INSTALLATION AND MAINTENANCE OF V-BELTS

1. GENERAL

1.01 This section outlines the methods and procedure for installing, removing and maintaining V-belts used for driving mechanical equipment in telephone buildings.

1.02 The useful service life of V-belts is mainly determined by the drive construction and the quality of regularly scheduled maintenance attention they receive.

1.03 A V-belt derives its driving ability from the wedging contact between the sides of the V-shaped belt and the walls of the V-shaped groove of the sheaves. This wedging contact is, in addition, augmented by the inherent bulging of the belt straight sides as it enters and maintains contact with sheave groove.

1.04 V-belts are manufactured in standard cross-sections "A to E," inclusive, Fig. 1, and in a varied assortment of lengths.

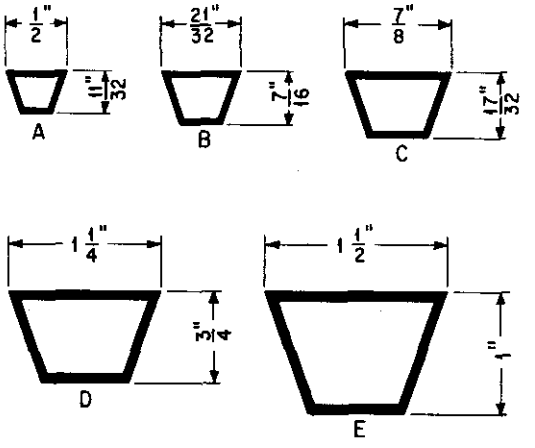

Fig. 1 - Standard V-Belt Cross-Sections

1.05 The size of a V-belt is determined by two measurements:

(a) The outside circumference - Fig. 2.

(b) The top width - Fig. 3.

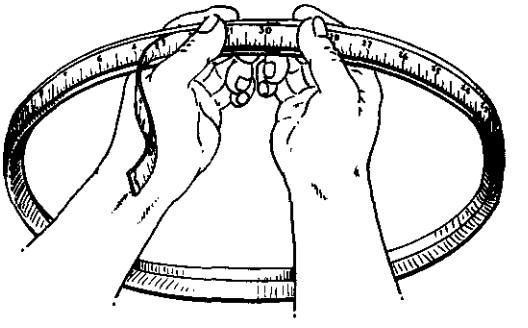

Fig. 2 - Measuring the Outside Circumference

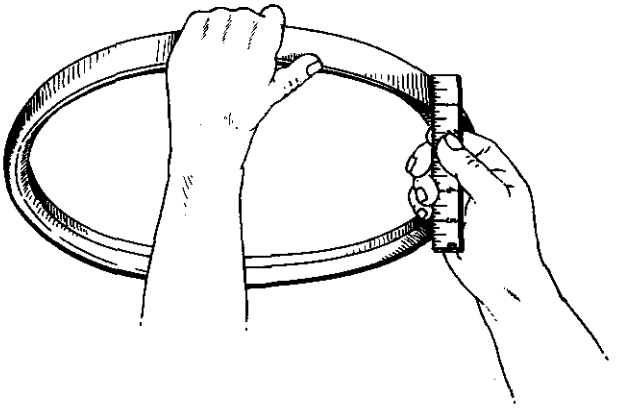

Fig. 3 - Measuring the Top Width

2. SAFETY

2.01 A belt drive is always dangerous to work on or around unless the following safety precautions are observed:

(a) Be sure the motor disconnect switch is in the open position before starting to work on the belts. Consider the necessity for removing the fuses to assure the motor is not started while work is in progress.

(b) If the motor disconnect switch is located at some distance from the drive assembly it is also advisable to place a tag on the switch stating that it is in the open position because men are working on the equipment.

(c) Never operate a machine unless the belt guard is in its proper place. Open the motor disconnect switch if the belt guard must be removed to perform certain repairs. After making the necessary repairs, adjustments and tests, replace the guard prior to restoring the machine to service.

3. INSTALLATION OF V-BELTS

3.01 The recommended procedure for installing a new set of belts is as follows:

(a) Comply with the safety precautions listed in Part 2 before proceeding with the installation.

(b) Move the motor far enough toward the driven machine to allow for the installation of the belts without forcing.

(c) Install the belts on the inside sheaves first. Lay all belts evenly in the grooves with all the slack on either the top or bottom side. Do not have the slack of some belts on the top and others on the bottom.

(d) Never attempt to pry the belts on to the sheaves as this may damage the inner cords of the belt.

(e) To tighten the belts move motor away from driven machine by turning the motor aligning and adjusting bolts. Turn the bolts, alternately, a few turns at a time to maintain the motor in alignment.

(f) Tighten belts sufficiently to prevent belt slip, squeal, or whip. Belts should not be tightened excessively. See Paragraph 5.02 (a) for method of proper tensioning.

(g) With the belts properly tensioned and the motor aligned, tighten the motor hold down bolts.

(h) Give the drive a trial run until the belts have become seated in place. Again adjust the drive until the belts are taut.

(i) Replace belt guard and securely tighten all bolts.

4. REMOVAL OF V-BELTS

4.01 The recommended procedure when removing V-belts is as follows:

(a) Comply with the safety precautions listed in Part 2 before starting to remove belts.

(b) Remove the bolts that hold the belt guard in position and remove guard.

(c) Loosen the motor hold down bolts.

(d) To move the motor towards the driven machine, turn the adjusting bolts. These bolts will turn freely and not bind if alternately turned a few threads at a time. To maintain the motor in alignment, turn each bolt the same number of threads. Move the motor far enough towards driven machine to allow easy removal of the belts from the sheaves.

(e) When removing belts, never attempt to pry or force the belts from the sheaves.

5. MAINTENANCE OF V-BELTS

5.01 The life and performance of a belt drive will be extended and improved through attention to the following maintenance items.

5.02 Tension: The proper tensioning of belts is very important. When the belts are applied with too little or too much tension, the efficiency of the belts, motor and driven machine is adversely affected.

(a) To obtain approximately the proper tension, put a measuring tape around the outside circumference of the belt before any tension has been applied. Then tension the belt on the drive until the outside circumference increases 1/4" to 3/8" per 100" of belt length.

(b) V-belts must be tensioned to avoid slip. When a belt is pulling a load, as in Fig. 4, the pulling leg of the belt will be tighter than the returning leg of the belt. As the belt goes around the sheave from the "loose" side to the "tight" side the belt will naturally stretch slightly. This causes a creep or slight slipping of the belt on each sheave. The normal expected slip due to this creep results in a total slip of approximately one per cent to two per cent at normal loads on the belts. Therefore, the output rpm of a V-belt drive will be about one per cent to two per cent less than if it were a chain drive at the same pitch diameter.

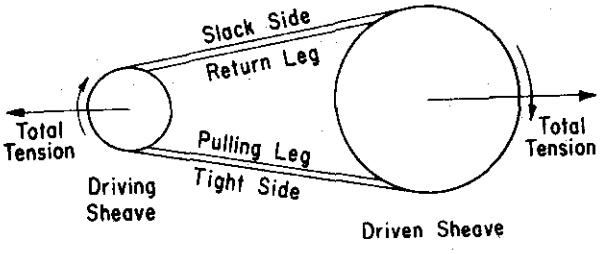

Fig. 4 - V-Belt Drive

(c) A V-belt drive operating with insufficient tension is subjected to a snapping action which will usually occur at peak loads or when starting the motor. This snapping action occurs when the excess slack is suddenly taken up and the belt is whipped taut. When this happens, see Fig. 5, a force far greater than that for which the drive was designed to transmit is imposed upon the belt. By reason of the above, a belt operating with insufficient tension will stretch more in service than one properly tensioned.

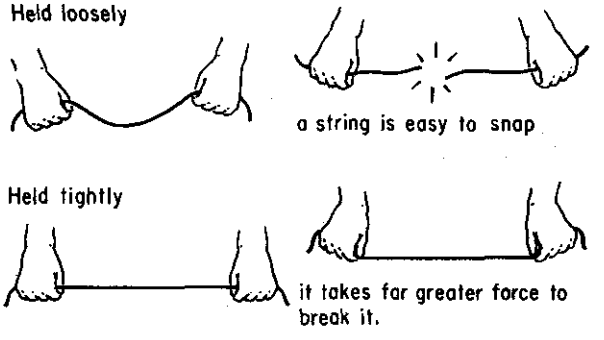

Fig. 5 - Simulating Belt Snapping Action

(d) A belt drive operating with too much tension will result in increased power consumption, overheating and accelerated wear of the motor and driven machine bearings.

(e) A slack belt feels dead when struck with the hand; a properly taut belt has an alive springiness.

5.03 Matched Sets: When installing belts, always use a complete set of new matched belts. Never use a mixed set of new and old belts. The use of a mixed set, because of the working stretch present in the old belts, will impose abnormal stress and strain on the new belts.

5.04 Initial Stretching: All new belts will have some stretch and tend to settle down in the grooves during the first few hours of operation causing a loss in belt tension. Therefore, the tension of the belts should be checked and adjusted after the first few hours of operation and scheduled for recheck at least twice a month for three months and no less than once a month thereafter.

5.05 Belt Wear: A belt which has worn until it rides on the bottom of the sheave groove instead of riding on the groove sides will slip excessively unless it is adjusted to abnormal tension. Belts should be replaced before they ride the bottom of the sheave grooves.

(a) Belts which are too loose result in a loss of rpm, reduced belt life due to heat and premature wearing of shoulders or rings in the sheave grooves. Excessive slip due to insufficient tension may be indicated by premature wear on the belt side walls. This may be recognized by the appearance of spots where the ply or layer of belt jacket has been worn through to the ply or layer underneath. Belts that slip excessively will wear rapidly.

5.06 Sheave Alignment: The alignment of the sheaves should be checked at least twice a year. The motor and driven machine shafts must be kept parallel and the sheaves aligned so a straightedge or a taut cord will touch across the entire flank of each sheave. Fig. 6

(a) Poor alignment of sheaves will also produce premature wear on belt side walls by causing the sides of the belt to chafe against the sheave flange at entry and leaving points. Rough or worn grooves in either or both sheaves will cause rapid wear of the belt sides. If alignment and condition of the sheaves are good, premature side wall wear is a sure sign of excessive slip.

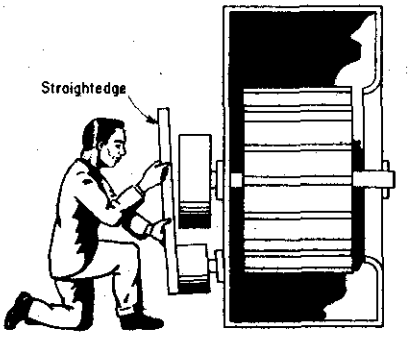

Fig. 6 - Checking Sheave Alignment

5.07 Belt Cross-Sections: Belts of the various cross-sections have a minimum diameter sheave, as indicated in the following table, on which they will operate satisfactorily. When used on sheaves of smaller diameter, the resulting internal friction, due to the increased cord flexing, will shorten the belt life.

Minimum Diameter Sheaves

Sheaves	"A"	"B"	"C"	"D"	"E"
Minimum Recommended Pitch Diameters	3.0"	5.4"	9.0"	13.0"	21.6"
Outside Diameters	3.25"	5.75"	9.4"	13.6"	22.4"

5.08 The pitch diameter and outside diameter of a typical V-belt sheave is illustrated by Fig. 7.

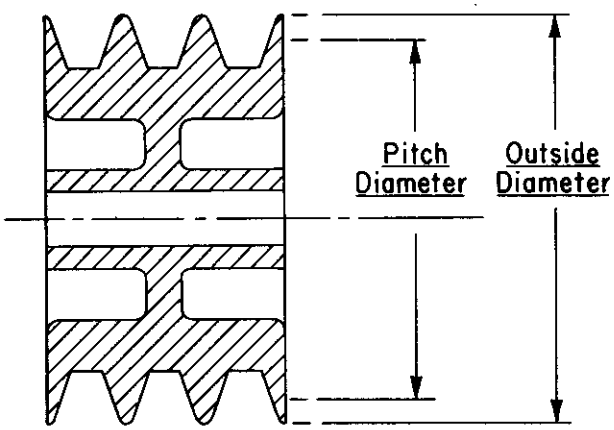

Fig. 7 - Sheave Cross-Section

5.09 Belt Dressing, etc.: Belt dressing should not be used and belts should be kept free of foreign materials such as oils and grease.

5.10 Records: In order to expedite maintenance and repairs, a record of the correct belt size for all equipment involved should be maintained in conjunction with Bell System Practice H51.350, "Building Mechanical Equipment Scheduling Routine Maintenance."