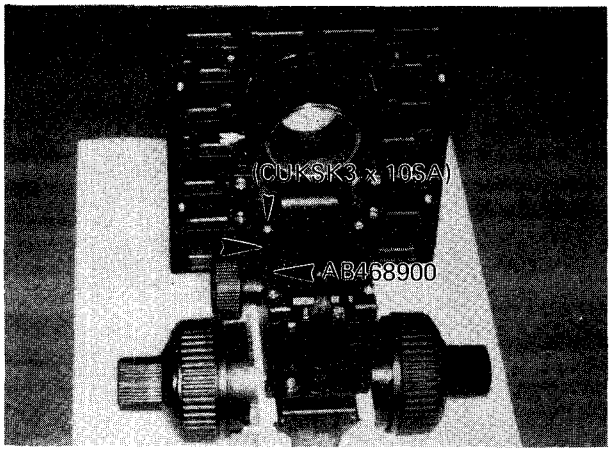

4-11. Mount the condenser rack (AA870700) with 2 screws (CUK3 x 6SA).




4-12. Apply grease (OT2008) on the dovetail portion.

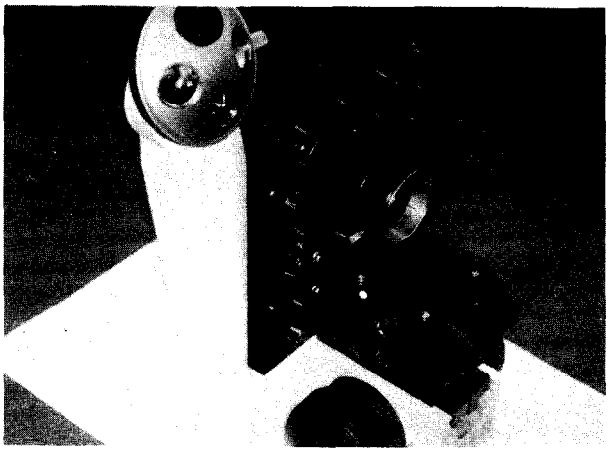



4-13. Place the condenser carrier assembly into the substage block.




4-14. Mount the left outer guide (AB468900) with 2 screws (CUKSK3 x 10SA).

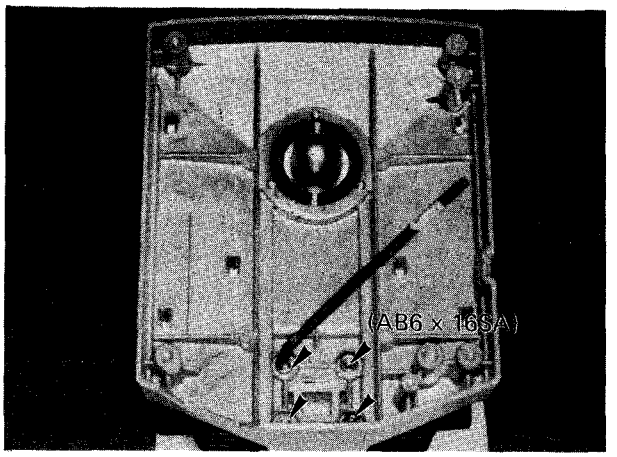
*Tighten screws evenly while pressing the guide in the direction of the arrow.



4-15. Check vertical movement of the condenser carrier.

4-15-1. Try to move the condenser carrier holding it at its end and confirm that there is no play.

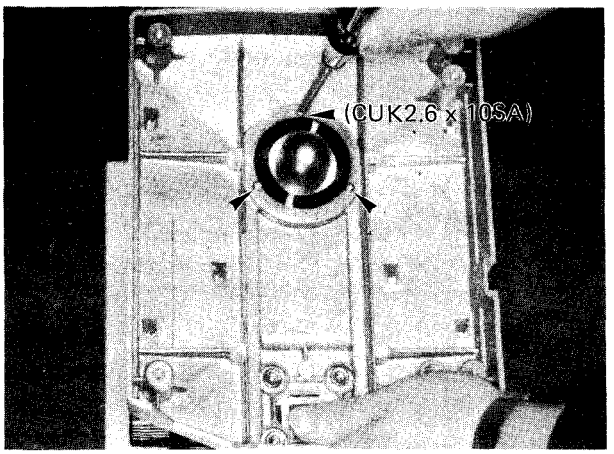
4-15-2. If there is some play readjust the left outer guide.




4-16. Assemble arm (C2-AS) and base (C2-BS) with 4 clamping screws (AB6 x 16SA).

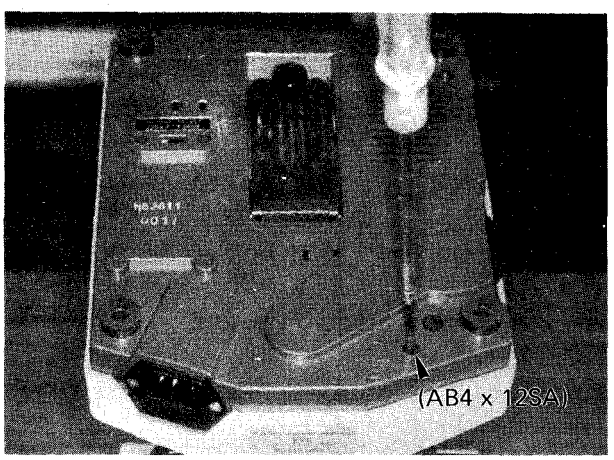
*Reassemble the base and arm according to the marks made during disassembling.

## 5. Assembling the light exit unit

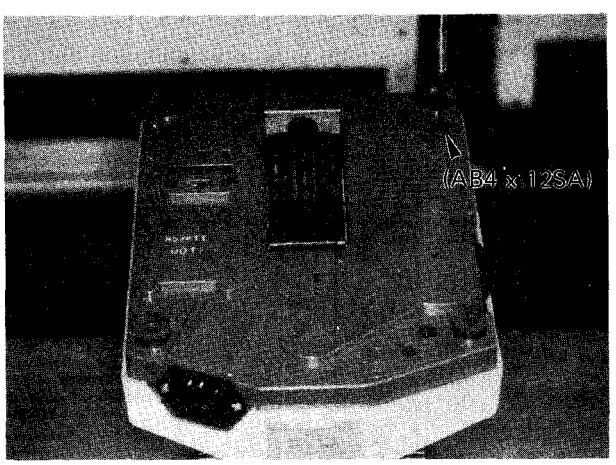



5-1. Place the microscope upside down and fasten the light exit unit with 3 screws (CUK2.6 x 10SA).

## 6. Assembling the bottom plate of base

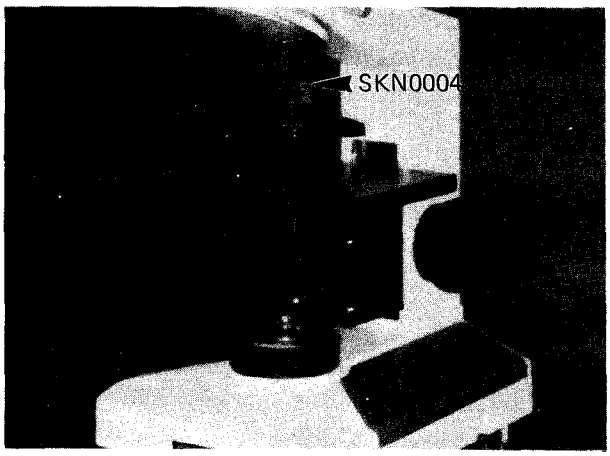



6-1. Fasten the ground wire (green) with screw (AB4 x 12SA).



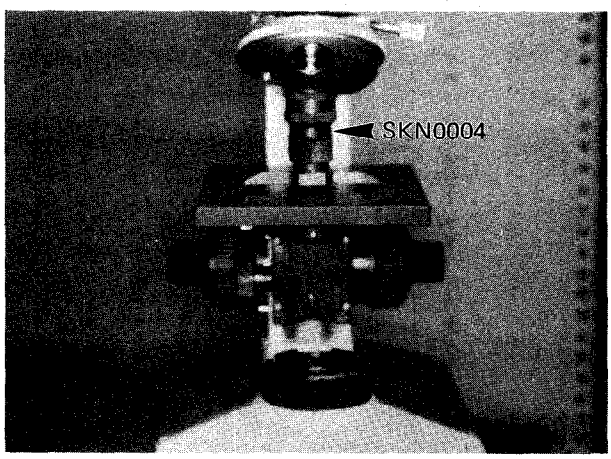

6-2. Mount the bottom plate (C2-BDS-C2-BDT) on the base with 4 screws (AB4 x 12SA).

## 7. Perpendicularity adjustment of stage

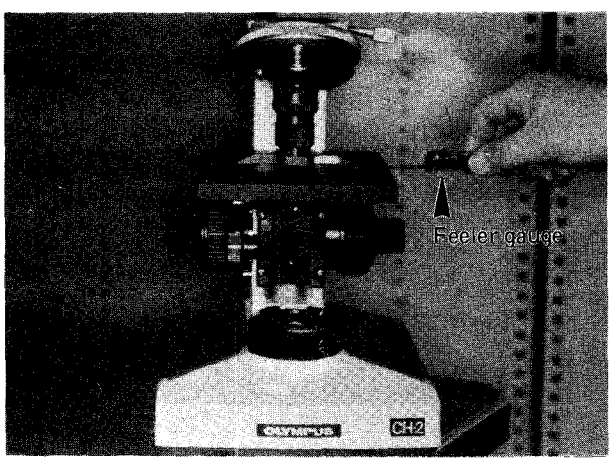



7-1. Adjustment of X (horizontal) direction

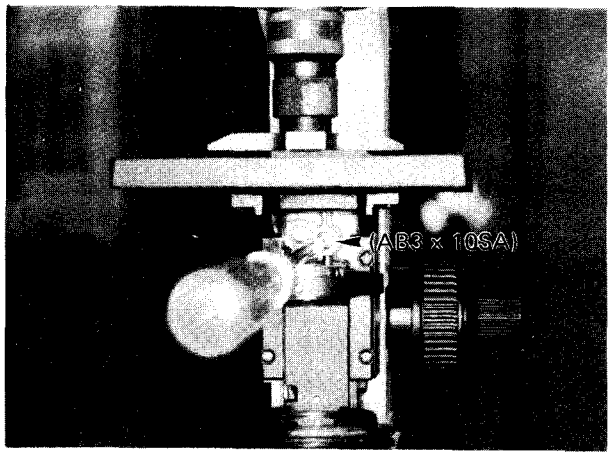
7-1-1. Screw jig (SKN0004) into the nosepiece.



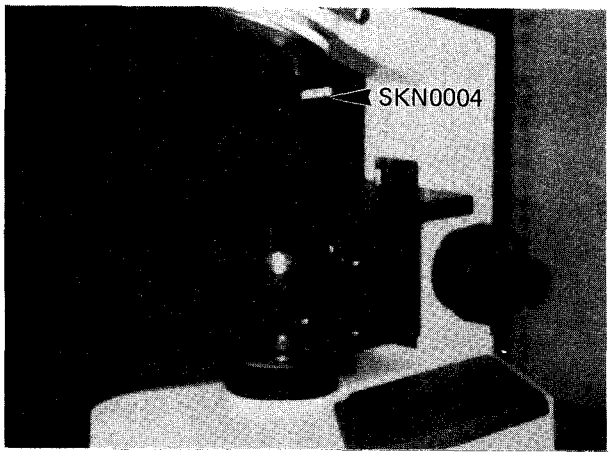

7-1-2. Rotate the jig (SKN0004) to bring it parallel to X-direction. Bring stage upwards until bottom surface of jig contacts stage surface.




7-1-3. Check for equal clearance between the jig and stage surface with the thickness gauge (OT0317) at the left or right end. Maximum telerance between stage surface and jig surface = 0.15 mm.

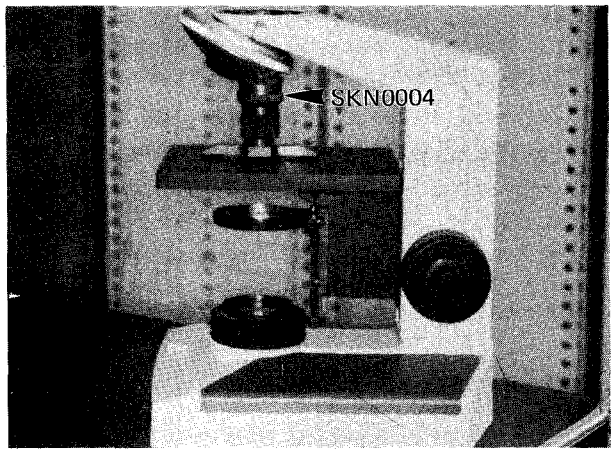



7-1-4. If the reading exceeds tolerance, adjust the tilt of condenser C2-CH carrier by loosening 4 clamping screws (AB3 x 10SA), tilting the entire assembly accordingly and tightening the 4 clamping screws.

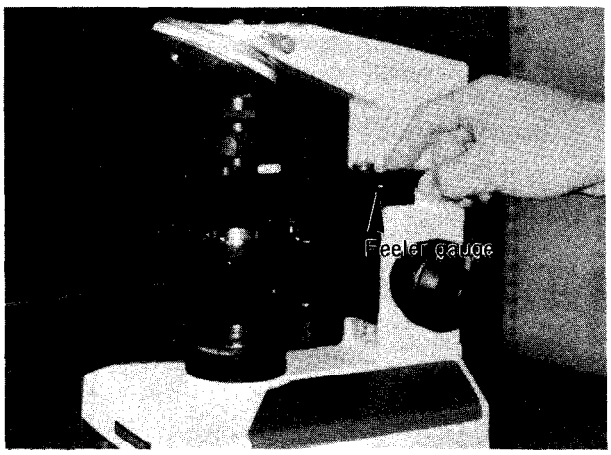



7-2. Adjustment of Y (vertical) direction

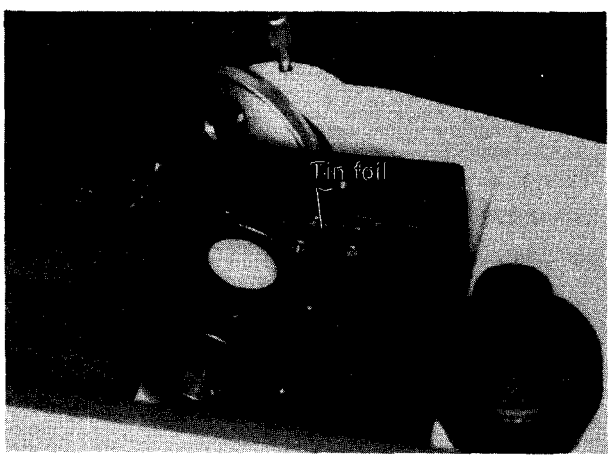
7-2-1. Screw jig (SKN0004) into the nosepiece.




7-2-2. Rotate the jig (SKN0004) to bring it parallel to the Y-direction. Bring stage upwards until bottom surface of jig contacts stage surface.




7-2-3. Check for equal clearance between the jig and the stage surface with feeler gauge (OT0317) at the front or back end. Maximum tolerance between stage and jig = 0.15 mm.




7-2-4. If the reading exceeds tolerance, adjust the tilt by inserting a piece of tin foil between the stage (AA871800) and the substage block (AB469400).

## 8. Accuracy adjustment of fine focus scale adjustment

8-1. Assemble the microscope as indicated in Fig.

Observation tube
Objective 40X
Eyepiece 10X
Condenser
Specimen (Any specimen good for 40X)
Block (B2KC0010)

No special jigs are required.

8-2. Check procedure

8-2-1. Focus on the specimen and check the fine focus scale reading.

8-2-2. Rotate the fine focus adjustment knob by ± 25 μm (10 divisions), then refocus on the specimen and take the scale reading.

8-2-3. The difference between the two reading obtained in step 8-2-1 and step 8-2-2 should be within 1.5 divisions.

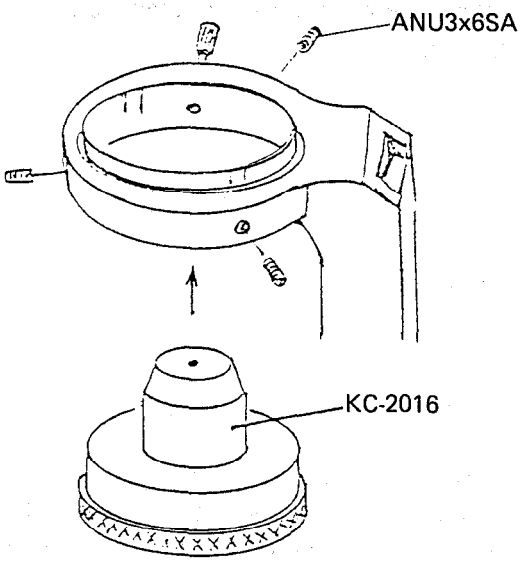
8-2-4. Repeat steps 8-2-1 and 8-2-2 after removing the block (B2KC0010).

8-3. If the readings exceed the above mentioned tolerances:

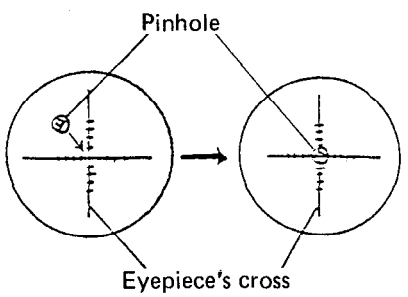
8-3-1. Recheck assembly step 1-2 and check for damages on components.

8-3-2. Recheck assembly step 3-1 and check for damages on components, especially gears.

## 9. C2-CH centering adjustment




9-1. Set the reference condenser KC-2016 in C2-CH.




9-2. Using the centering eyepiece KN0028 and objective 10X, focus the pinhole in the reference condenser.

9-3. Adjust the pinhole to the center of the eye-piece's cross, using the 3 screws (ANU3x6SA) that fasten sleeve AB469000.