CHAPTER 34
PROPELLER

1. General

1.1 J9–G1 propeller consists of propeller housing, shaft hub, propeller sleeve, counterweight, cylinder set, blade and so on (see Fig.47).

1.2 Magnetic inspection and fluorescence inspection are conducted in accordance with Appendix 1 in this manual. Welding is not allowed if any crack is found.

1.3 Part surface treatment is conducted in accordance with Appendix 2 in this manual.

2. Repair

2.1 Propeller housing G1–1001

2.1.1 Check that propeller housing surface is free from scratch not more than 0.4 mm in depth. Dress it by grinding for reuse if slightly corrosive area does not exceed 50 mm^2.

2.1.2 Dress propeller housing with not more than one eighth turn of damaged thread at both ends for reuse.

2.1.3 Check pin G1–1006 for freedom of looseness. Replace it if any.

2.2 Shaft hub G1–1002

2.2.1 Derust conical face, if corrosive, by grinding with No.180～220 emery paper to finish $\stackrel{1.6}{\nabla}$, and ensure that fit area with conical sleeve is not less than 70% of the total.

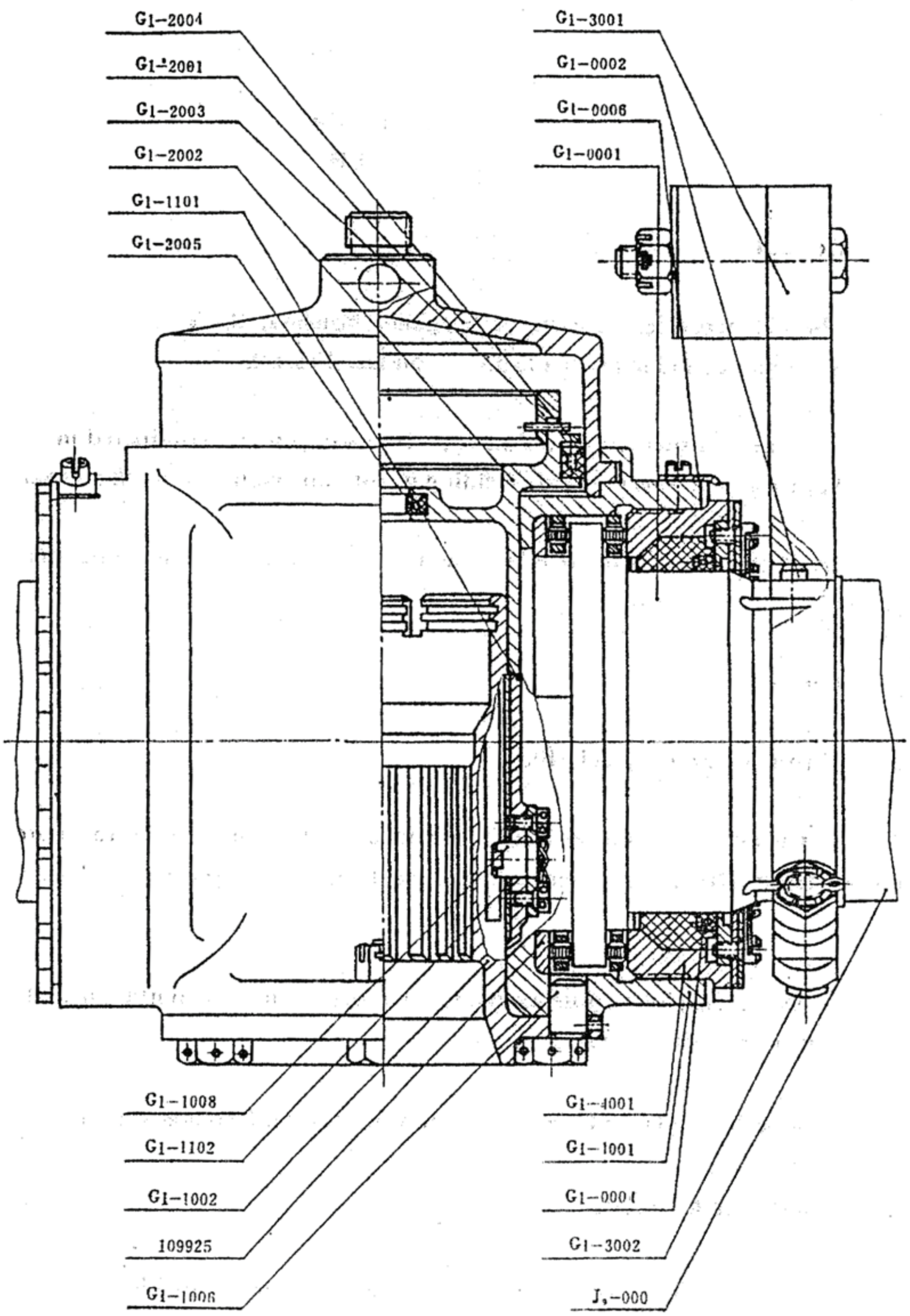
G1-2004
G1-2001
G1-2003
G1-2002
G1-1101
G1-2005
G1-3001
G1-0002
G1-0006
G1-0001
G1-1008
G1-1102
G1-1002
109925
G1-1006
G1-4001
G1-1001
G1-0004
G1-3002
J,-000

Fig. 47

2.2.2 Reuse spline with slight dent of which area does not exceeds 50% of working area. Ensure that total number of splines with the said defects is not more than 3.

2.2.3 If outer circle of shaft hub is severely damaged or scratched or fit gap with fabroil bush is more than 0.155 mm, replace fabroil bush or chromium–plate shaft hub (not more than twice) and ensure that one–side plating thickness is not more than 0.2 mm and finish $\overset{1.6}{\bigtriangledown}\!/$.

2.2.4 After dressing, check that outer circle of shaft hub is Φ76f7 and does not deviate more than 0.03 mm from central line of shaft hub.

2.2.5 Enlarge hole for fixing pin, if damaged, from M4X0.7 to M5X0.8.

2.2.6 If fit gap between shaft hub and propeller housing is beyond tolerance, chromium–plate the portion at Φ77k6 and ensure that one–side plating thickness is not more than 0.2 mm and finish $\overset{1.6}{\bigtriangledown}\!/$.

2.2.7 Dress by filing R corner in notch for shaft hub cone and ensure that the depth does not exceed 0.2 mm.

2.3 Housing nut G1–4001

2.3.1 Dress nut with not more than one eighth turn of damaged thread for reuse. Copper–plate nut if its plating is sheded, and ensure that plating thickness is 0.01～0.02 mm.

2.3.2 Ground nut bearing face if worn, and ensure that:

a. Ground amount is not more than 0.2 mm.
b. Nut thickness is not less than 30.8 mm.
c. Finish is $\overset{0.4}{\bigtriangledown}\!/$.

2.3.3 Check on repaired nut that ground end face does not deviate more than 0.1 mm from inner diameter Φ137H9 and outer diameter Φ156H9.

2.3.4 Replace rubber seal ring G1–0004.

2.4 Propeller sleeve G–0001

2.4.1 Check that pin G1–0002 is free from looseness. Replace it if severely damaged.

2.4.2 Replace propeller sleeve if its threaded part is broken. Dress it for reuse if slightly damaged.

2.4.3 Grind shoulder bearing face if worn, and ensure that:

a. Ground amount is not more than 0.2 mm.
b. Thickness of ground shoulder is not less than 10.8 mm.
c. Its deflection from Φ114H9 surface is not more than 0.02 mm.
d. Its finish is $\overset{0.4}{\nabla}$.
f. At transit portion, R corner is $2.5_{-0.5}$ mm, and finish not lower than $\overset{1.6}{\nabla}$

2.4.4 Grind movable steel ring of bearing 109925 if worn, and ensure that its thickness after grinding is not more than 0.2 mm less than nominal size. Allow to add stainless steel shims during assembly.

2.5 Counterweight clamp assembly G1–3000

2.5.1 Replace clamp G1–3001 and draw bolt G1–3002 if their thread is damaged.

2.5.2 Repair clamp for reuse if damage depth is more than 0.5 mm at its concave face for fixing bolt.

2.6 Cylinder assembly G1–2000

2.6.1 Grind inner surface of cylinder G1–2001 for reuse, if wear or scratch depth is more than 0.1 mm, by using No.180~220 emery paper.

2.6.2 Replace seal rubber cups G1–2004 and G1–2005.

2.7 Blade J9–000

2.7.1 Grind blade surface for reuse, if corrosive or scratched in not more than 0.1 mm depth, by using No 180~220 emery paper.

2.7.2 Grind blade leading edge for reuse if its damaged notch is not more than 3 mm deep (not more than 4 mm within range of 50 mm from blade tip) (see Fig. 48).

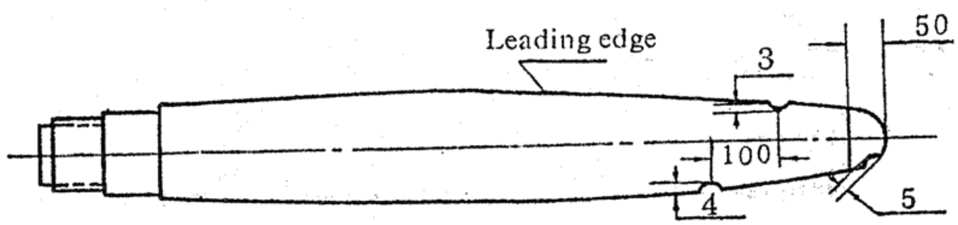

Fig. 48

2.7.3 Grind blade trailing edge for reuse if its damaged notch is not more than 4 mm deep (not more than 5 mm within range of 50 mm from blade tip) (see Fig. 48).

2.7.4 Ensure that damaged notches on leading and trailing edges of one blade are not in a same profile and separated from each other by not less than 100mm. Replace blade if the above requirement can not be met. Ensure that damaged notches on one blade is not more than 3 in quantity (see Fig.48).

2.7.5 Dress blade surface for reuse if dent on it is not more than 1 mm (not more than 2 mm at blade tip) deep.

2.7.6 Dress blade root for reuse if its thread is dented not more than 3 mm deep and damaged not more than 50 mm long from beginning.

2.8 Check that fit of relevant parts in propeller housing assembly meets tolerance requirements as stipulated (see Table 4).

Table 4

Ser. No.	Description	Drawing No.	Fit Tolerance
1	Slider	G1–0003	$22g6^{-0.007}_{-0.020}$
	Driving sleeve lug groove	G1–1101	$22H8^{+0.033}$
2	Cotter in propeller sleeve	G1–0002	$\Phi 10f7^{-0.006}_{-0.034}$
	Slider	G1–0003	$\Phi 14H7^{+0.018}$
3	Shaft hub	G1–1002	$\Phi 76f7^{-0.030}_{-0.060}$
	Fabroil bush	G1–1102	$\Phi 76^{+0.095}_{+0.050}$
4	Housing	G1–1001	$\Phi 77H7^{+0.030}$
	Shaft hub	G1–1002	$\Phi 77k6^{+0.021}_{+0.002}$
5	fabroil bush	G1–1102	$\Phi 80u8^{+0.148}_{+0.102}$
	Driving sleeve	G1–1101	$\Phi 80H9^{+0.074}$

2.9 To replace non–interchangeable parts if damaged, seclect new ones for matching based on their characteristics and functions (see Table 5).

3. Assembly

3.1 Clean metal parts with gasoline, and dry them with compressed air.

3.2 Apply $\frac{1}{13}$ grease to internal parts and a thick layer of $\frac{1}{13}$ grease to inner wall of propellerhousing with exception of fabroil bush.

3.3 To assemble propeller housing assembly, check that all parts are in correct numbers.

3.4 Install driving sleeve, check that it moves vertically and freely.

3.5 Check that there is no radial gap for propeller sleeve in propeller housing.

3.6 To install blade, apply No. 20 aviation oil to threaded portion on propeller sleeve and blade root. Screw blade into propeller sleeve fully, and then screw out not more than 1 turn to align installation line on blade to middle line of sleeve scale.

Table 5

Ser. No.	Drawing No.	Description	Characteristics and Function for Selection and Matching
1	G1–1001	Housing	Cotter hole caliberated against bolt hole of shaft hub
	G1–1002	Shaft hub	Housing conjugated with shaft hub
2	G1–2003	Stop coller	Angle at high pitch to be adjusted during assembly
3	G1–0006	Propeller lock sheet	After definiting nut tightness during assembly
4	J9–000	Blade Assembly	In set and in light of weight and moment during assembly

3.7 Check that counterweight clamp is tightly rested on flange of propeller sleeve.

3.8 Torque screws and bolts for counterweight clamp and propeller housing as follows:

a. Screw on driving sleeve key to 49～7.8 N.M.

b. Bolt on counterweight clamp to 78～88 N.M.

c. Bolt on counterweight sheet to 39～58.8 N.M.

d. Bolt for propeller housing and shaft hub to 58.8～78 N.M.

e. Torque propeller housing nut to such extent that before installation of driving sleeve, rotation moment for each blade is 9.8 ± 2 N.M during change from low pitch to high pitch. Ensure that torgue difference between two nuts is not more than 2 N.M.

3.9 Check that clearance between groove of propeller housing nut and boss of lock sheet on both sides is not more than 0.5 mm.

3.10 Tighten counterweight clamp, and check that propeller sleeve is well fittrd with blade root, and allow a gap not more than 0.1 mm which is 15 mm deep and 10 mm wide.

3.11 Adjust blade pitch variation range, and allow to repair by turning end face A of limit ring G1--2003 and ensure that thickness of flange after turning is not less than 3 mm (see Fig. 49).

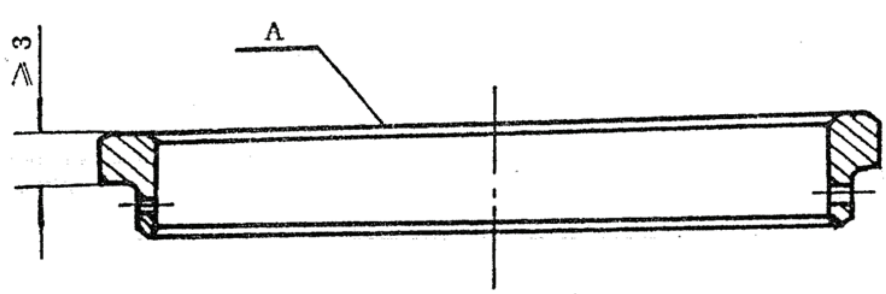

Fig. 49

4. Measurement and Static Balance

4.1 Check that the minimum incidence angle of blade is $16^{\circ} \pm 10'$ at the place where $R = 1000$ mm.

4.2 Check that the maximum incidence angle of blade is $31^{\circ}\ 30'^{+1^{\circ}}$ at the place where $R = 1000$ mm.

4.3 Check that:

- a. The minimum incidence angle difference between two blades is not more than $10'$.
- b. The maximum incidence angle difference between two blades is not more than $20'$.

4.4 Check that angular clearance is not more than $20'$.

4.5 Check that counterweight incidence angle is $25^{\circ} \pm 1^{\circ}$.

4.6 Check that incidence angle difference between two counterweights is not more than $25'$.

4.7 Check that radius length difference ($R = 1200$ mm) between two blades is not more than 1 mm.

4.8 Check at minimum incidence angle that mutual offset between two blade trailing edges at inspection profile is not more than 1 mm.

4.9 Check that height difference between two blade tips is not more than 1.5 mm.

4.10 Check at $R = 1000$ mm that static unbalance is not more than 3 g for minimum incidence angel and 6 g for maximum incidence angle.

4.11 Remove static unbalance of propeller by adjusting with balance sheet. Determine quantity, length and location of balance sheets as required, and ensure that:

a. Not more than 5 balance sheets are used in the direction of their thickness.
b. Length of each balance sheet is not shorter than the distance between two screw holes.
c. Sharp corner of balance sheet is chamfered and varnished.

5. Test

5.1 Airtightness test

Apply a hydraulic pressure of 2.5 MPa, keep for 20 minutes and check that cylinder set is free from leakage.

5.2 Pitch control test

Apply a hydraulic pressure of 1.8 ± 0.1 MPa, make pitch change from high pitch to low pitch 20 times (manually operate to make pitch control from low pitch to high pitch), and check that pitch control is good.

5.3 Pitch control flexibility test

Check that hydraulic pressure used for low pitch change does not exceed 0.4 MPa.

5.4 During test, use No.20 aviation oil and heat it to 80～90℃ (do not heat the oil if diluted).