



**PARAG FAN & COOLING SYSTEMS LTD.**

"AN ISO 9001:2000 COMPANY"

# **ASSEMBLY & INSTALLATION MANUAL**

**For**

**Cooling Tower, Air Cooled Heat Exchanger  
and Air Cooled Condenser Fans**





## 01 GENERAL NOTES

- The Fan assembly Serial Number is indicated on the Packing List and is also imprinted on the top face of the Hub Assembly. Always refer the Serial Number when reordering or corresponding with our Customer Services Department regarding the respective fan assembly.
- For determining bolt, nut & washer combinations and thread sizes, refer to the Fan General Assembly Drawing provided with each shipment.
- Only standard overall fan diameters and blade lengths are listed in the tables for various Parag Fan Models. If the overall fan diameter and blade length stated on the assembly drawing for the corresponding model differ from the actual dimensions of the received unit, a custom fan assembly may have been supplied, please refer to the enclosed inspection report for notes pertaining to fan diameter and size of the actual assembly.
- PARAG manually Pitched FRP fans are engineered to exact standards and manufactured to rigid requirements. While robustly constructed and made from the best materials available, they still should be considered as precision equipment. Due to the precision balance of each FRP blade, care should be taken during the unpacking and installation of the fan. Properly installed FRP Fan will prove efficient for years long.
- Below you will find step-by-step instructions on proper installation and assembly of your PARAG FRP Fan.

### ❖ LIST OF PACKGING

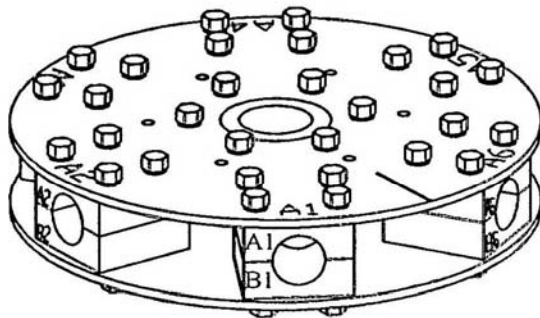
- a. **HUB ASSEMBLY**
- b. **SET OF FAN BLADES**
- c. **PITCH SETTING BLOCK**
- d. **ASSEMBLY & INSTRUCTION MANUAL**
- e. **OPERATION & MAINTENANCE MANUAL**
- f. **GENERAL ARRANGEMENT DRAWING**

## 02 VISUAL INSPECTION OF FAN ASSEMBLY COMPONENTS

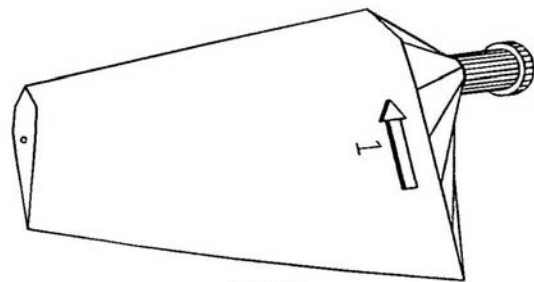
Inspect the shipping cartons and contents for any damage or missing parts. In case there is damage to either shipping cartons or contents, notify the shipping company immediately and file a claim with them.

Ensure the contents of all shipping cartons are as per the packing list enclosed with each shipment. A standard packaged fan assembly consists of **Blades**, **Hub Assembly**, **Seal Disc** and **Fastening hardware** (Notes: Seal Disc is supplied as per requirement of specific application).

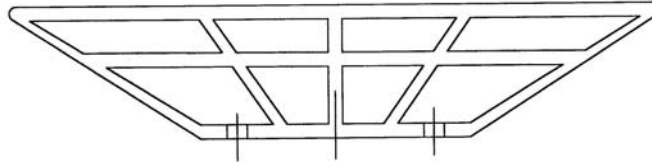
The Hub Assembly is dispatched in pre assembled, balanced and match marked condition.



HUB ASSEMBLY  
(PRE-ASSEMBLED)



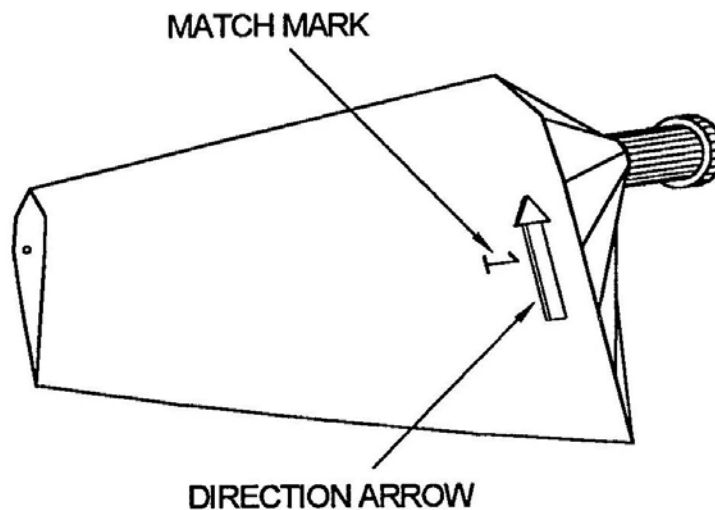
BLADE



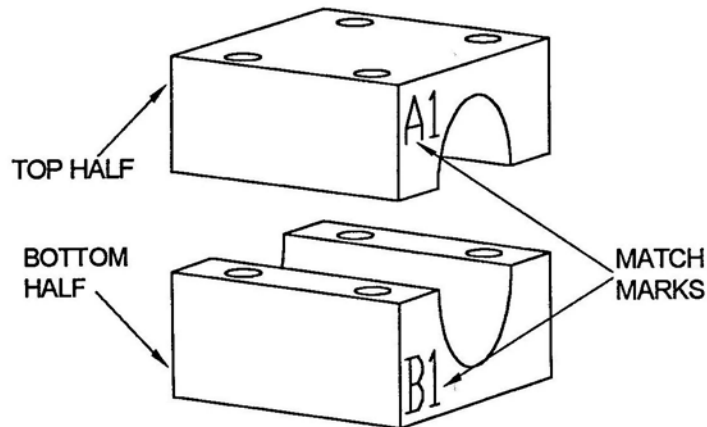
**SEAL DISK**

## 03 MATCH MARKING DETAILS : BLADE & BLADE HOLDING BLOCKS

Blades are Match Marked with a Number Imprinted on, or next to the 'Direction Arrow'



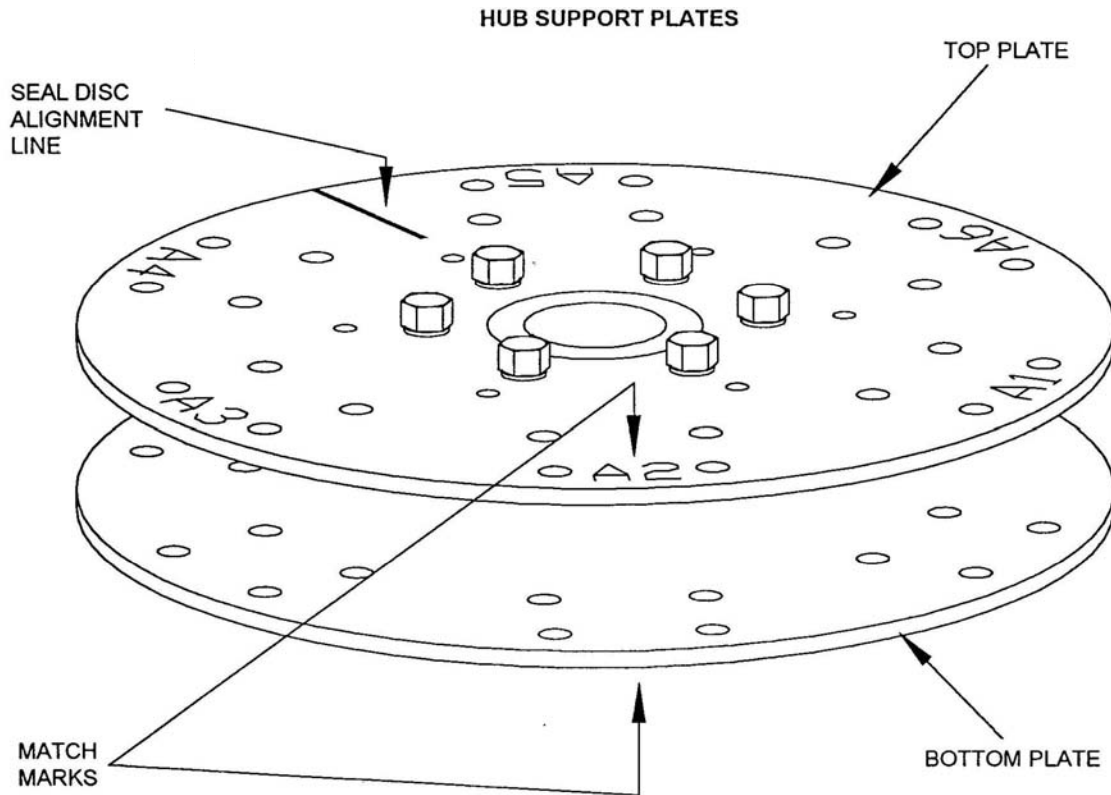
Each set of **Blade Holding Blocks** consist of a top & bottom half block. Each half block is marked with an 'A' or 'B' followed by a number. The letter 'A' and 'B' on the half blocks correspond to 'top' and 'bottom' positions, respectively. The number on each half block corresponds to the blade having the same match mark number



## 04 MATCH MARKING DETAILS : SUPPORT PLATES

The top and bottom Support Plates that make up the Hub Assembly have pre etched match marked positions for fitting corresponding blocks and blades. All the match marked positions are indicated by the letter 'A' or 'B' followed by a number. A plate having match markings beginning with the letter 'A' will indicate that the plate is to be in the top position of the Hub Assembly; A plate having match markings beginning with the letter 'B' indicates that the plate is to be in the bottom position. The number after an 'A' or 'B' letter on either plate indicates the position in which the corresponding match marked blade and Blocks set will be placed.

The black line on the top plate is a color match mark to be used for the proper alignment of the seal disc.



## 05 MATCH MARKING DETAILS : SEAL DISC

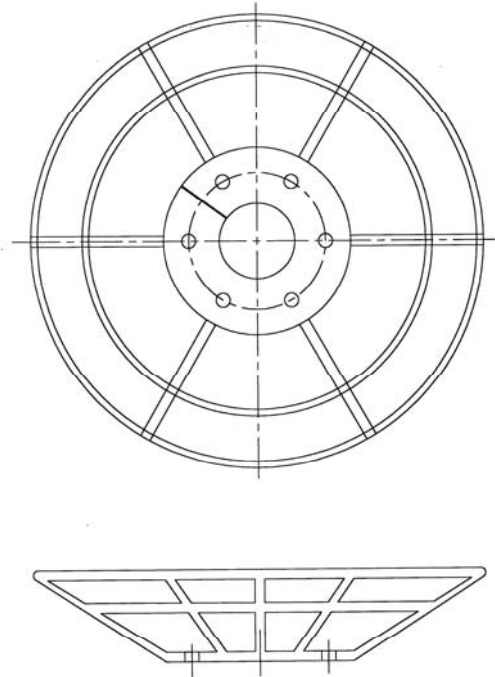
FRP Seal Discs are supplied in single piece construction and can be directly mounted on the top plate of hub. The top plate of hub is provided with necessary mounting holes and fasteners.

Seal Discs are individually balanced and can be mounted on hub top plate in any angular position. However, for ease of installation and alignment a match marking line is provided at inside face of the seal disc



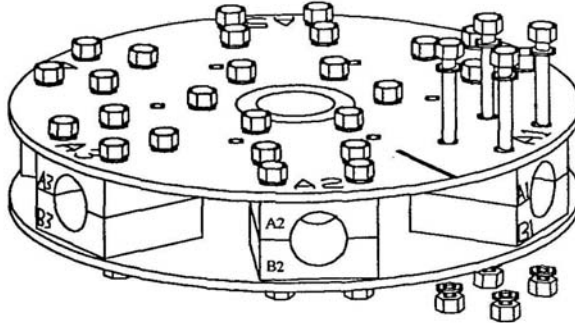
## Caution

Seal Disc should not be loaded by any fixture, heavy article, ladder or weight of person / operator during the assembly. Seal Disc should be assembled after mounting the hub on gear box and fixing the blades in position. Seal Disc should be removed first before dismantling the blades and hub from gear box. Seal Disc should not be lifted with any other parts assembled or attached.

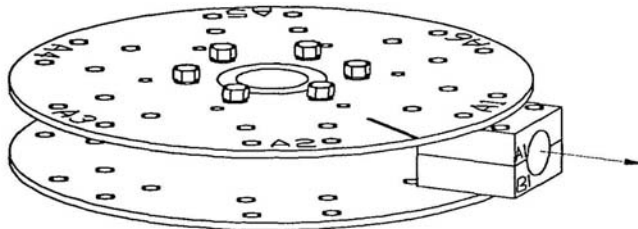


## 06 REMOVAL OF BLADE HOLDING BLOCKS

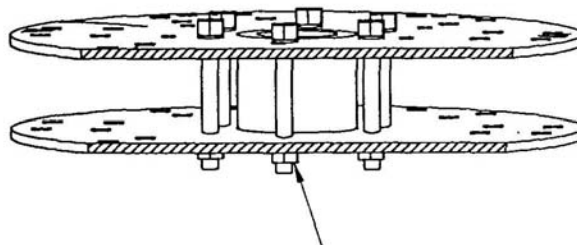
- 6.01 Loosen and remove all bolts, nuts and washers that are fastening the Blade Holding Blocks to the Hub.



- 6.02 Remove all the Blade Holding Blocks by sliding them out from the Hub Assembly.



- 6.03 Slightly loosen, but do not remove, the nuts on the bottom support plate that are fastening the center bush to the Hub.



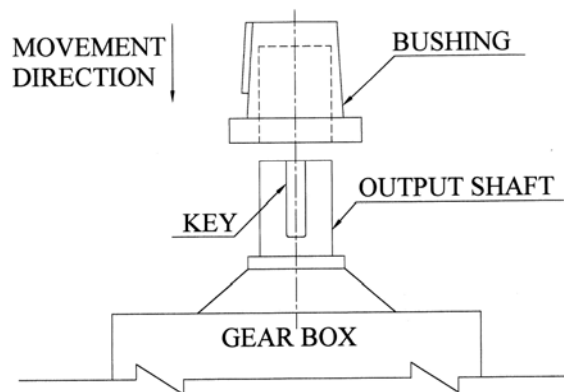
SLIGHTLY LOOSEN ALL NUTS

## 07 PREPRETON OF MATING SURFACES

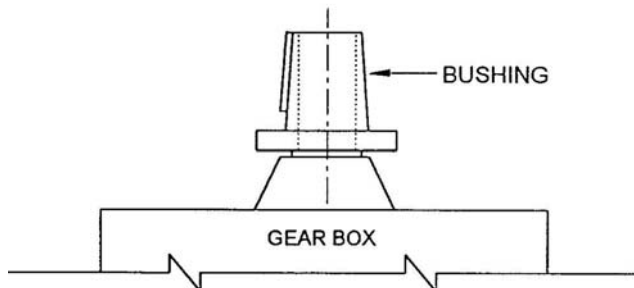
Ensure gear box output shaft and Hub center bush bore are cleaned and treated with antiseize compound.

## 08 (A) INSTALLATION USING A BUSHING

8.A1 Align the bushing key way with the output shaft and slide the bushing on the shaft until the bushing is completely engaged

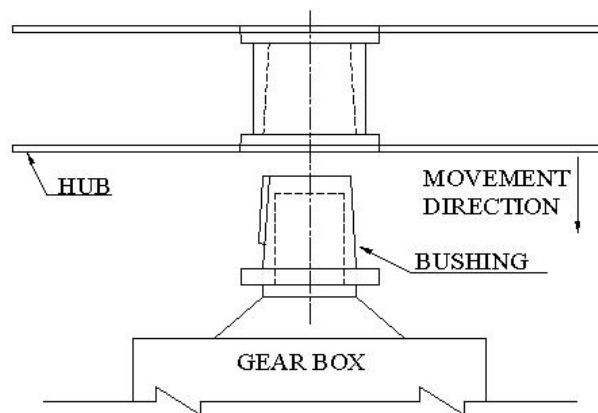


Bushing engaged over the shaft

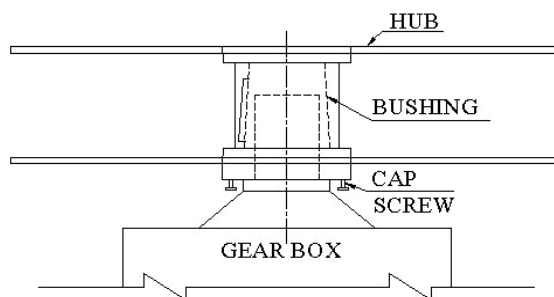


## ..... 08 (A) INSTALLATION USING A BUSHING

- 8.A2 Align the Hub Center bush key way with output shaft and slide Hub on the shaft until the tapered bore length of center bush is completely engaged. Ensure that the bottom face of Hub enters the shaft first.



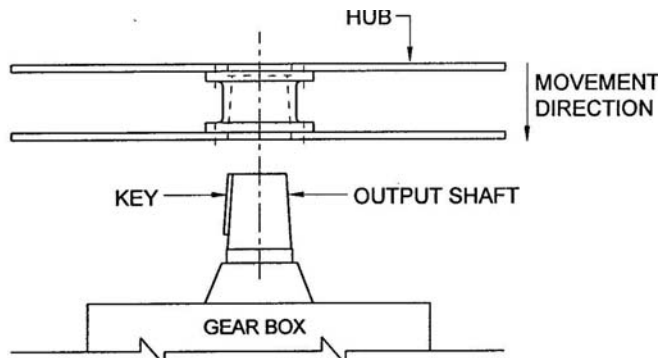
- 8.A3 Engage and fasten the three cap screws as per the torque chart in the Appendix.



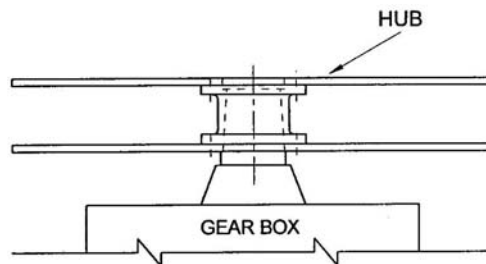
- 8.A4 Proceed to Step 9.10 fixing of blades

## 08 (B) INSTALLTION WITH TAPERED SHAFT

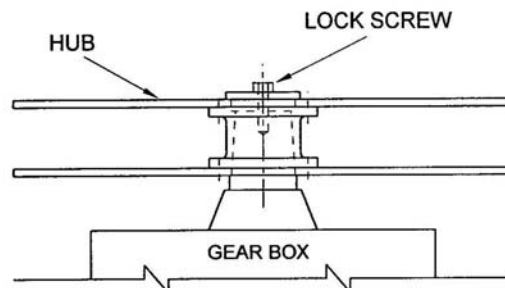
8.B1. Align the Hub center bush key way with output shaft and slide hub on the shaft until the tapered bore length of Hub is completely engaged. Ensure that the bottom face of Hub enters the shaft first.



Hub Engaged over the output shaft

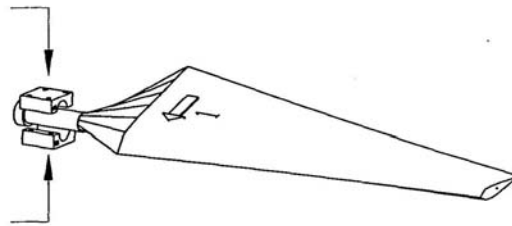


8.B2. Align the Hub center bush key way with output shaft and slide hub on the shaft until the tapered bore length of Hub is completely engaged. Ensure that the bottom face of Hub enters the shaft first



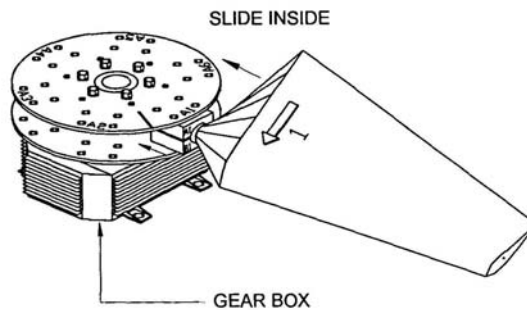
## 09.10 FIXING OF BLADES WITH BOX TYPE HUB

9.11 Select a Blade and the corresponding match marked Blade Holding Blocks .



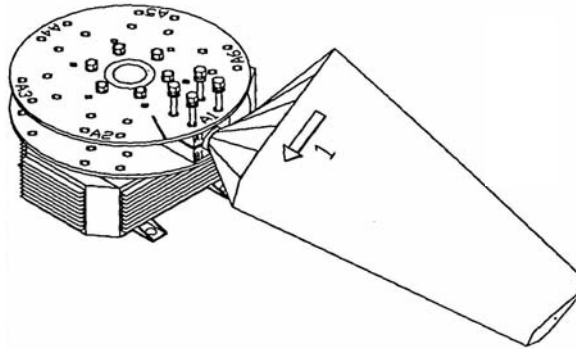
9.12 Place the top and bottom Blocks on the blade shank. Ensure that match marks on the Blocks are visible from Blade Side.

9.13 Locate the corresponding match marks on the Hub, slide and position the Blade along with Blade Holding Blocks into the space between the Hub all four bolt holes in the Blocks and support plates are aligned, and, 'Direction Arrow' on the Blade is placed to the top side of the Hub.



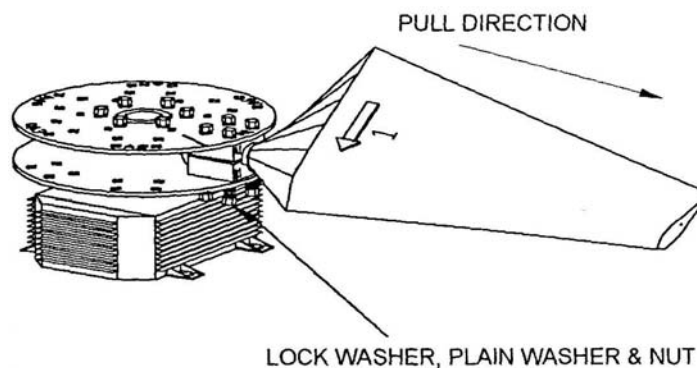
## 9.10 FIXING OF BLADES WITH BOX TYPE HUB

- 9.14 From the top face of the Hub, insert the bolts and washers through the Hub plates and blade holding blocks.



- 9.15 Pull the Blade to ensure that Blade shank collar is properly resting on Blade Holding Block face.

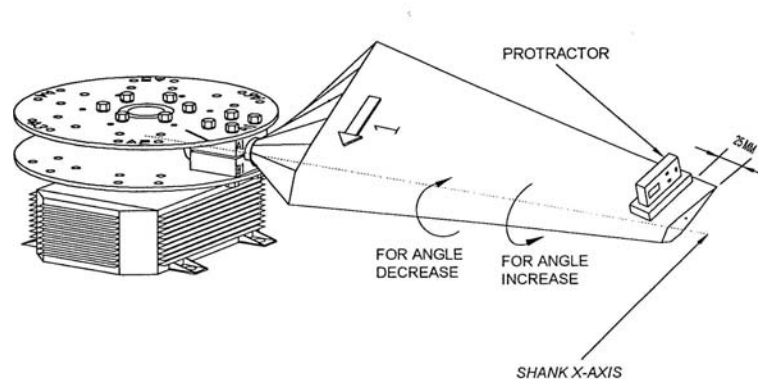
- 9.16 From the bottom face of Hub, insert lock washers, plain washers and nuts. Slightly tighten the nuts.



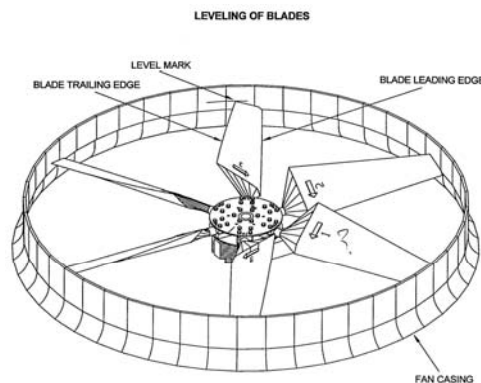
## 10.0 PITCH ANGLE SETTING & LEVELING BLADES

### Note :

- ❖ Blade Pitch angle is set using either a bubble or digital protector.
- ❖ The Protector should be placed on a flat bar to provide a uniform base.



- 10.1 Select any Blade and place the protector on a flat bar approximately 25 mm away from tip of the respective blade.
- 10.2 Rotate the Blade about the Blade Shank x – axis until the desired pitch angle
- 10.3 Tighten the Blade holding nuts as per the torque chart in the appendix
- 10.4 Recheck the pitch angle setting to ensure that it is correct.
- 10.5 Using a dark pencil or marker, trace the upper most point of the trailing edge of blade tip onto the fan casing wall. This trace line is referred to as the 'Level Mark'.



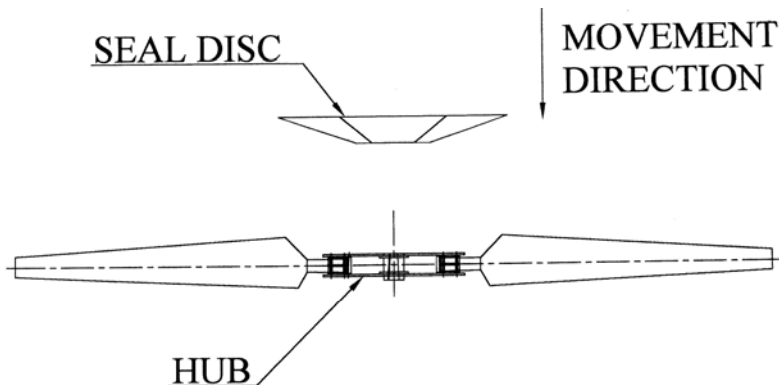


## .....10.0 PITCH ANGLE SETTING & LEVELING BLADES

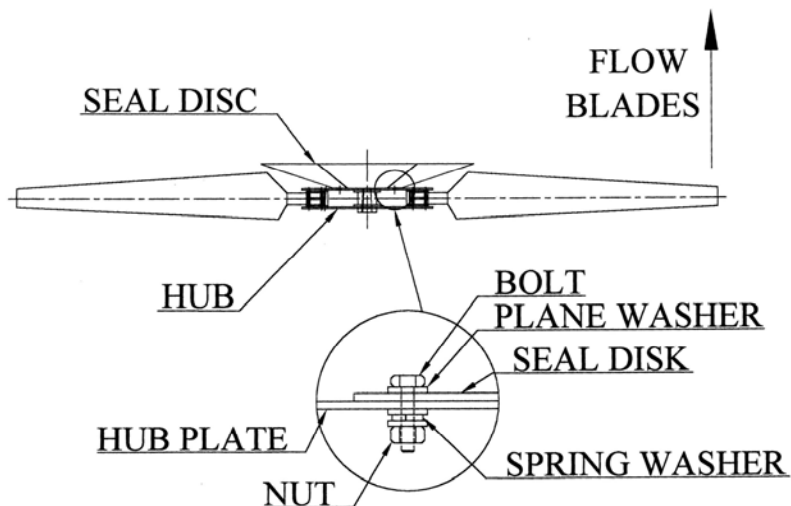
- 10.6 Adjust the pitch angle for the remaining Blades by aligning the upper most point of the trailing edge of each Blade tip with the 'Level Mark' in Step 10.5 and accordingly tighten the respective nuts that are holding the blades as per torque chart in the appendix .
- 10.7 Recheck the pitch angle setting and 'Mark Level' of each blade. The difference between the 'Level Mark' height of any Blade should not exceed 15 mm for fans upto 20 feet diameter, and 25 mm for fans larger than 20 feet diameter.
- 10.8 Tighten nuts loosened in step 10.6.

## 11.0 SEAL DISC MOUNTING

- 11.1 Place the Seal Disc on the top face of the Hub Assembly; ensure that the black line on the Seal Disc is aligned with the corresponding black line on the Hub to form the continuous line.

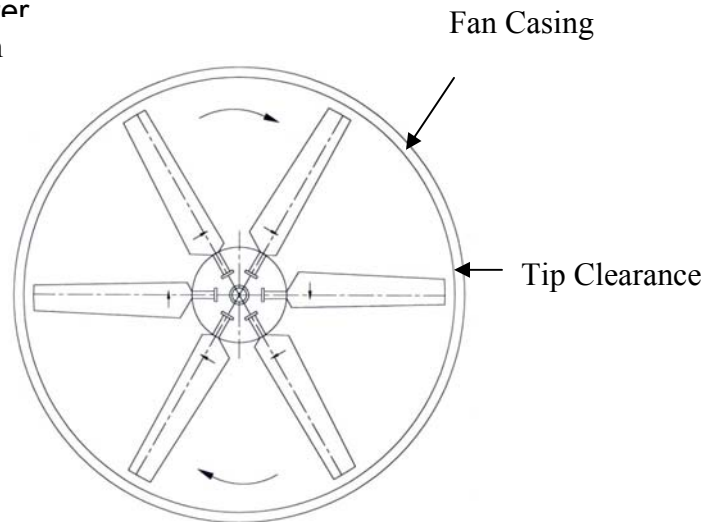


- 11.2 Fasten the Seal Disc to the Hub Assembly by fastening the mounting holes with fasteners provided in the packet marked "**Fasteners for Seal Disc Assembly**"

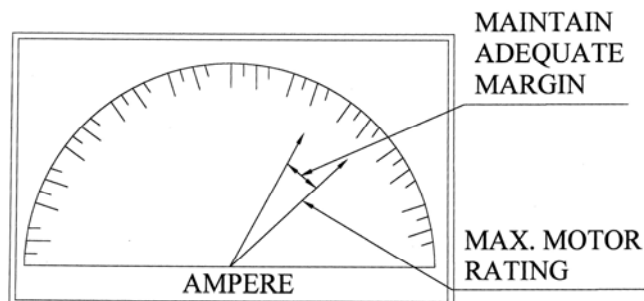


## 12.0 MAINTAINING TIP CLEARANCE & OPERATING PRECAUTIONS

- ❖ The recommended tip clearance between blade tip and fan casing is 0.2 % - 0.5% of fan diameter
- Direction of Rotation



- 12.1 Check the tip clearance by rotating the fan inside the fan casing.
- 12.2 Identify the points where the tip clearance is not within the recommended range and adjust the fan casing accordingly in order that the tip clearance is set in the proper range.
- 12.3 Check the direction of rotation; it must be in a clockwise direction when viewed from the top.
- 12.4 Check motor loading and ensure that a safe margin is available as per rating to accommodate load fluctuations that occur due to weather changes.





## 13.0 APPENDIX

THREAD SIZE	FOOT-POUND	NEWTON-METER
M-6	5-10	7-13
M-8	15-20	20-27
M-10	25-30	34-40
M-12	65-80	88-108
M-16	100-125	133-170
M-20	180-200	244-270

