Construction and Working of Pivoted Motor Bases for Belt Drives

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The information contained in this article represents a significant collection of technical information about construction and working of pivoted motor bases, also called reactive torque motor bases for belt drives. They are widely used to automatically control the belt's tension to minimize maintenance and maximize belt life. This information will help to achieve increased reliability at a decreased cost. Assemblage of this information will provide a single point of reference that might otherwise be time consuming to obtain. Most of information given in this article is mainly derived from literature on the subject from sources as per the reference list given at the end of this article. For more information, please refer them. All information contained in this article has been assembled with great care. However, the information is given for guidance purposes only. The ultimate responsibility for its use and any subsequent liability rests with the end user. Please view the disclaimer uploaded on http://www.practicalmaintenance.net.

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Pivoted Motor Bases for Belt Drives

In a belt drive, optimal belt tension is critical for avoiding belt slippage and excessive strain that lead to higher maintenance costs and additional downtime. Optimal belt tension helps lengthen the service lifetime of components, such as belts and motor bearings. Two types of motor bases used to regulate the pressure in a belt driven system are: fixed-position adjustable bases and tension-controlling bases.

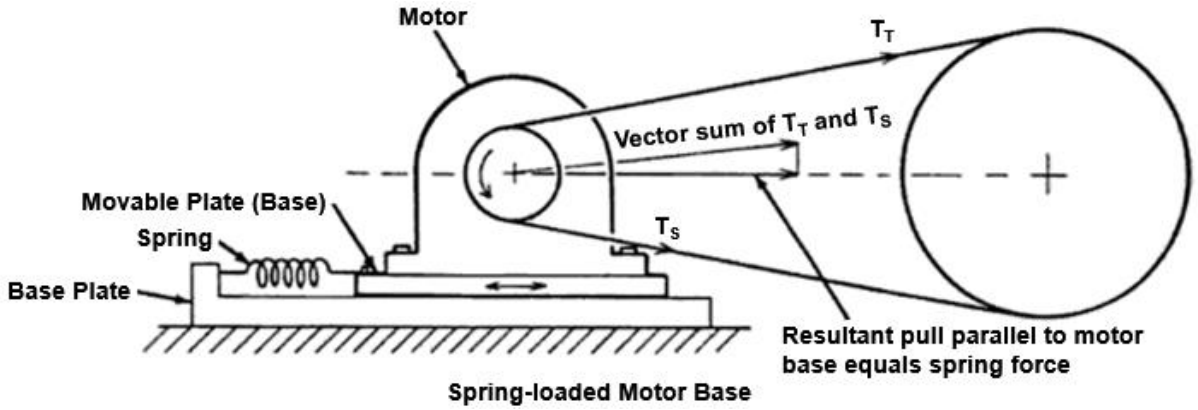
Fixed-position adjustable bases adjust belt tension via manual alteration of the center distance that separates a driver and driven pulleys. They allow pushing or pulling a motor into place to install or adjust the belt. Once the belt is pulled over the pulley, single or multiple screws force the motor away from the driven pulley until the desired tension level is attained. The mounting bolts are then tightened to complete the process. Fixed-position mechanisms are selected due to their cost advantage over higher priced tension-controlling mechanisms.

Tension-controlling bases have mechanisms that automatically alter the center distance of a pulley of a running motor in response to load condition requirements. Information on types, construction and working of tension-controlling bases is given in this article

Types of Tension-controlling Bases

The two types of motor bases used to control belt tension automatically are spring-loaded motor base and reactive torque motor base, commonly called pivoted motor base.

Spring-loaded Motor Base

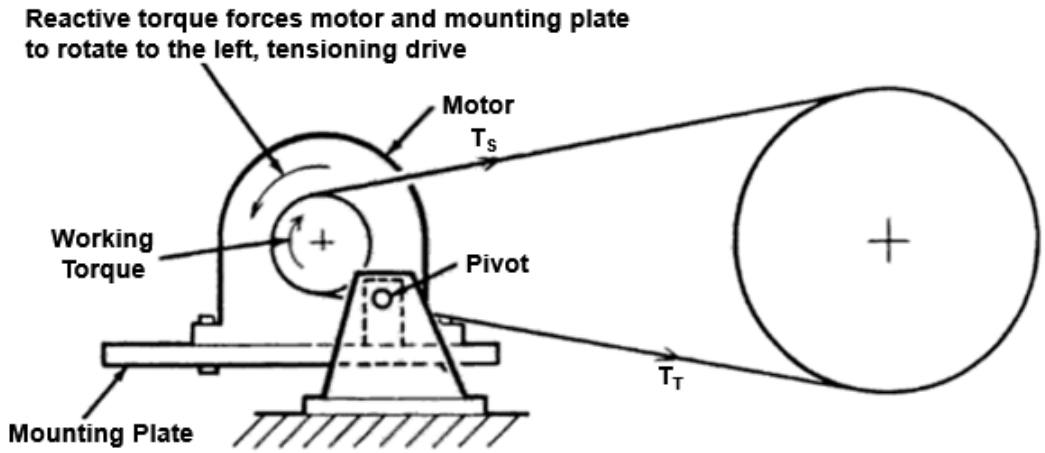


Spring loaded motor bases employ built-in springs to control the belt tension/strain. In this type of motor base, the spring force must be such that the motor is pulled back against the drive with a force equal and opposite to the resultant belt pull, parallel to the base. The spring must have some extra force, to overcome the friction in the base. If the mounting is not horizontal, the effect of motor weight must be taken into account. Spring-loaded bases are most commonly used on industrial drives with motors from 5 to 10 HP, and occasionally on larger drives.

Reactive Torque Motor Base (Pivoted Motor Base)

Reactive torque motor base uses the reactive torque of the motor to help tension the drive. As shown in the following figure, when a motor is delivering power to a sheave or pulley, its frame tries to rotate in a direction opposite to that of the sheave or pulley. With the motor in a

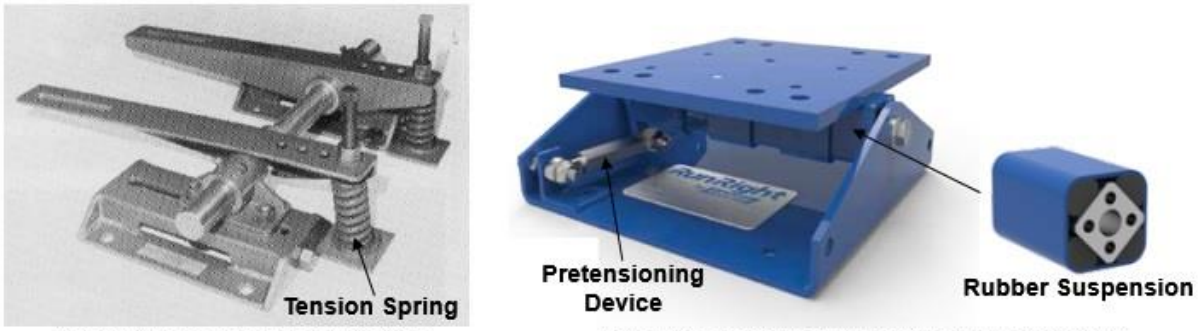
cradle with a pivot point near the motor shaft, the motor can move away from the driven sheave, tensioning the drive. As torque increases, tension increases.



Reactive Torque Motor Base (Pivoted Motor Base)

The reactive torque motor base must be installed so that the direction of rotation is correct. If the motor shaft were rotating in the opposite direction, the reactive torque would actually loosen the drive, rather than tighten it. Operating in the same direction, both the reactive torque and the motor weight act to tension the drive.

Construction of Pivoted Motor Bases (Reactive Torque Motor Base)



Motor Base with Tension Spring Motor Base with Elastomeric Tensioning Unit

Typical Constructions of Pivoted Motor Bases

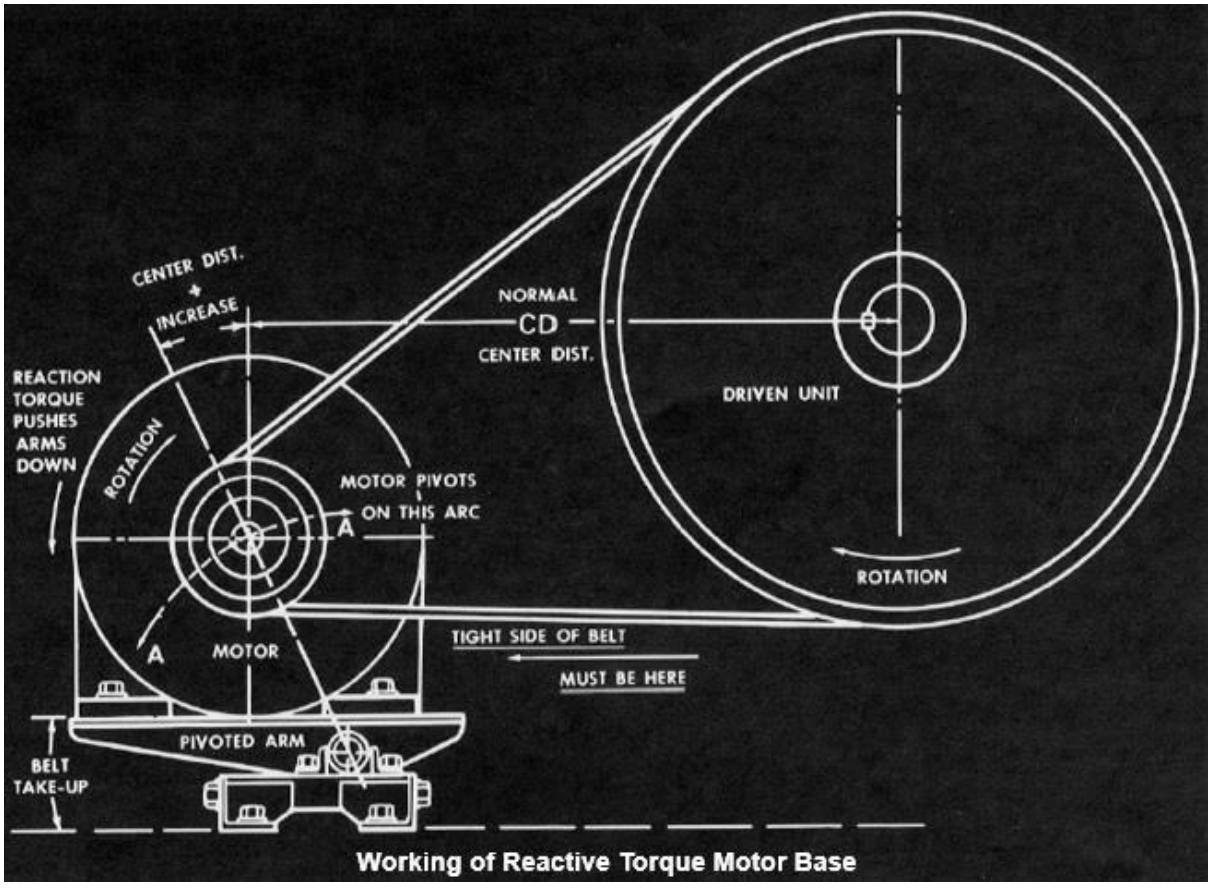
Above figure shows typical constructions of pivoted motor bases with tension spring and elastomeric tensioning unit. Depending on the construction, final belt tensioning is carried out by adjusting the mechanical pretensioning device (the tension springs of motor base with tension spring or the pretensioning device of motor base with elastomeric tensioning unit). In case of motor base with elastomeric tensioning unit, the pretensioning device adjusts torsion in the rubber suspension unit (often called torsion spring of elastomeric tensioning unit).

Elastomeric tensioning motor bases utilize a rubber suspension unit as a pivot mount. The rubber suspension unit continuously compensates for belt stretching, hopping, fluttering and excessive pull when a drive is started. Elastomeric tensioning motor bases are the ideal tensioning solution for all belt drives from about 1/2 to 700 HP.

Because elastomeric tensioning motor bases utilize rubber inserts, generally they can be used for applications operating within a −40˚ to 180˚F (−40˚ to 80˚C) temperature range.

Working of Reactive Torque Motor Base (Pivoted Motor Base)

The following figure and text illustrates working of a reactive torque motor base (commonly called pivoted motor base).



Working of Reactive Torque Motor Base

Automatic Tension Control

Increase in load (e.g. starting load) activates reaction torque, which operates in a direction opposite to the rotation. This force pushes down on pivoted arms.

As arms swing down, motor pivots on arc A-A, increasing center distance. This builds up belt tension in direct proportion to load.

When drive is at full speed, load drops back to normal, reaction torque disappears, arms swing back up, decreasing CD, and belt tension returns to normal operating condition.

Automatic Belt Take-Up

With a portion of the motor weight offset away from the driven unit on the pivoted arms in an amount sufficient to provide for the initial belt tension requirement, the force of gravity gives the pivoted motor base its automatic and continual belt stretch take-up feature (because the motor weight always acts to tension the drive). This keeps drive maintenance to an absolute minimum.

Smoothing Vibration

Due to the fact that the motor "floats on the belts", many types of minor vibration are effectively smoothed out by the pivoted motor base.

Installation Instructions

In a pivoted motor base, pulling side (tight side) of the belt must come between motor shaft and pivot shaft.

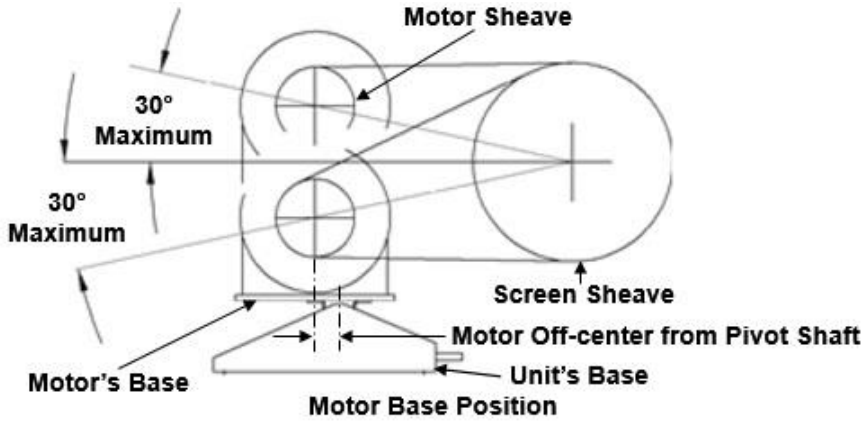
Insure that motor shaft, pivot shaft and driven shaft are parallel.

As shown in the following figure, the unit's base must be parallel to the motor's base. If not, the unit will not have adequate adjustability.

Over-tightened belts put an extra load on the mechanism bearings that is unnecessary and may damage motor and motor base. Ideally, the belts should be just tight enough so that they do not slip during start-up.

Follow the manufacturer's instructions for the following:

The distance that the motor is off-center from the pivot shaft must be large enough to carry the starting and peak loads, yet be as small as possible for maximum belt and bearing life.



Since ideal motor base position depends on its construction and application, the driven sheave (pulley) should be located with respect to the motor sheave as per manufacturer's recommendation. For example, as per one screen manufacturer, the center of the motor sheave should be located within 30 degrees up or down from the horizontal center of the screen sheave as shown in above figure.

References

Belt selection and application for engineers / edited by Wallace D. Erickson / published by Marcel Dekker, Inc. USA.

TENS - A - MATIC Pivoted Motor Bases by Overly Hautz Motor Base Company, website address: http://www.overlyhautz.com.

RunRight™ by Lovejoy, Inc. USA, website address: http://www.lovejoy-inc.com

ROSTA Motor bases by ROSTA AG, website address: http://www.rosta.com