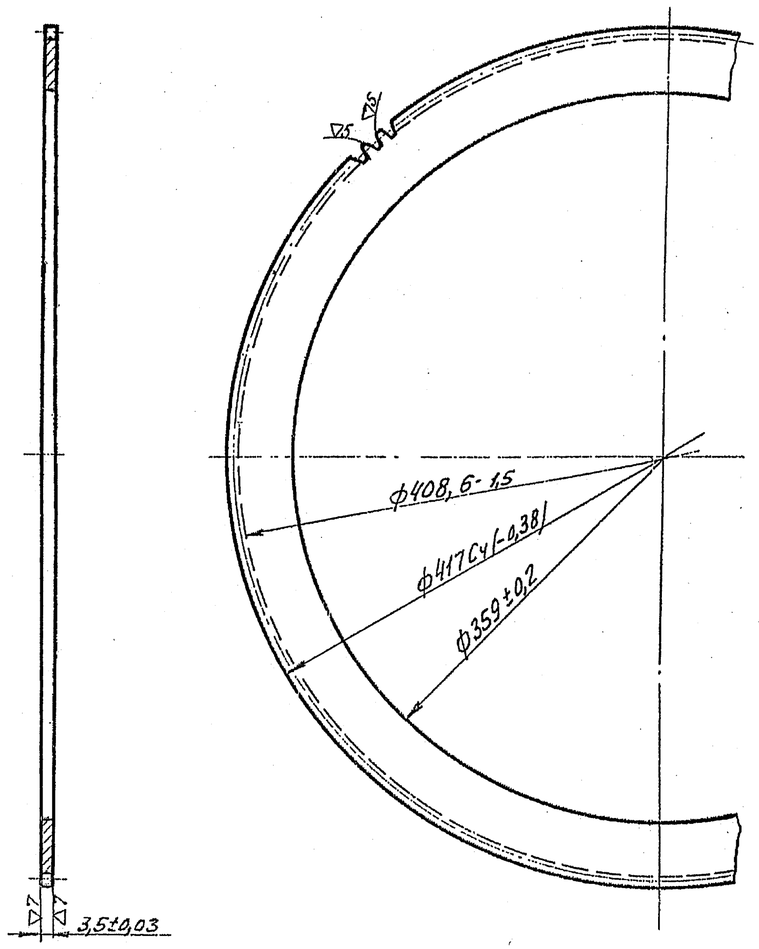
DRAWING NUMBER
432.40.074-1

SHEET No. 1 OF 1

▽4 (▽)



1. NON FLATNESS OF DISC FACES SHOULD NOT EXCEED 0.15 MM. (WHEN CHECKED ON PLATE 0.15 MM FEELER BINDS).
2. VARIATION IN THICKNESS OF DISCS SHOULD NOT EXCEED 0.04 MM.
3. VARIATION IN WIDTH OF DISCS SHOULD NOT EXCEED 0.4 MM.
4. INCREASE OF PITCH BY 0.2 MM BEYOND TOLERANCE IS ALLOWED ON NOT MORE THAN TEN TEETH.
5. VARIATION IN DEPTH OF ANY PAIR OF TEETH EXCLUDING TEN TEETH HAVING INCREASED PITCH SHOULD NOT EXCEED 0.4 MM. VARIATION IN DEPTH SHOULD BE CHECKED ON FINISHED DISCS AFTER ROLLING OF TEETH ROOTS.
6. BURRS ARE NOT ALLOWED.
7. AFTER STRAIGHTENING FINISHED DISCS SHOULD BE CHECKED BY MAGNOFLUX METHOD CRACKS, HAIR CRACKS, AND SEPERATION ARE NOT PERMITTED.
8. DISCS SHOULD BE DE-MAGNETIZED.
9. HEAT TREATMENT: HARDNESS HRC 35 TO 28
10. CARRY OUT LONGITUDINAL ROLLING OF TEETH ROOTS IN THE FOLLOWING WAY;
    a) LONGITUDINAL ROLLING OF TEETH ROOTS SHOULD BE CARRIED OUT AT AN EFFORT OF P = 1000±50 Kg. DEPTH OF DEPRESSION (DEFORMATION OF ROOT OF DISC) SHOULD BE WITHIN $0.2^{+0.2}_{-0.1}$ MM (TO BE CHECKED ON SAMPLE). LONGITUDINAL ROLLING SPEED SHOULD NOT BE MORE THAN 2,7 m / MINUTE.
    b) CHAMFERS SHOULD BE ON EITHER SIDE OF DISC ALONG TEETH PROFILE EXCEPT FOR POINT AT AN EFFORT OF P = 1400 ± 50Kg.
11. BEFORE FINAL GRINDING AND ROLLING THERMAL STABILIZATION OF DISCS SHOULD BE CARRIED OUT IN COMPLIANCE WITH PROCEDURE ADOPTED IN THE FACTORY LABORATORY.
12. COATING: CHEMO, OXIDO, OIL. COATING SHOULD BE APPLIED TO COMPONENTS TO BE USED AS SPARES ONLY.
13. HARDNESS MAY BE CHECKED BY BRINEL METHOD.

BASIC DATA		
MODULE	m	3
NUMBER OF TEETH	z	138
PITCH CIRCLE DIAMETER	Do	414
PRESSURE ANGLE	∝	20°
COEFFICIENT OF TOOTH DEPTH	K	0.7
TOLERANCE FOR TOOTH DEPTH COEFFICIENT	△K	0
ADDENDUM	h2	1.5 TAPPING
DEDENDUM	hH	2.7
TOOTH DEPTH	H	4.2
FILLET RADIUS OF CUTTING TOOL	R	1.5 −0.2
RADIUS OF ACTIVE FLANK START	R	—

DATA FOR CHECKING (FINISHED COMPONENT)		
BASE TANGENT LENGTH		143.07 $^{-0.7}_{-1}$
TOLERANCE FOR BASE TANGENT LENGTH		0.12
LIMIT DEVIATION OF BASE PITCH		——
LIMIT COMPOSITE ERROR DOUBLE FLANK WHEN CHECKED WITH STANDARD GEAR	TOOTH TO TOOTH	——
	TOTAL	——
NON-PARALLELITY OF TOOTH PROFILE GENERATRIX RELATIVE TO DISC AXLE		——

14. BASE TANGENT LENGTH Ø 408.6 AND ITS TOLERANCE FOR ONE RIM SHOULD BE CHECKED BEFORE MAKING OF CHAMFERS ON TOOTH PROFILE ROLLING AND OF TOOTH ROOTS.
15. TO BE MARKED WITH ACID AND SUBSEQUENTLY NEUTRALIZED.
16. AFTER CHAMFERING AND LONGITUDINAL ROLLING NOT MORE THAN 0.2 MM OF EXTRA METAL IS ALLOWED OVER TEETH POINTS.

(14A) 172.40.052cbCb, 172.40.053cbCb, 172.40.054cbCb

" COMMON TO T-90 "
DRG. RE INDIANISED BASED ON RUSSIAN ORIGINAL ISSUE - 14 (R.RAMANI) 10-03-06

PILOT SAMPLE SHOULD BE APPROVED BY A H S P BEFORE BULK PRODUCTION.

EST. WT. (Kg)	TO BE STAMPED OR MARKED WHERE INDICATED THUS # (LETTERS)
0.92	

ALL SHARP EDGES AND CORNERS TO BE REMOVED UNLESS OTHERWISE STATED MACHINED CORNERS TO HAVE R OUTSIDE R INSIDE EQUIVALENT CHAMFERS ARE PERMISSIBLE.

ISSUE	DATE	NATURE OF AMENDMENTS
14A	17.9.04	N OF A. No. CQA(HV)/T90/40/001

DRN	Sd/=
CHD	Sd/=
APPD	Sd/=
DATE	19-09-88
SCALE:-	1:2
DIMENSIONS IN mm	
TOLERANCE ON DIMNS UNLESS OTHERWISE STATED IS: 2102-69	
ALL THREADS TO CONFORM TO	

MATERIAL:- STEEL 30ХГСА-3-а GOST 11269-76

USED ON:- 172.40.018cbCb, 172.40.019cbCb, 172.40.020cbCb

CONTROLLERATE OF QUALITY ASSURANCE (HEAVY VEHICLES) AVADI

TITLE:- DISC WITH EXTERNAL TEETH

D S CAT NUMBER

DRAWING NUMBER 432.40.074-1

F-78

SIZE A2

RESTRICTED

QUALITY ASSURANCE INSTRUCTIONS FOR

DISC DRIVING
(TANK T-72 M1)
No. CQA(HV)/QAI/41/DISC DRIVING

ISSUE : 1

DATE : 31 AUG'96

CONTROLLERATE OF QUALITY ASSURANCE
(HEAVY VEHICLES)
AVADI , MADRAS-600054

RESTRICTED

IMPORTANT NOTES

NOTE : 1

This is only a provisional instruction and will be amended from time to time according to the requirement. No addition, deletion and reproduction will be done without the permission of Controller, CQA (MV) Avadi, Madras-600 054

NOTE : 2

Any instruction contained in this does not prejudice the terms and conditions of the contract what so ever. In case of any contradiction between the contents of this QAI and the clauses in the contract, the latter will prevail.

NOTE : 3

The stores should be manufactured strictly as per the drawings supplied by the Inspection Authority only and not as per the samples, if any received by the manufacturer for guidance purpose.

NOTE : 4

Any amendment issued by the ANSP shall be incorporated in the QAI and the records for the amendments carried out should be maintained as per the proforma at Appendix 'B'.

C O N T E N T S

APPENDIX 'B'

RECORD OF AMENDMENTS

Amendment No : Date	Amended by	Date of Insertion	Initial

QUALITY ASSURANCE INSTRUCTION

No. CQA(HV)/PROJ/QAI/175-41-007 GB/DISC DRIVING

FOR

DISC DRIVING

OF

T-72

INTRODUCTION

1. This Quality Assurance Instruction lays down the inspection and testing procedure to be carried out on DISC DRIVING being procured indigenously. This is prepared, based on the acceptance standards and inspection parameters laid down in collaborators documents and on the inspection test standards followed in respect of similar indigenous items.

2. This QAI is the property of Government of India and is liable for amendment as and when required. Controllerate of Quality Assurance (Heavy Vehicles) Avadi, MADRAS-54 is the Authority Holding Sealed Particulars (AHSP) for this assembly. Any query/clarification on the contents of this QAI shall be referred to the AHSP. Any departure from these instructions is allowed only after written approval from above authority. Notwithstanding the tests indicated in this QAI, the inspecting officer has the right to carry out any test to check conformance to the paper particulars quoted in the Supply Order, which he may consider necessary to satisfy himself about the stores which he has to accept.

....2/-

AIM

3. This QAI is aimed at standardising the inspection procedure and acceptance norms for DISC DRIVING. It also aims at giving adequate information to the manufacturer on the quality requirements so that the required quality control methods are established. This is also meant to guide the authorised inspecting officer in the routine inspection and to set out main points to which his attention must be drawn to ensure that the accepted stores meet the stipulated standard.

SCOPE

4. This QAI outlines in general terms, the checks and methods to be used during inspection of DISC DRIVING including the technical requirements of the drawings. The recommended Quality Assurance Programme stipulated herein are mandatory and should be strictly adhered to. For inspection purposes only the latest issue of this QAI will be made applicable and required number of copies of this QAI can be obtained from the issuing authority (i.e) the Controller, CQA (MV) Avadi, MADRAS-54.

DOCUMENTS

5. On placement of firm supply order one set of certified drawings will be forwarded to the Contractor and to the respective inspecting officer. One set of relevant specification and technical instructions on the subject item can be obtained from the ANSP.

....3/-

6. Any clarification required on these documents should be obtained from the ANSP. Equivalence to the collaborators specifications and standards will be decided only by the ANSP and should not be unilaterily decided. For any change in the specifications, standards or written tests, the ANSP should be approached in writing. Only based on the written approval, any alterations in specifications can be affected and not otherwise.

7. The process instruction sheets supplied by the collaborators are available with the ANSP for the reference. The relevant process sheets may be studied at the premises of the ANSP after obtaining necessary permission.

8. The supplier after scrutiny of the concerned process sheets and connected paper particulars should establish the necessary production and inspection facilities. Particularly the inspection test rigs, stands fixtures, templates, gauges etc., should be provided as recommended in these process sheets.

....4/-

LAYOUT AND FUNCTION

9 Layout diagram of Code 175-41 Gn3 Fan Drive with Universal joint is given at Sketch 'P' 1. Disc Driving to Part No 175-41-007 Gb is a Sub Assembly of the above system. This fan friction clutch mainly consists of a driven hub, pressure plate, friction disc and driving hub (Refer Sketch P). This is located between transmission Gear Unit and the Cooling fan. This is intended to transmit the drive obtained from the transmission gear unit through an universal joint. However this is provided mainly to protect the drive part from destruction due to the sharp change of the engine speed (ie) during the sharp change, the disc will slip when the transmitting torque exceeds between 25 - 35 Kgf/m. The Sub assembly covered by this QAI is the Disc Driving of the system.

MATERIAL

10 Material should be as per the relevant drawings. Test specimen shall be supplied by the manufacturer, whenever warranted by the authorities or his representatives. Alternative material suggested by the manufacturer may be considered by ANSP and on his written approval only such alternate material should be used for manufacturing.

SAMPLING PLAN

11

	Pilot	Bulk
a) Visual Inspection	100%	100%
b) Material check		
i) Driving Disc	One specimen representing the pilot batch	One specimen representing the bulk batches
ii) Facing Ring	-do-	-do-
iii) Tubular rivet	-do-	-do-

....5/-

	Pilot	Bulk
(c) Dimensional check (Assy)	100%	IL-IV AQL 1.5 as per IS 2500 Part I
(d) Dimensional check (comp.)	100%	Facing Ring IL-IV AQL 1.5 as per IS 2500 Part I. OthersIL-VI AQL 1.5 as per IS 2500 Part I.
(e) Fitment & Performance	3 Nos for fitment & 1 No. for performance	One per bulk lot for fitment and one at random for performance.
(f) Preservation	-	100%
(g) Packing	-	100%

VISUAL INSPECTION

12 This assy should be checked for the following and it should be free from the following defects :-

(a) Defects in construction.

(b) Fitment of all component.

(c) Presence of moisture, grease oil on the friction surface.

(d) Corrosion of metal parts.

(e) Any form of deterioration of material and finishing.

(f) Uneven surface of friction area.

(g) Distortion

(h) Mechanical imperfection.

(j) Improper rivetting of friction disc.

(k) Finishing condition

(l) Internal and external cracks.

....6/-

MATERIAL CHECK

13 Material specimen/test bars of components shall be in conformity as per the material mentioned in the drawing radom test sample will be checked as per the sampling plan.

DIMENSIONAL CHECK (ASSEMBLY)

14 (a) Flanged tubular rivet head should sink behind the surface of friction disc by $1^{+0.3}_{-0.5}$ mm

(b) Conformity of dimension 'a' shown in drawing 175-41-007 Cb should be adhered to strictly.

(c) The gap between the friction disc and driving disc should not exceed 0.5 mm. This should be measured at the rivetting points.

DIMENSONAL CHECK (COMPONENT)

15 (a) Driving Disc (175-41-029)

It should be made from high grade special alloy steel grade 30 XГСА (GOST 11269-76) and it should be plated by Zn 12 -Cr.

(b) Hardness rockwell control should be 33 - 39 or BHN 321 - 375.

(c) The dimensions generally should confirm as per the drawing, however, permissible deviation on dimensions are as given under :-

i)	In Disc thickness	- 0.08 mm
ii)	Disc width	- 0.4 mm
iii)	Disc Buckling	- Below 0.15 mm (0.15 mm feeler gauge should not enter into the surface.)

.....7/-

iv) Hole (ϕ 8.3) Axis Displacement from the true axis. - Max. 0.2 mm

v) Pitch dimension in inside serrated teeth of disc (Driving) - May be increased upto 0.2 mm by the tolerance on 5th teeth maximum.

vi) Height dimension in spur gear teeth - Any pair of teeth in not to exceed 0.4 mm.

vii) Inside diameter's shrinkage effect after heat treatment - Within 0.56 mm.

viii) Serration should be checked with the gauge manufactured as per the higher dimension of the mating component.

FACING RING - 54-41-013-2/ FRICTION DISC

16 (a) Visual Inspection

Lining should be free from peeling, cracks and fraying at the edges.

(b) Dimensional check

Overall dimension should be as per the relevant drawing.

(c) Material Check

Fabric lining with brass or copper wire and resine impregnated to grade 25-7113-1115 to GOST 1786-80.

All other tests such as co-efficient of friction, Hardness etc., are to be carried out as per the parameter stated in specification GOST 1786-80 for the lining code designation to 11.

(d) Brinell hardness BHN 250 - 470.

(e) Co-efficient of friction with respect to Cast Iron grade C 415 (GOST 1412-79) 0.34 - 0.48

(f) Specific pressure MPa (Kg/cm^2) 0.14- 0.25 (1.4 -2.5)

....8/-

(f) Deviation in co-efficient of friction with in a given batch % not more than 15

(g) Linear wearout with respect to Cast iron grade CH15 (GOST 1412-79) mm not more than 0.16

(h) Increase in weight in liquid media % not more than

in water 4.0

in oil 4.0

Note : Testing of Hardness and co-efficient of friction should be carried as per specification GOST 1786-80.

FITMENT AND SLIP TEST

17 This test will be carried out on the vehicle as it is not possible to be done on a Rig.

Disc driving which are found to be suitable in the tests enumerated above should be sent to the ANSP clearly marked/labled as pilot samples for fitment trials. On receipt of the stores at CQA (HV) arrangement will be made to fit the item in runner vehicle. The date of starting of the trial will be intimated well in time to time to Zonal Inspector and the firm, whose representative should attend the test.

The following appliances are required for carrying out the slip test (Ref Sktech 'P-2' attached).

a) 172-91-953 Gb - Dynamometer (torque measuring device)

b) 172-91-203 GbA - Lever

c) 54-28-594 - Pin ϕ 24.

....9/-

Procedure :-

(a) Fix the ϕ 24 pin into the intermediate yoke hole of the driving unit.

(b) Rotate the rim with the aid of the lever till the pin is locked. The driving unit will be stationary.

(c) Fix the dynamometer (Torque measuring device) on the lever and pull the same either clock-wise or anticlockwise till the driven unit starts to move. This indicate the slipping of the clutch.

Note down the reading the clutch slipping torque should be within 25 - 35 kgf/m.

PERFORMANCE TEST ON THE VEHICLE

18 The friction disc should be fitted on vehicle and checked for 750 KM. After completing the test it is to be yellow banded. It should not be used again for production or service.

MARKING

19 All the components should be marked with Part Number. Suitable method of marking can be adopted wherever the same is not mentioned in the relevant drawings. The marking should be legible.

The plates should be marked on the following at non operating surfaces :

a). Lining desingation.

b) Manufacturer name and trade mark.

c) Inspector's mark.

d) Batch Number of the lining.

e) Year of manufacture

} width should not be less than 30 mm.

....10/-

PRESERVATION

20 Plating, painting and preservation should be in conformity as per the specification mentioned in the relevant drawings.

STORAGE

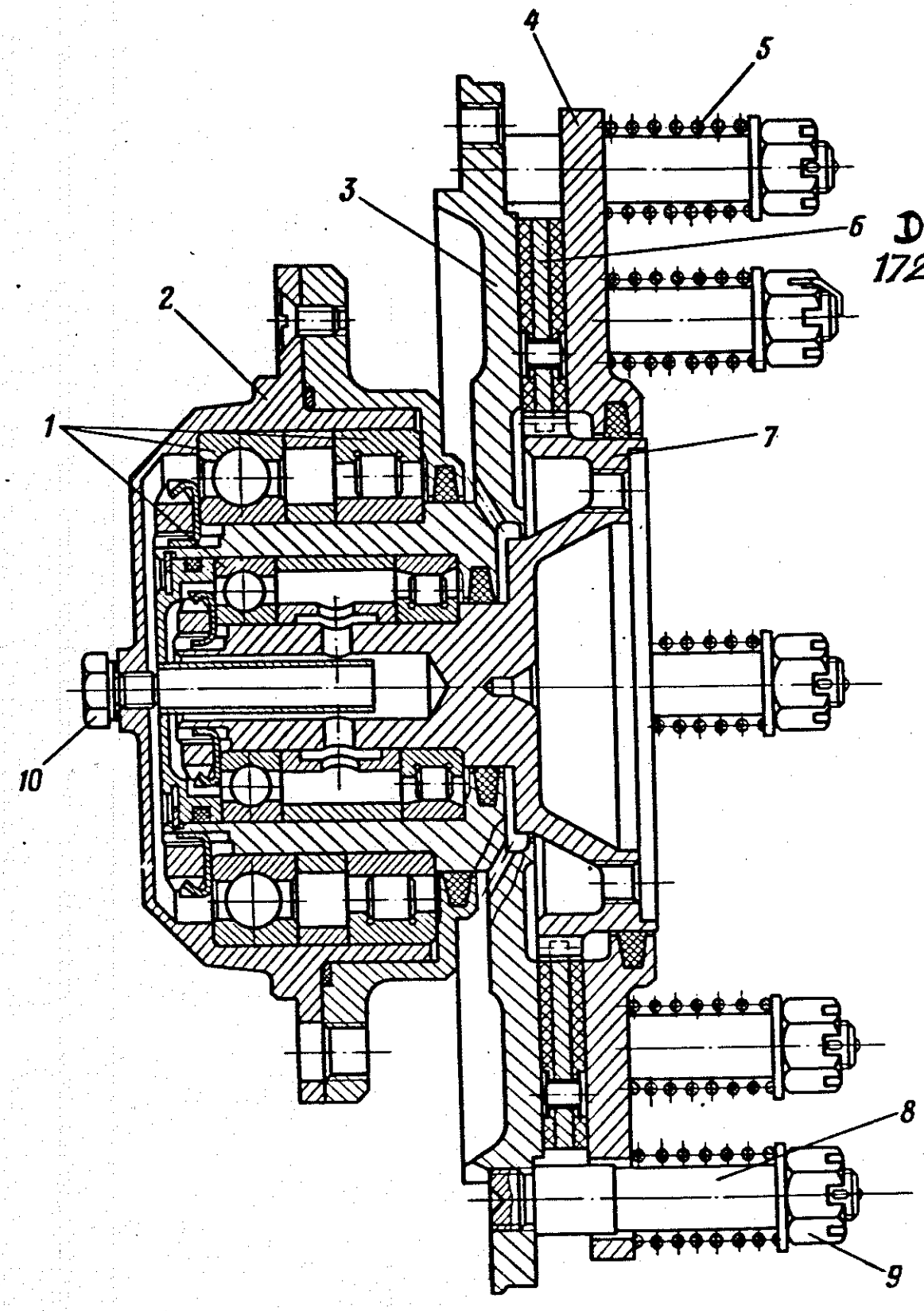
21 Assembly (with friction plates) must be placed into enclosed store premises under condition eleminating possibility of contact with water, oil or other such substances. It should not be stored more than 5 years in idle condition.

PACKING

22 Each should be packed seperately So that it is protected from moisture and dust. The units can be packed in a box which should withstand the transportation effect.

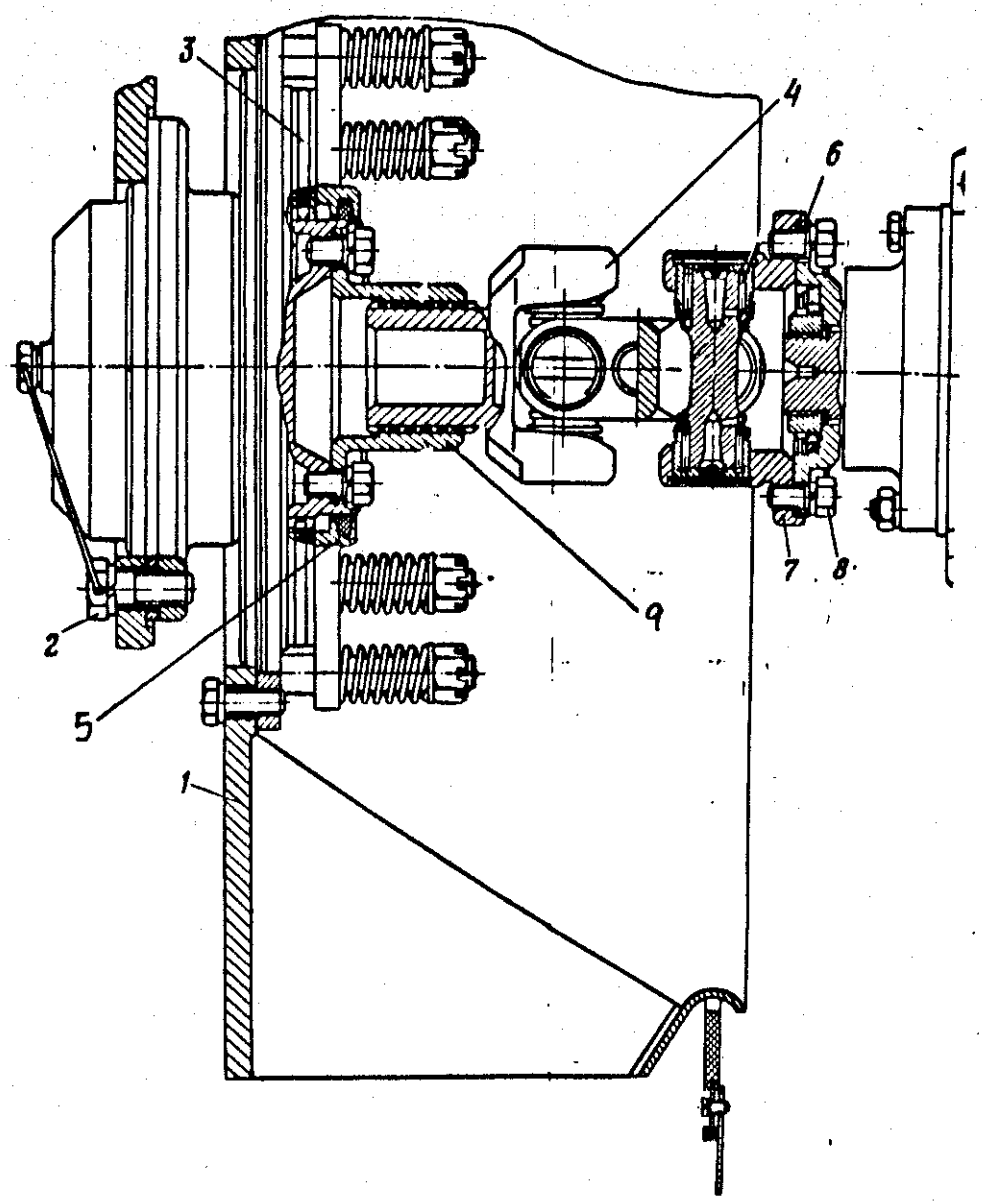
-oOo-

SKETCH-P



FAN FRICTION CLUTCH

1. FRICTION CLUTCH BEARING, 2. BEARING HOUSING, 3. DRIVEN HUB
4. PRESSURE PLATE, 5. SPRING, 6. FRICTION DISC 7. DRIVING HUB
8. STUD , 9. NUT, 10. PLUG



SKETCH 'P1'

F A N D R I V E

1. FAN
2. FAN FRICTION CLUTCH ATTACHMENT BOLT
3. FAN FRICTION CLUTCH
4. UNIVERSAL JOINT YOKE
5. FRICTION CLUTCH DRIVING HUB
6. UNIVERSAL JOINT YOKE
7. BEVEL GEAR FLANGE
8. DRIVING HUB COUPLING

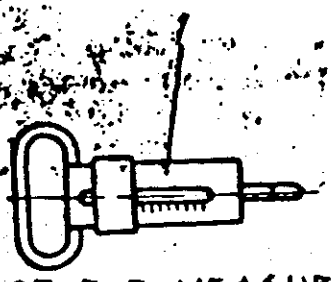
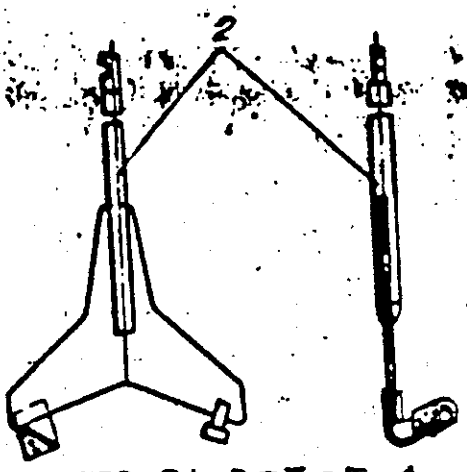


FIG. 308. APPLIANCE FOR MEASURING SLIP TORQUE OF FAN CLUTCH.



1- DYNAMOMETER 172.91.053cb; 2- LEVER, 172.91.203cb-A.

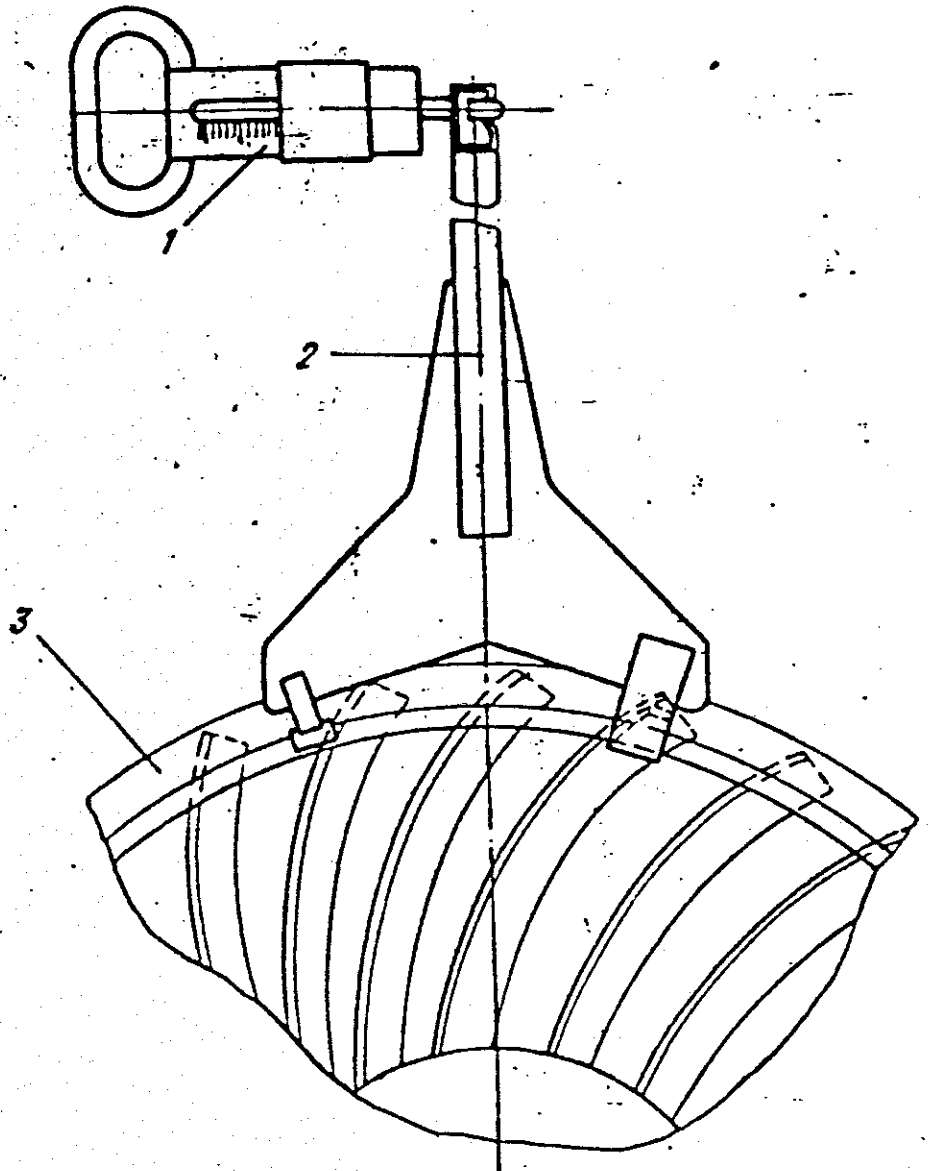


FIG. 309. DIAGRAM OF INSTALLING THE APPLIANCE FOR MEASURING SLIP TORQUE OF FAN CLUTCH.

1- DYNAMOMETER 172.91.055cb; 2- LEVER 172.91.203cb-A; 3- FAN.

DISC with Outer Teeth to Drg. No. 432.40.071-1 (List Sl.no 397 / OFB No 2041)
DISC with External Teeth to Drg. No. 432.40.074-1(List Sl.no 395 / OFB No 1864)

Nomenclature & drawing No.	Manufacturing technology & Testing / Inspection Facilities required to produce the item		Essential (To be possessed by the vendor in his premises) (P&M list and testing / inspection equipment list to be submitted)	Desirable (May be posses by the vendor in his premises or out sourced) (Self declaration to be submitted)	FIRM Compliance (Y/N)	Remarks
DISC with Outer Teeth to Drg.No. 432.40.071-1 & DISC with External Teeth to Drg. No. 432.40.074-1	TECHNOLOGY-1	Turning Machine	Turning machine Dia.550, Dia.450 with 0.020mm accuracy			
		Gear Hobbing	Gear Hobbing machine Dia.500 x Stroke height 50mm or more, module 3 or more which can able to produce gears of DIN7 or better accuracy.			
		Surface Grinding	Rotary surface grinder 600mm table dia or more with 0.005mm accuracy			
	TECHNOLOGY-2	Cutting	Laser cutting or Oxy-acetylene Gas profile cutting machine to cut the blank from sheet metal			Instead of Gas/Laser cutting, firm can make blank by Shearing method on Hydraulic press
	TECHNOLOGY-4	Roll Hardening	Should develop/position Roll hardening facility for hardening of each tooth space by work hardening method and firm should submit the undertaking in this regard at the time of submission of bids that they will create the Roll hardening facilities within 6 months from the date of receipt of order			

Nomenclature & drawing No.	Manufacturing technology & Testing / Inspection Facilities required to produce the item		Essential (To be possessed by the vendor in his premises) (P&M list and testing / inspection equipment list to be submitted)	Desirable (May be posses by the vendor in his premises or out sourced) (Self declaration to be submitted)	FIRM Compliance (Y/N)	Remarks
DISC with Outer Teeth to Drg.No. 432.40.071-1 & DISC with External Teeth to Drg. No. 432.40.074-1	TECHNOLOGY-5	Raw material		Firm should capable to arrange the required raw material as per drawing specifications.		
	TECHNOLOGY-6	Hardening & Tempering	Hardening & Tempering furnace with Oil quenching facility			
	TEST / INSP-1	Inspection	➢ Measuring Instruments like Gear Teeth Micrometer, Vernier Caliper, Surface Roughness Tester, Feeler Gauge, Precision surface table. ➢ Hardness Tester (BHN/HRC)	➢ Gear Profile Tester (Max module 5) ➢ Magnetic particle crack detection Facility		
	TEST / INSP-2	Inspection	➢ All testing facility Chemical, mechanical and physical properties with certification as per component requirement.			

(D.Gnanasambandan)
Member
JWM/QA(GA)

(K.Durairaj)
Member
JWM/Trans

19/1/19

(Animesh Paik)
Team Leader
DGM/TRG

Addl. GM/P

Addl. GM/PC&EO

Addl. GM/QA, ARJUN & RRD

Addl. GM/TMM