Technical Protocol No. 174

Section General 1st July 1988

Design and Maintenance of STUDER Capstan Motors

1. Lubrication of sintered Bearings in Capstan Motors

General Information on Bearing Design

Sintered bearings are used exclusively for the capstan shafts in STUDER tape recorders.

By depositing the lubricant in the body of the bearing and due to the realization of minimal play between shaft and bearing, optimum conditions are achieved for long-term stability and low-noise operation of the bearing.

The porous structure of the bearing material is saturated with lubricant under vacuum. The pores in the bearing material are amounting to 15 - 30 % of the bearing's volume. Depending on load and operating conditions, the amount of lubricant thus stored may last for the life of a motor.

In contrast to a solid bearing design, the lubricant in sintered bearings is not applied to the face of the bearing via a few central lubricating points but is instead available through the capilliaries of the porous sintered material. In this way, a minimal oil film around the shaft is maintained even at standstill of the motor.

Bearing gap in a sintered bearing

a) shaft at standstill

b) shaft in motion (rotating)

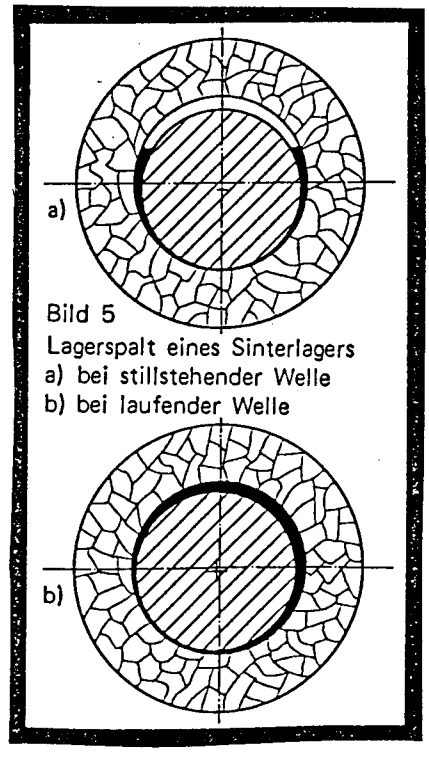


Bild 5
Lagerspalt eines Sinterlagers
a) bei stillstehender Welle
b) bei laufender Welle

Loss of lubricant due to seepage may occur more often with the shaft arranged vertically than when it is mounted horizontally. Cases of loss through oil seepage have become evident in the model A80. The oil oozed out of the bearing gap and disappeared. To achieve long service life, replenishment of the lubricant is necessary. After about 60 to 70 % of the originally absorbed lubricant have been lost, the sintered bearing will no longer perform satisfactorily. This may become evident in a degraded wow and flutter performance or in that nominal speed can no longer be reached or even freezing of the shaft in the worst case. In all those situations the motor has to be returned to STUDER INTERNATIONAL for inspection and repair.

Without replenishing the lubricant, the service life of a capstan motor extends to 4'000 hours approximately. By replenishing the lubricant, an extension to 10'000 hours will be possible under normal service. On the capstan motors used in STUDER tape recorders service life is extended by oil replenishment from a felt ring and more recently from a plastic oil reservoir.

2. Maintenance of Capstan Motors lubricated with ISOFLEX PDP 65 (20.020.401.04)

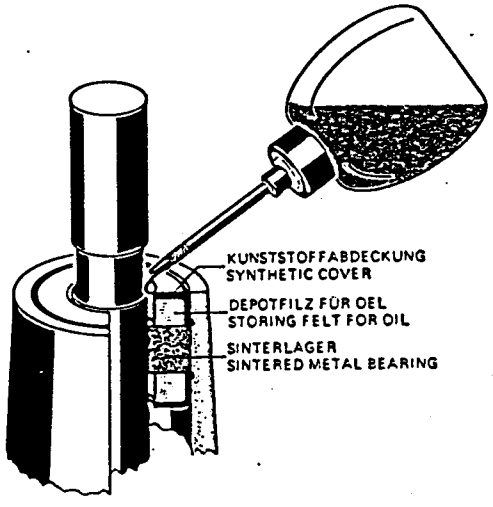
(Applies to all capstan motors manufactured until the end of 1987).

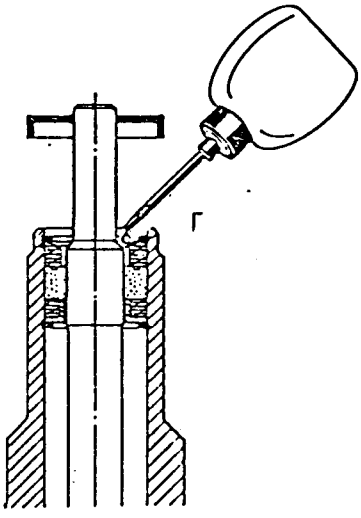
This synthetic oil (Ester-oil) possesses excellent wetting properties and has an impressive low temperature stability. Synthetic oils are non-oxidizing and have good temperature stability.

ISOFLEX PDP 65 is a special oil and must not be mixed with other lubricants.

For oil replenishment this motor is equipped with an oil saturated felt ring. Out of this felt the oil passes easily to the sintered bearing with the result that oil is lost and replenishment becomes necessary after 2'000 hours or in six month intervals. This loss of oil occurs also in storage; therefore, replenishment is advisable before putting a capstan motor into service.

To replenish the oil supply, use oiler (order no. 20.020.401.04) and apply ISOFLEX PDP 65 to the felt through the hole in the cap or on DC-Capstanmotors pull off the plastic cap.





When replacing the plastic cap, one has to make shure it is pushed home fully to its stop, as it may otherwise touch the cover plate.

Important: When cleaning the capstan shaft, great care must be exercised to prevent the cleaning fluid from flowing into the upper bearing. For cleaning use a cloth only slightly dampened with cleaning fluid.

3. Maintenance of Capstan Motors with liquid grease CONSTANT GLY 2100 (20.020.401.10)

In use since 1988 in the following machines:
A820 (0.25" & 0.5"), A820 MCH (1" & 2"), A812, A807, D820X.

These capstan motors carry a red label which contains information as to the lubricant used.

Liquid grease (impregnating fluids) will ensure extremely low bearing friction. They are especially suitable for applications where extremely good wow and flutter performance is essential.

Motors lubricated with liquid grease are equipped with a plastic reservoir for oil replenishment. The supply of lubricant is adjusted to the requirement of a sintered bearing, and already small capilliary repulsion through the open pores of the bearing will suffice to provide lubrication.

As a result of an enlarged sintered bearing (larger lubricant reservoir) combined with the liquid grease CONSTANT GLY 2100 and a plastic oil reservoir, replenishment is necessary in 1 year intervals only.

For replenishment one has to remove the headblock after which the plastic cap can be pulled off. Now apply a few drops of liquid grease (order no. 20.020.401.10) between shaft and bearing. When replacing the plastic cap, one has to make sure it is pushed home fully to its stop, as it may otherwise touch the cover plate.

4. Basic Facts

Capstan shafts are polished in relation to the inside diameter of the pressfitted sintered bearing.

It is not possible, therefore, to replace a capstan shaft in the field.

For this reason capstan motors have to be returned to the manufacturer for overhaul.

LUBRICATION OF SINTERED BEARINGS IN CAPSTAN MOTORS

TWO DIFFERENT KINDS OF LUBRICANTS ARE USED FOR THE SINTERED BEARINGS SINCE JANUARY 1988, DEPENDING ON THE MOTOR TYPE :

- SYNTHETIC OIL 'ISOFLEX PDB 65' 20.020.401.04
  OR NEWLY
- LIQUID GREASE 'CONSTANT GLY 2100' 20.020.401.10

MOTORS LUBRICATED WITH LIQUID GREASE ARE IDENTIFIED BY A RED LABEL ON THE BOTTOM.

FOR MAINTENANCE ONLY THE PRESCRIBED LUBRICANT MUST BE USED !