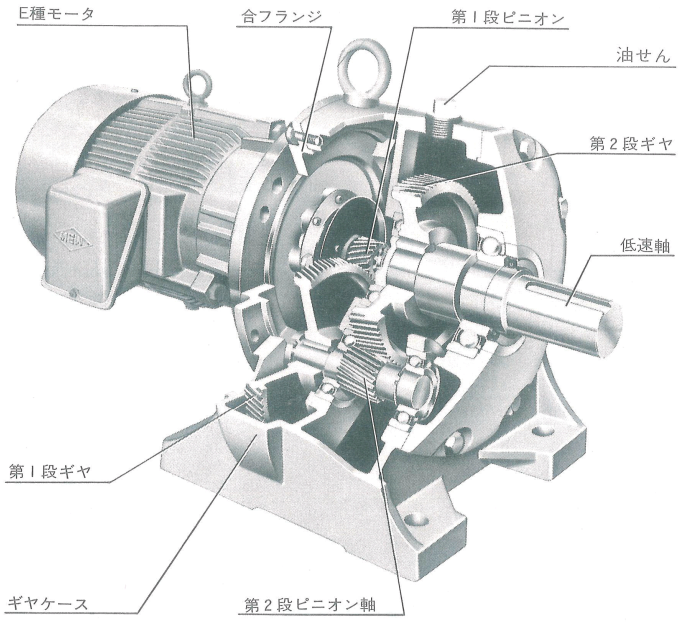
# *Instruction Manual*

# of

## *EF-Series Geared Motor*

## *EZ-Series Gear Reducer*





## *Tamana Seisakusho Co.,Ltd.*

*Kumamoto Japan*

*(http://www.tamana.co.jp)*

## PREFACE

*Tamana* Geared Motors (Type EF & EZ Series), because of their high working efficiency and robust, easy-to-use construction, can be used for a long time without auxiety. If, however, they are mishandled, it will not only greatly shorten their life but may lead to an unexpected accident, and so be sure to go through this instruction manual before use and pay full attention to their inspection, handling and maintenance.

## CONTENTS

1. Construction (ref. annexed assembly dwg.)

The geared motor Type EF series is a self-lubricating gear reducer with a motor flange-mounted directly on the gear case. Helical gears and antifriction bearings are arranged in the style of a simple gear train in the enclosed gear case which also serves as an oil both. Lubrication of the gears and bearing is carried out by splash of oil in the gear case, but the bearings of the outside low speed shaft and the motor shaft are lubricated with grease.

The gear reducer EZ series has a bracket incorporating a high speed shaft in plac of a motor.

2. Checking

Before installation, check and confirm the following points:

(1) Whether kW; gear ratio; rpm of shaft; type, voltage & rating of motor; all given on the nameplate are just as specified on your order.

(2) Whether there is any damage, indentation, crack, etc. caused in transit or during custody.
Rotate the shaft with hand and see whether you can feel any catch or hear an irregular noise.

3. Installation

Carry out installation carefully, or imperfect installation greatly impairs the durability of the unit by giving rise to vibration, noise or anomalous temperature rise and sometime causes a serious trouble.

(1) Build a foundation or a holding base as stoutly as possible.

(2) Install the unit so as to bring the low speed shaft as horizontal as possible, but not to twist the gear case.

(3) In case of need to install the unit in another direction than proposed, be sure to write for our instruction. If the unit is installed tilted beyond the permissible range, it not only causes a lubrication trouble but sometimes invites oil leakage out to the gear case and into the motor.

## 4. Connection to a Driven Machine

The flexible shaft coupling is recommended for direct coupling. In the case of the chain drive, select a pitch diameter of the sprocket wheel to be 3 times the shaft diameter. (ref. cat.)

Unlike a motor, a V-belt or a flat belt, when applied to the low speed shaft, transmits a great torque of power at low speed so that the shaft and bearing of the gear reducer as well as the belt itself are thus set to a heavy task. Therefore, avoid such use of the belt by all means.

As the finish tolerance for the shaft extension diameter is specified to be m6, H7 is adequate for the tolerance of the inside diameter of the shaft coupling and the sprocket

### 4.1 By Flexible Shaft Coupling

(1) Fix the coupling flange in such a manner that its side and runout wobblings do not exceed 0.05 mm each. (Fig. 1)

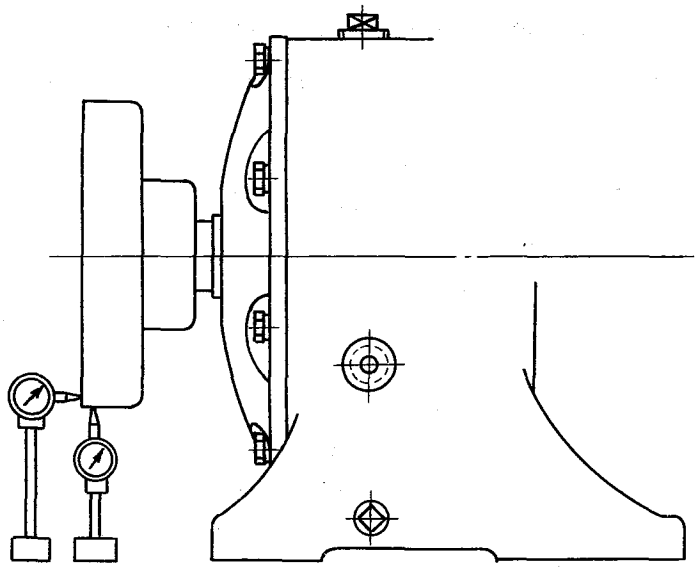


Fig. 1

(2) Adjust both shaft centers to align with each other until you can confirm the alignment from the circumference of the opposite flange and also by the clearance between the end faces of the flanges, and then couple the two shafts together. (Fig. 2)

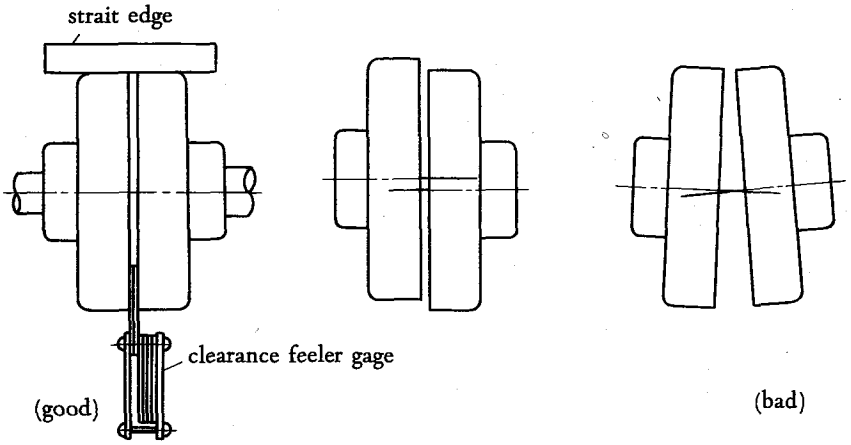


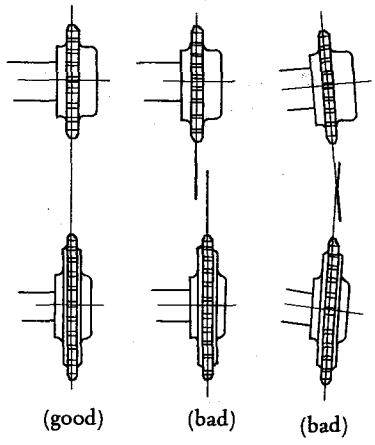

Fig. 2

4.2 By Chain

(1) In fixing the sprocket, pay as much attention to the side and runout wobblings as in the case of the coupling flange

(2) Install the unit in such a manner that both shafts will be brought parallel to each other, the tooth center of one sprocket aligned with that of the other and the chain set perpendicular to the shaft. (Fig. 3)

Fig. 3




(3) In case slide rails are used, lay 2 rails in such a manner that the respective rail faces on which the gear case is mounted, constitute a horizontal plane, and then fix the gear case there on. (Fig. 4)

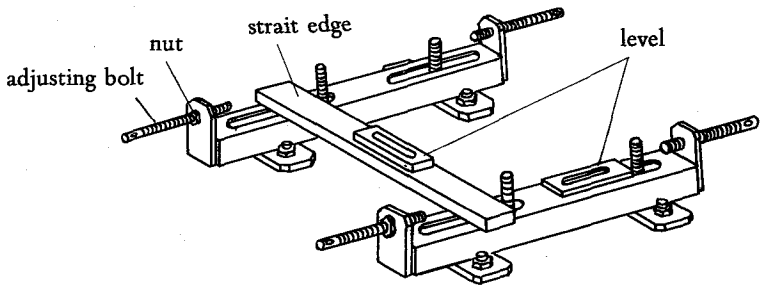



Fig. 4

4.3 By Gears

(1) Place two shafts parallel to each other, and decide a center-to-center distance of the shafts in such a manner that a proper backlash (module x 0.05 0.1mm) is kept constant all along the tooth trace when the gear is put in mesh with a driven gear. (Fig. 5)

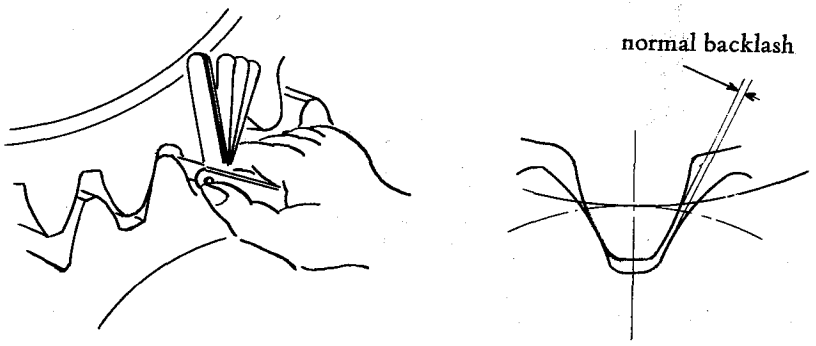



Fig. 5

(2) In installing the gear, adjust its position so as to eliminate an end tooth beaing by examining the tooth bearing with minium. (Fig. 6)

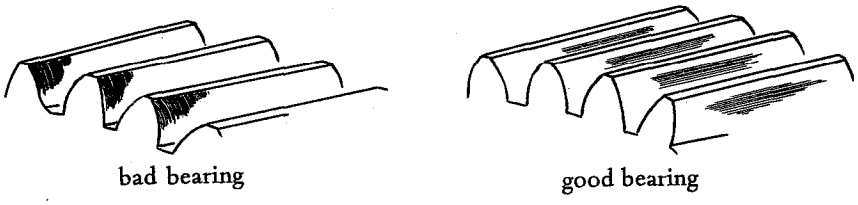



Fig. 6

4.4 Fixing of Gear Case

Upon coupling the unit with a driven machine, either drive knock pins into the base (2 peaces) of the gear case or affid stoppers so that the gear case may not be dislocated by a load. (Fig. 7)

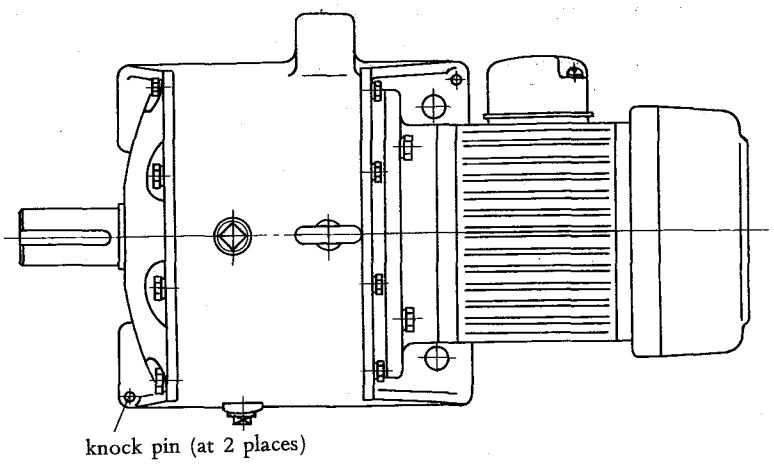



Fig. 7

5. Operation

(1) Fill the lubricant specified on the nameplate a little only the indicated line of the oil gauge.

(2) As the oil level goes down a little when the unit is operated, substitute or let out the oil till the oil level is kept in line with the indicated line during operation.

(3) At first, operate the unit without load, disconnecting a driven machine from the unit. Next, connect a driven machine to the unit and operate the unit under varied loads preferably starting with a light load and ending with a ful load. This gives a better fit to tooth faces and a long life to gears.

⟶ ref. annexed table (Recommended Lubricant)

6. Maintenance

6.1 Replacement of Lubricant

The replacement time and oil amount are specified on the nameplate. When us under a severe load condition or at a high ambient temperature, the oil should be replaced earlier than scheduled.

(1) Replacement of Oil

| | |
|---|---|
| Time of replacement | Total 2500 hrs of operation, or every 6 months, whichever is earlier |

In replacing the oil wash the interior of the gear case with flushing oil, take out sludge and then fill new oil.

(2) Replacement of Grease

| | |
|---|---|
| Time of replacement | every 6 months, for high speed shaft<br>once a year, for low speed shaft |

Take off the cover, remove old grease, and then apply new grease to the bearings about half as much as their spaces.

In case a grease nipple is available, you can supply grease from outside by use of a grease gun.

## 6.2 Inspection

Make a careful inspection of the unit especially for several days beginning with the initial running, and hold a periodic inspection thereafter.

If you find the unit anomalous, immediately adjust or repair it. If you cannot, write for our instruction.

(1) Whether the oil level is normal (whether it coincides with the indication line of the oil gauge during operation)

a) Loosening of the bolt at the binding plans of the gear case

b) Damage or misalignment of the oil seal

c) Oil leakage due to installation tilted beyond the permissible range

(2) Whether the unit gives rise to unusual noise or vibration

a) Is there any noise or vibration coming from a motor or a driven machine?

b) Is there anything wrong in the installation or connection?

Loosening of fastening bolt,

Abrasion of chain, etc.

c) Is the brand of oil or oil amount proper?

d) Are the inside gears and bearings out of order?

(3) Whether you can perceive an unexpected rise of oil temperature by touching the gear case.

a) Is the brand of oil or oil amount proper?

b) Is the unit under an overload?

(4) If possible, disassemble the unit for cleaning once a year.

Through inspection and maintenance assure a longer life of the unit.

## 6.3 Rust Prevention Treatment

If the unit was stopped running for a long time awing to discontinuance of operation, custody, shipment, etc. of the unit, fill rust preventive oil (JIS Z 1803) in the unit and operate the unit under no load for about one minute and then exhaust the oil, and thus you can prevent rust from depositing on the inside gears and bearings. This rust preventive effect will last for 6 months or so.

## 7. Disassembling and Assembling

### 7.1 Disassembling

First drain the lubricant off, next disconnect a motor (or a bracket of the high speed shaft) from the unit and then disassemble the gear section as follows:

#### 7.1.1 Units up to Unit Size E-21

(1) Remove a motor

a) Take off the fastening bolts (65), insert the tip of a driver in 2 indentations provided at the binding place of the flange (3), wrench up the plane and thus disconnect the faucet joint. (Fig. 8)

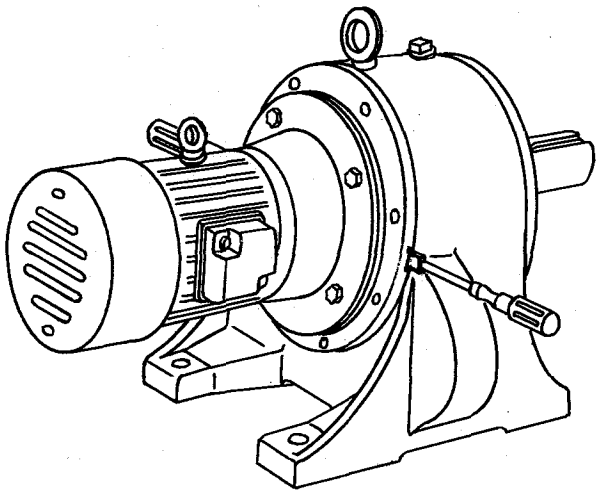


Fig. 8

b) The motor is taken out with the 1st reduction pinion (21) mounted on its shaft end so that care should be given to the meshing of gears in disconnecting the motor.

(2) Remove the cover

Apply a suitable holder on the motor side, erect the gear case upright so as to keep the low speed shaft upword perpendicularly and then set out the removal.

a) Take out the bolts (64), screw 2 of these bolts in the tapped holes and remove the cover (2) with the 2 bolts as jack holts. (If you go screwin the 2 bolts evenly, the contact plane is lifted so as to separate the faucet joint.) (Fig. 9)

In case of a heavy cover, screw eye-bolts in the tapped holes (so as to separate the faucet joint), pass a rope through each eye, and hang up the cover to remove it.

b) There is an oil seal in the center of the cover. Therefore, indrawing out the cover along the shaft, such care as winding the shaftend with paper should be taken so that the key way may not damage the oil seal lip. (Fig. 9)

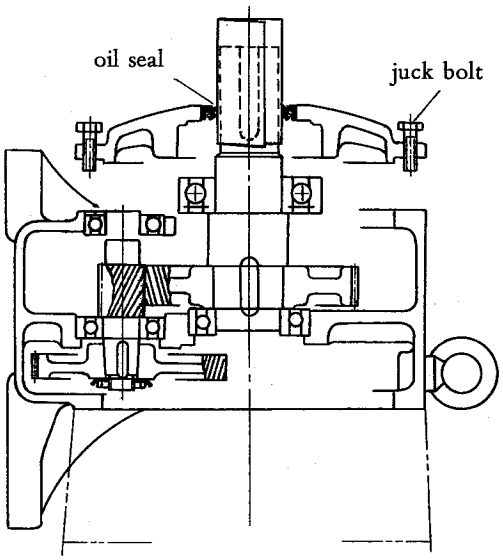



Fig. 9

(3) Take out the low speed shaft with gears and bearings on.

a) When the low speed shaft (25) is raised as far as the upper part of the 2 nd gear hits against the bearing box of the intermediate shaft in the gear case, the lower bearing (28) gets completely out of the bearing box. Then move the shaft horizontally and draw it up. In the case of a heavy shaft, attach a lathe dog at the shaft end, hook a rope thereon and draw the shaft out.

(4) Take out 1st gear and 2nd reduction pinion shaft.

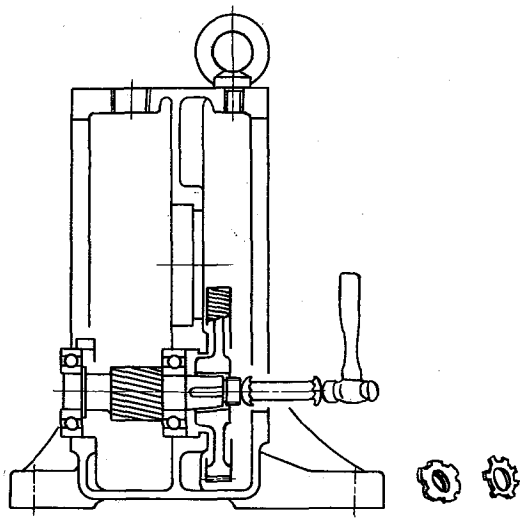
Put the gear case on the floor horizontaly, and then set out the removal.

a) Remove the lock-nut and washer (36) at the shaft end.

b) Apply a suitable bar at the end on the gear side of the 2nd pinion shaft (23) and strike the bar with a hummer; then the first gear (22) and the shaft get out of the taper fit.

Take out the gear from the high speed side and the shaft with bearing from the appoint side. (Fig. 10)

Fig. 10

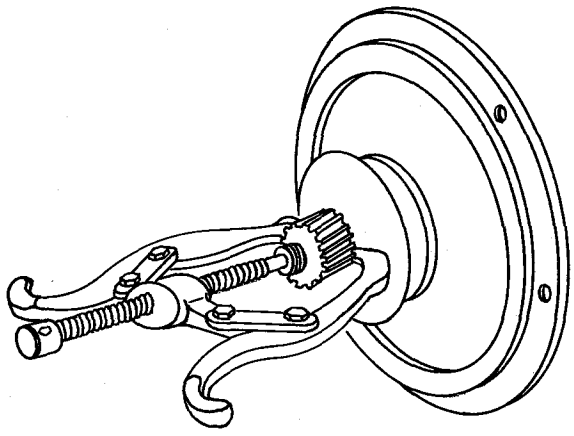


(5) Disassembling of interior gears

Disassemble interior gears only when the gears or bearings are to be replaced.

a) As the first pinion (21) and the motor shaft are in a taper fit, besure to pull out the pinion with a bearing puller. (Fig. 11)
(on the EFA series, the end of motor shaft is hobbed to the first pinion gear.)

Fig. 11



b) Use a bearing puller or a hydraulic press in drawing out the bearing and the 2nd reduction gear from the shaft.

7.1.2 Unit size exceeding E23

As the gear case is divisible into the upper and lower parts, the disassembling is very easy.

(1) Remove a motor

Take the fastening bolts (68), screw 2 of these bolts in the tapped holes in the motor flange and separate the faucet joint to draw it out.

(2) Remove the cover

a) Take off the slinger plates (4) (5). As the slinger plate (4) has an oil seal, take care not to damage the oil lip. (ref. Fig. 9)

b) In the case of a steel housing, first take off the set screw (77) and the slinger (30), and then remove the slinger plate (4).

c) Pull out the bolts (64) and the threaded taper pin (55), twiss a rope round the hook on the cover (2), and hang up the cover carefully not to tilt.

The threaded taper pin is lifted by screwing the nut of the screw section clockwise so that you can easily pull it out with hand.

(3) Remove the interior gears

By taking off the cover, the upper half of the gear case is made quite open for disassembling. Remove the bearing cap(6) and then interior gears one by one. Pull out the threaded taper pin (56) of the cap by using the nut of the pin for the cover.

7.2 Assembling

Assembling is made under the adverse process to disassembling. During assembling care should be taken not to admit foreign materials into the interior, especially into bearings and gearing surfaces.

(1) Assembling of interior gears

a) Mount the bearings, preferably by oil shrinkage fit.

b) Gears to be taper-fitted, when mounted on the shaft, are given even taps at the end surface in order to ensure the close fit and further tightened with the lock nut and washer. Do not fail to ensure the

locking of the lock washer.

(2) As for the cover for unit size larger than E23, first align the pin holes, drive taper pin therein and then tighten the bolts.

(3) Apply non-drying seal paste evenly on each contact plane of the gear case and clamp the plane evenly with bolts.

(4) In inserting the oil seal in the shaft, first apply grease on the internal circumference of the oil seal and also on the shaft (with the key way covered with paper), and then thrust the oil seal in, taking care not to damage the lip.

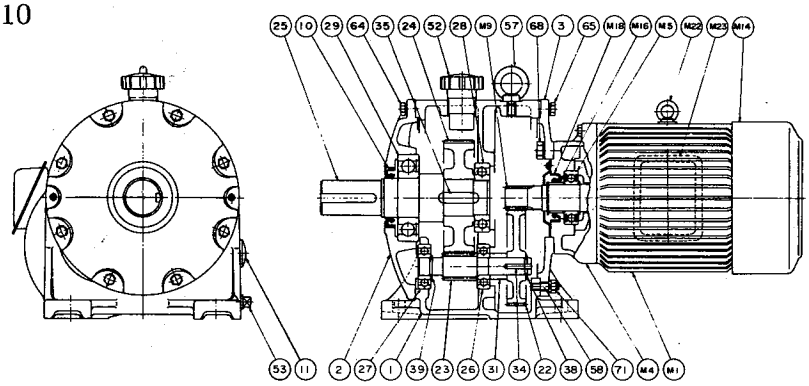
(5) Bearing numbers and oil seal numbers are given on the nameplate.

Geared Motor

## ASSEMBLY DRAWINGS

Type EFA

Unite Size EA6~EA10



Type EF, EFB

Unite Size E6 ~ E14

EB11~EB14

Fig. 12

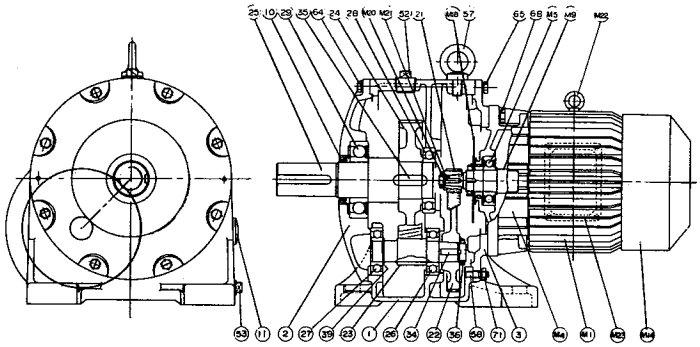
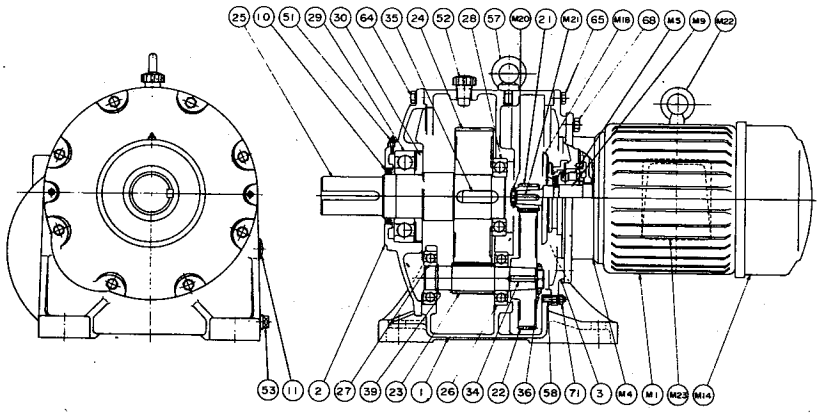


Fig. 13

Type EF, EFB

Unite Size E15~ E21

EB15~EB21



Type EF

Unite Size E23, 25, 27

Fig. 14

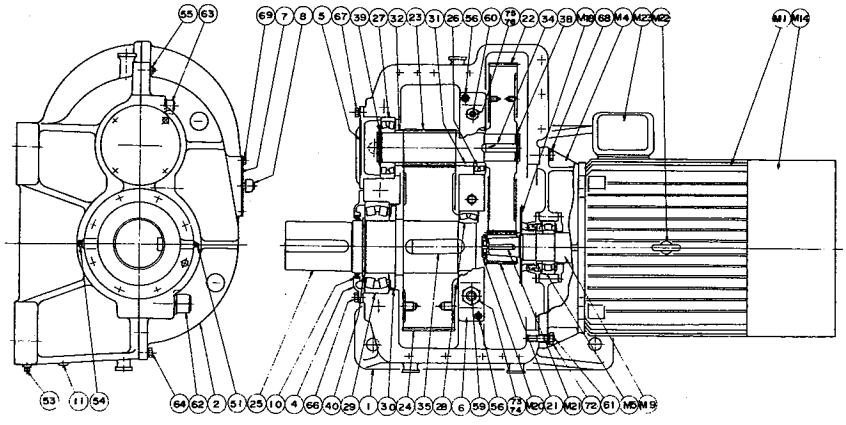


Fig. 15

Unit Size E26 ~ E41

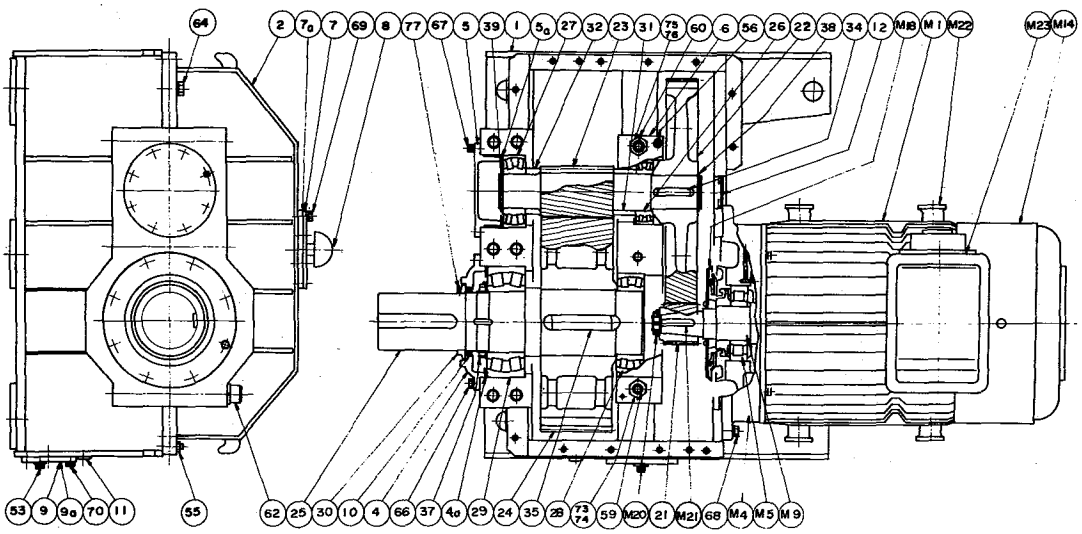


Fig. 16

1. MOTOR

| | |
|---|---|
| M1 | motor frame |
| M4 | load-side bracket |
| M5 | load-side bearing |
| M9 | motor shaft |
| M14 | fan cover |
| M18 | oil slinger |
| M20 | lock nut & washer |
| M21 | sunk key |
| M22 | hanging eye bolt |
| M23 | terminal box |

2. GEAR PART

1. gear case
2. cover
3. flange
4. slinger plate (for low speed shaft)
4a shim (for low speed shaft)
5. slinger plate (for intermediate shaft)
5a shim (for intermediate shaft)
6 bearing cap
7 cap for oiling hole
7a packing for cap
8. air breather
9. cap for flushing hole
9a packing for cap
10. oil seal
11. oil gauge
12. seal cap
21. 1st reduction pinion
22. 1st reduction gear
23. 2nd reduction pinion shaft
24. 2nd reduction gear
25. low speed shaft
26. bearing (for intermediate shaft on inside)
27. bearing (for intermediate shaft on outside)
28. bearing (for low speed shaft on inside)
29. bearing (for low speed shaft on outside)
30. slinger
31. collar (for intermediate shaft on inside)
32. collar (for intermediate shaft on outside)
34. sunk key (for intermediate shaft)
35. sunk key (for low speed shaft)
36. lock nut & washer (for intermediate shaft)
37. lock nut & washer (for low speed shaft)
38. snap ring (for intermediate shaft on inside)
39. snap ring (for intermediate shaft on outside
40. snap ring (for low speed shaft)
51. grease nipple
52. oil plug
53. drain plug
54. plug
55. threaded taper pin (for cover)
56. threaded taper pin (for bearing cap)
57. hanging eye bolt
58. stud bolt (for cover)
59. stud bolt (for bearing cap)
60. stud bolt (for bearing cap)
61. stud bolt
62. socket head cap bolt with spring washer
63. socket head cap bolt with spring washer
64. fastening bolt with spring washer (for cover)
65. fastening bolt with spring washer (for flange
66. fastening bolt with spring washer (for slinger
67. fastening bolt with spring washer (for slinger
68. fastening bolt with spring washer (for motor
69. fastening bolt
70. fastening bolt
71. nut with spring washer (for flange)
72. nut with spring washer (for motor)
73. nut (for bearing cap)
74. nut (for bearing cap)
75. nut (for bearing cap)
76. nut (for bearing cap)
77. set screw (for slinger)

Gear Reducer Type EZ

Unit Size E6 ~ E21, EB11 ~ EB21

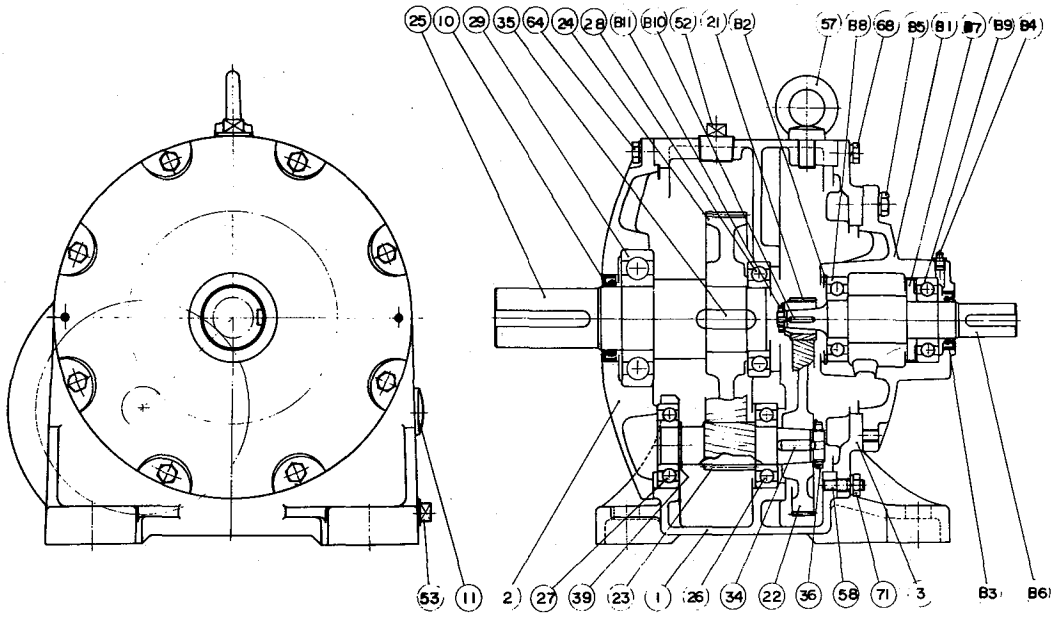



Fig. 17

Unit Size E23·25·27

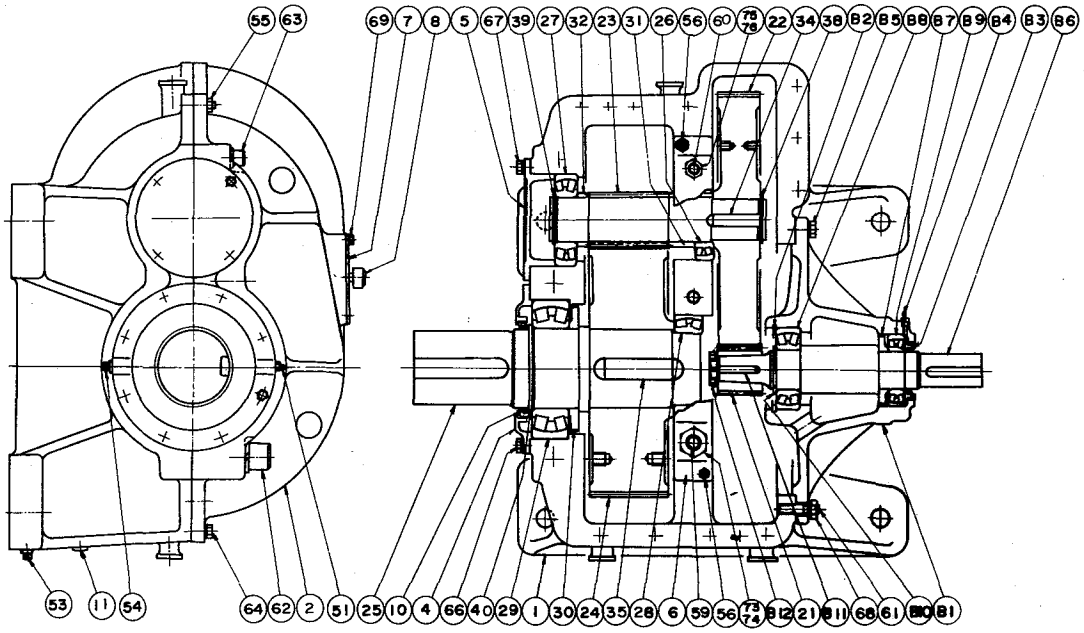



Fig. 18

Unit Size E26 ~ E41

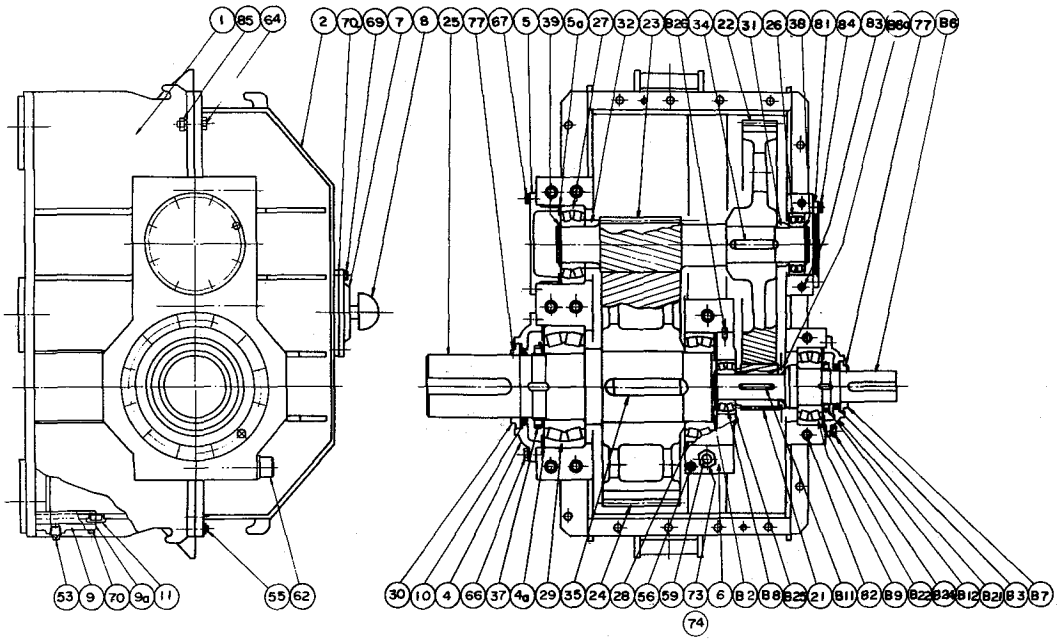


Fig. 19

1. BRACKET FOR HIGH SPEED SHAFT

- B1 bracket for high speed shaft
- B2 snap ring
- B3 oil seal
- B4 grease nipple
- B5 fastening bolt with spring washer
- B6 high speed shaft
- B7 slinger
- B8 bearing (for high speed shaft on inside)
- B9 bearing (for high speed shaft on outside)
- B10 snap ring
- B11 sunk key (for high speed shaft )
- B12 lock nut & washer (for high speed shaft)
- B21 Slinger plate (for high speed shaft)
- B22 Shim (for high speed shaft)
- B23 collar
- B24 fastening bolt with spring washer (for slinger plate)
- B25 bush
- B26 knock pin

2. GEAR PART

1. gear case
2. cover
3. flange
4. slinger plate (for low speed shaft)
4a shim (for low speed shaft)
5. slinger plate (for intermediate shaft)
5a shim (for intermediate shaft)
6. bearing cap
7. cap for oiling hole
7a packing for cap
8. air breather
9. cap for flushing hole
9a packing for cap
10. oil seal
11. oil gauge
12. seal cap
21. 1st reduction pinion
22. 1st reduction gear
23. 2nd reduction pinion shaft
24. 2nd reduction gear
25. low speed shaft
26. bearing (for intermediate shaft on inside)
27. bearing (for intermediate shaft on outside)
28. bearing (for low speed shaft on insdie)
29. bearing (for low speed shaft on outside)
30. slinger
31. collar (for intermediate shaft on inside)
32. collar (for intermediate shaft on outside)
34. sunk key (for intermediate shaft)
35. sunk key (for low speed shaft)
36. lock nut & washer (for intermediate shaft)
37. lock nut & washer (for low speed shaft)
38. snap ring (for intermediate shaft on inside)
39. snap ring (for intermediate shaft on outside)
40. snap ring (for low speed shaft)
51. grease nipple
52. oil plug
53. drain plug
54. plug
55. threaded taper pin (for cover)
56. threaded taper pin (for bearing cap)
57. hanging eye bolt
58. stud bolt (for cover)
59. stud bolt (for bearing cap)
60. stud bolt (for bearing cap)
61. stud bolt (for bracket)
62. socket head cap bolt with spring wa
63. socket head cap bolt with spring wa
64. fastening bolt with spring washer (fo
65. fastening bolt with spring washer (fo
66. fastening bolt with spring washer (for slinger
67. fastening bolt with spring washer (for slinger
68. fastening bolt with spring washer (fo
69. fastening bolt
70. fastening bolt
71. nut with spring washer (for flange)
72. nut with spring washer (for motor)
73. nut (for bearing cap)
74. nut (for bearing cap)
75. nut (for bearing cap)
76. nut (for bearing cap)
77. set screw (for slinger)
81. slinger plate (for intermediate shaft)
82. fastening bolt with spring washer (fo
83. fastening bolt with spring washer (fo
84. fastening bolt with spring washer (for slinge
85. nut (for cover)

Geared Motor Type SEF

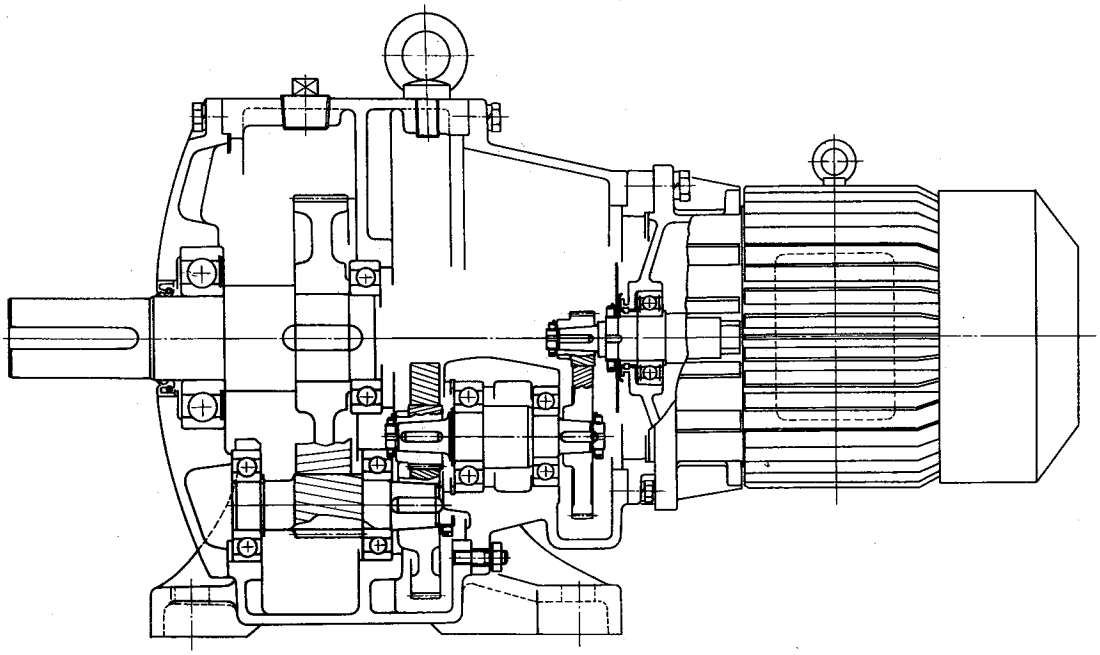


Fig. 20

Gear Reducer Type SEZ

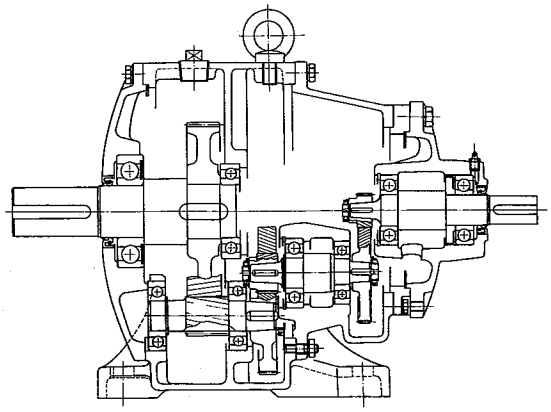


Fig. 21

Vertical Geared Motor (an example)

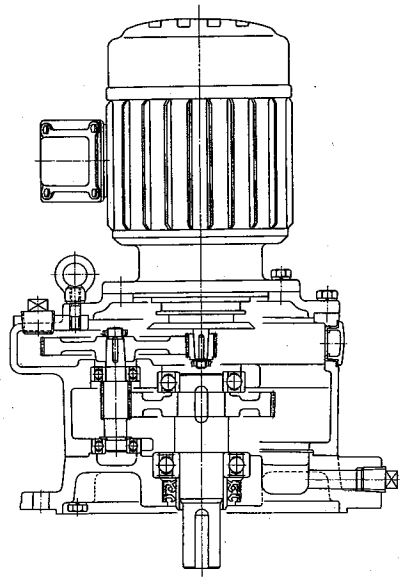


Fig. 22

Hydroflex Geard Motor Type EF-H

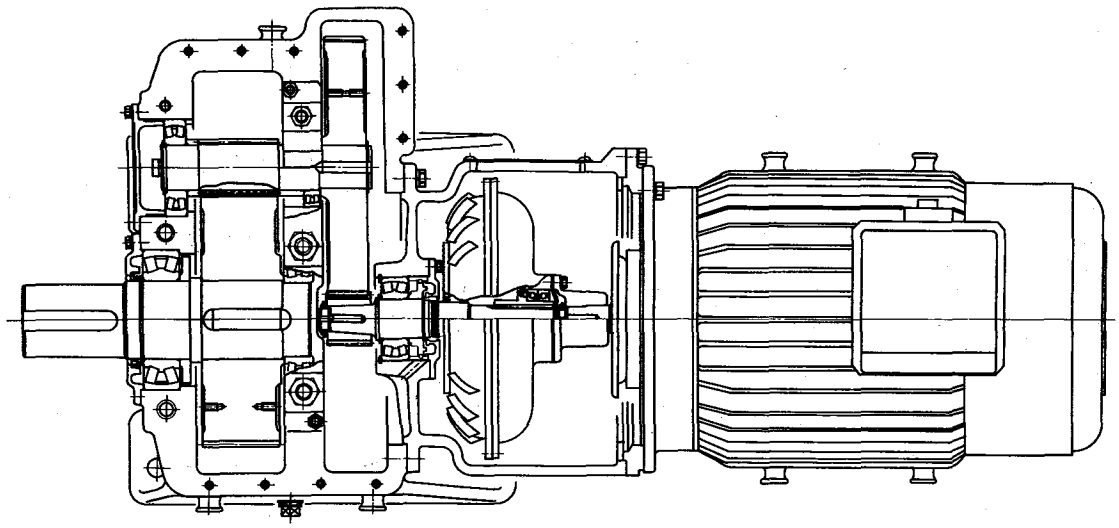


Fig. 23

Powderflex Geared Motor Type EF-P

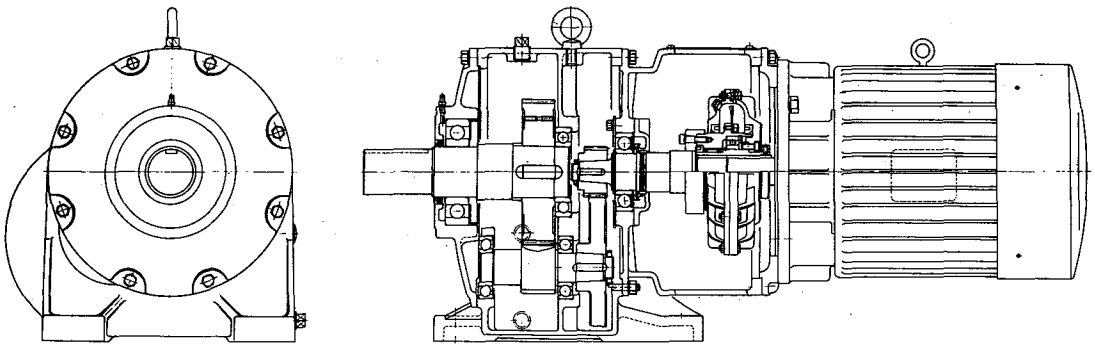


Fig. 24