Installation, Maintenance and Troubleshooting Guide

Power Transmission Belt Drives

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GOODYEAR

INSTALLATION

V-BELTS

Torque-Flex,® Hy-T,® Compass®-V-Steel, Hy-T® Wedge, Torque-Team,® Hex and F.H.P. V-belts

1. INSPECT SHEAVES

Worn sheaves will substantially reduce belt life. If the grooves are worh, the belt will bottom out. This will result in slippage and the belts may char or burn. If the sidewalls are dished out, the bottom shoulder of the sheave will wear the bottom corner of the belt, thus causing premature failure.

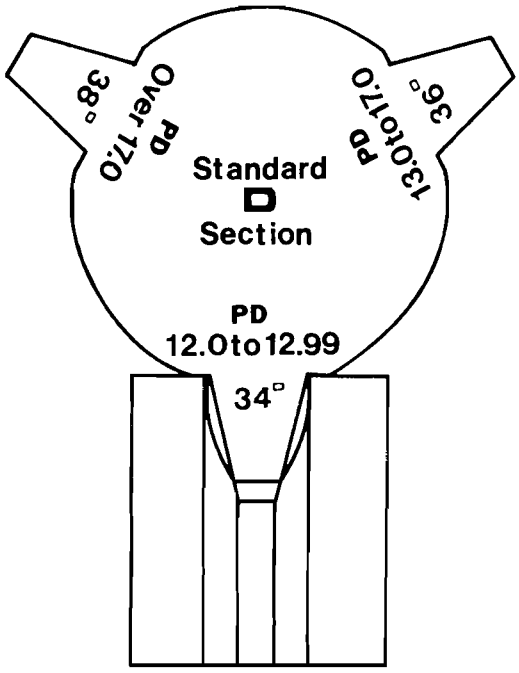
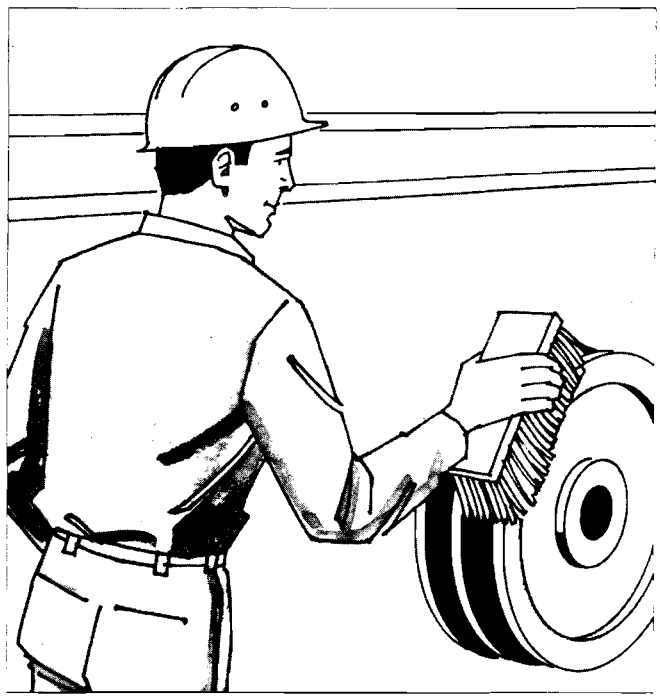


Fig. 1

SHEAVE GROOVE GAUGE

Select the proper sheave groove gauge and template for the sheave diameter. Insert the gauge to check sheave grooves for wear.



Check sheaves for rust and wear. Wipe clean of oil and grease.

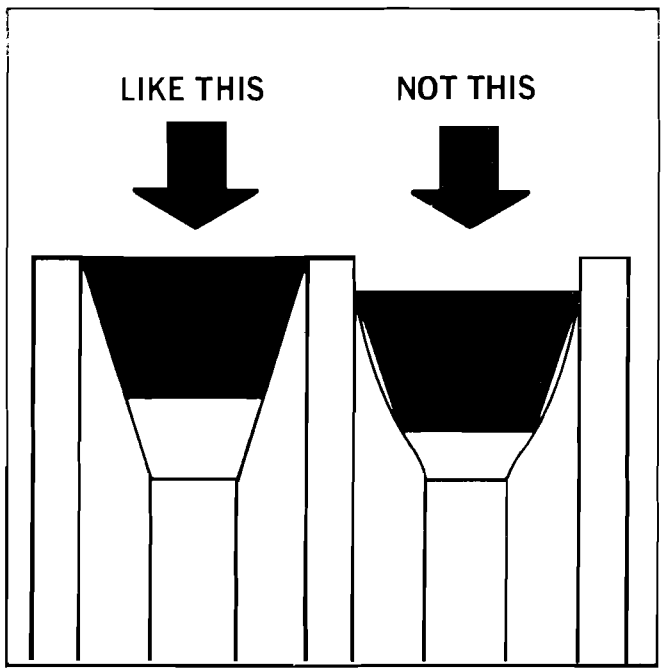
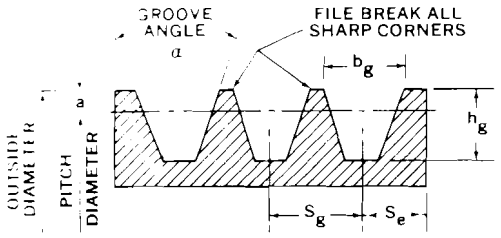


Fig. 2

Sheave grooves must be correct

Industry Standard Groove Dimensions for V-belt Sheaves



Face Width of Standard and Deep Groove Sheaves

$$\text{Face Width} = S_g(N_g - 1) + 2S_e$$

Where:

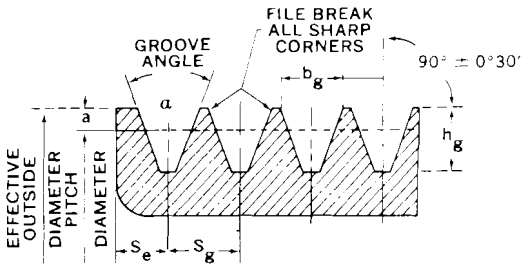
N_g = Number of Grooves

Standard Groove Dimensions

TABLE—1

Pitch Diameter			Groove Angle	Standard Groove Dimensions				
Cross Section	Min. Recommended inches	Range inches	α ±0°20′	*bg inches	hg ±.031 inches	a inches	**Sg ±.031 inches	Se inches
A	3.0	2.6 to 5.4 Over 5.4	34 38	.494 .504 } ±.005	0.490	.125	0.625	0.375 +.070 −.000
B	5.4	4.6 to 7.0 Over 7.0	34 38	.637 .650 } ±.005	0.580	.175	0.750	0.500 +.150 −.000
C	9.0	7.0 to 7.99 8.0 to 12.0 Over 12.0	34 36 38	.879 .887 .895 } ±.007	0.780	.200	1.000	.0.688 +.150 −.000
D	13.0	12.0 to 12.99 13.0 to 17.0 Over 17.0	34 36 38	1.259 1.271 1.283 } ±.007	1.050	.300	1.438	0.875 +.250 −.000
E	21.0	18.0 to 24.0 Over 24.0	36 38	1.527 1.542 } ±.010	1.300	.400	1.750	1.125 +.250 −.000

Industry Standard Groove Dimensions for Hy-T Wedge Belt Sheaves



Face Width of Standard and Deep Groove Sheaves

$$\text{Face Width} = S_g(N_g - 1) + 2S_e$$

Where:

N_g = Number of Grooves

Table 2

	STANDARD GROOVE OUTSIDE DIAMETER (in.)		α	STANDARD GROOVE DIMENSIONS (Inches)					DEEP GROOVE OUTSIDE DIAMETER (In.)		DEEP GROOVE DIMENSIONS (Inches)				
V-Belt Section	Min. Recom.	Range	Groove Angle +0°20′	bg ±0.005	hg +0.010 −0.000	a	Sg ±0.015	Se	Min. Recom.	Range	bg ±0.005	hg +0.010 −0.000	a	Sg* ±0.015	Se
3V	2.65	Less than 3.50 3.50 to 6.00 6.01 to 12.00 Over 12.00	36° 38° 40° 42°	0.350	0.350	.025	0.406	+0.094 0.344 −0.000	2.87	Less than 3.72 3.72 to 6.22 6.23 to 12.22 Over 12.22	0.421 0.425 0.429 0.434	0.459	.134	0.500	+0.094 0.375—0.000
5V	7.10	Less than 10.00 10.00 to 16.00 Over 16.00	38° 40° 42°	0.600	0.600	.050	0.688	+0.125 0.500 −0.000	7.42	Less than 10.32 10.32 to 16.32 Over 16.32	0.710 0.716 0.723	0.760	.210	0.812	+0.125 0.562—0.000
8V	12.50	Less than 16.00 16.00 to 22.40 Over 22.40	38° 40° 42°	1.000	1.000	.100	1.125	+0.250 0.750 −0.000	13.02	Less than 16.52 16.52 to 22.92 Over 22.92	1.180 1.190 1.200	1.261	.361	1.312	+0.250 0.844—0.000

2. MOUNTING SHEAVES

THE QD HUB

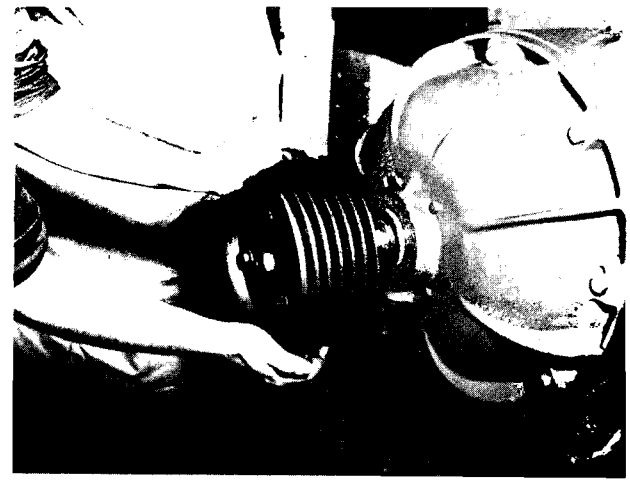
Conventional Mount

The Conventional Mounting position for all "QD" Sheaves is with the Hub flange located toward the bearing. Loosely assemble the QD Hub in the rim insert the pull-up bolts (finger tight). Slip the loosely assembled unit, flanged end first, and align it in the desired position on the shaft.

Tighten the hollow head setscrew in the flange down on the key only snug enough to keep it in the desired position on the shaft.

Tighten each pull-up bolt alternately and evenly.

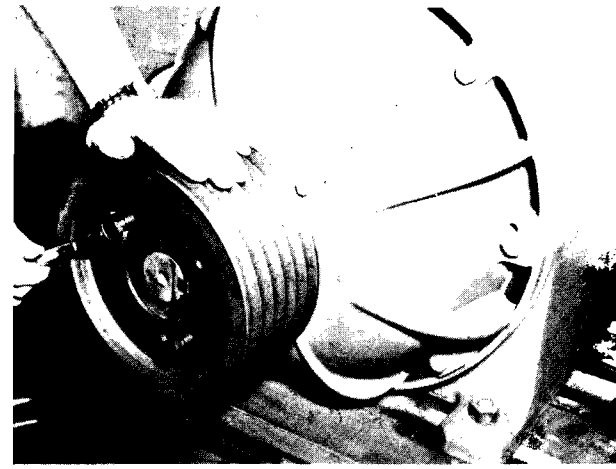
Finally, tighten the setscrew down tight on the key to hold it securely in place when driving.



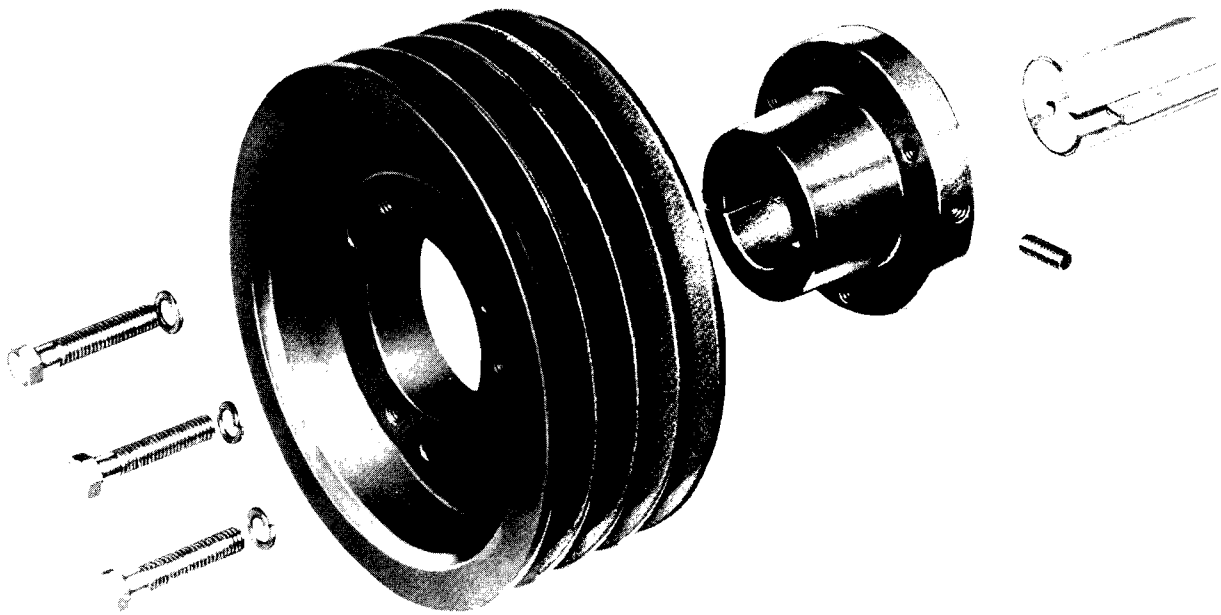
Conventional mount

Removal

Place two or three of the pull-up bolts in the tapped holes in the sheave. As you draw up on the bolts they act as jack screws against flange of QD hub to break the cone grip between hub and rim.

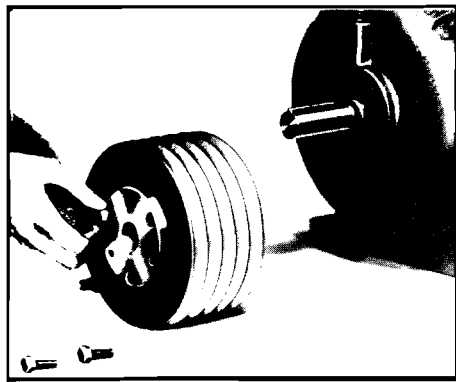


Easy off

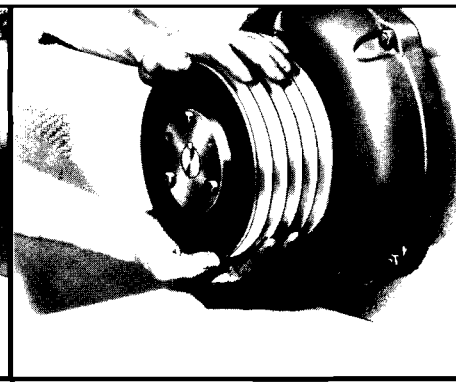


THE SPLIT TAPER BUSHING

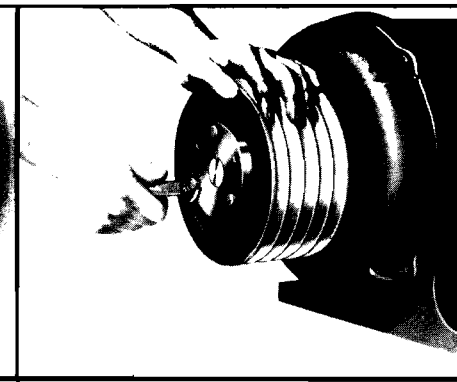
How To Mount Split Taper Bushing Sheaves



1. Put bushing loosely in sheave and start capscrews.

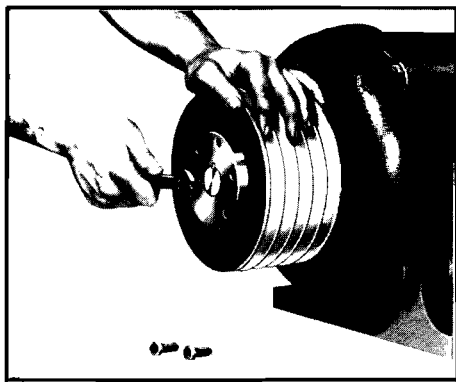


2. Place sheave on shaft and line up drive along edge of both sheaves.

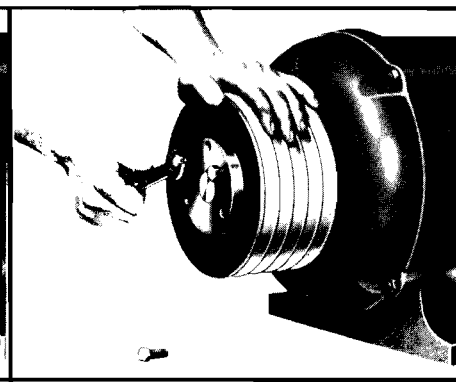


3. Tighten capscrews per instructions furnished with bushings.

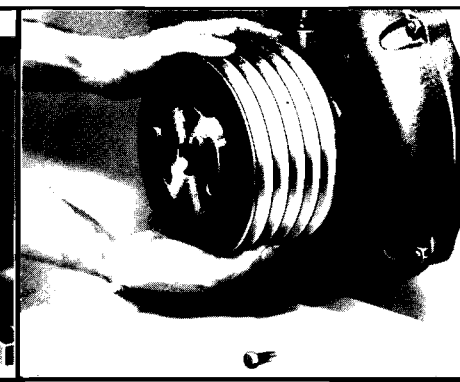
How To Remove Split Taper Bushing Sheaves



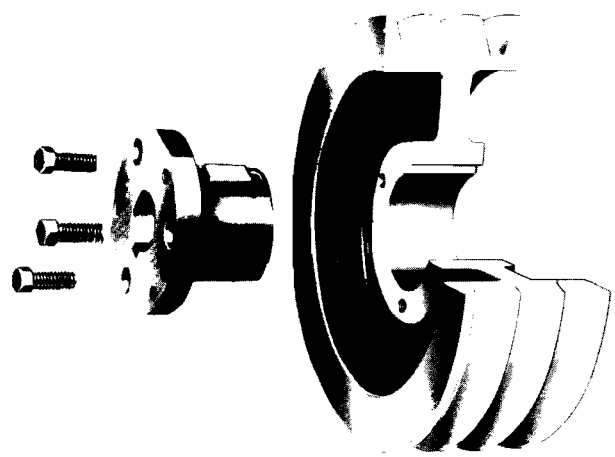
1. Remove capscrews.



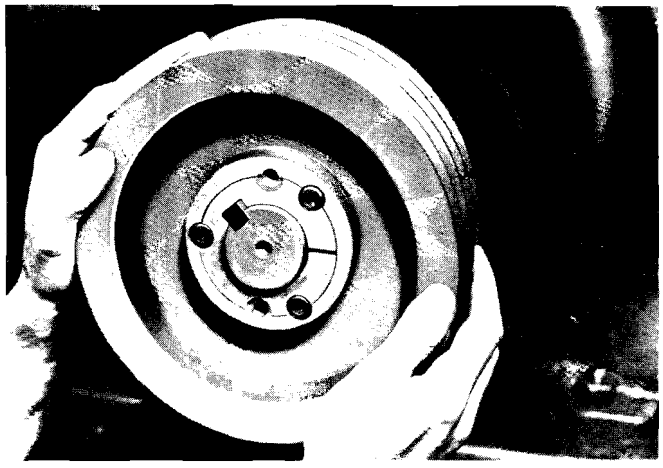
2. Put two capscrews in push-off holes in flange. Tighten until sheave has loosened.

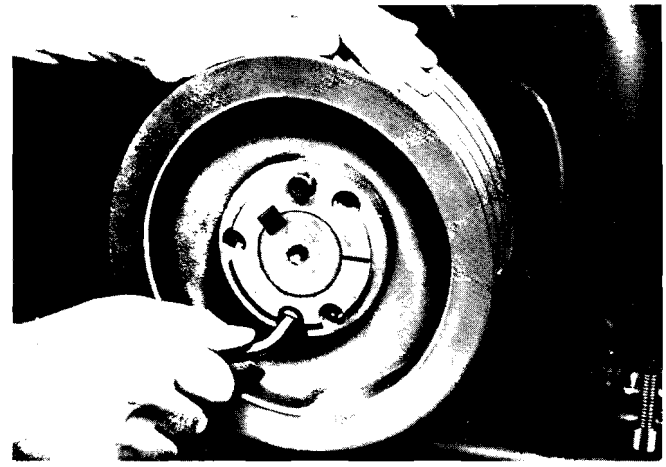


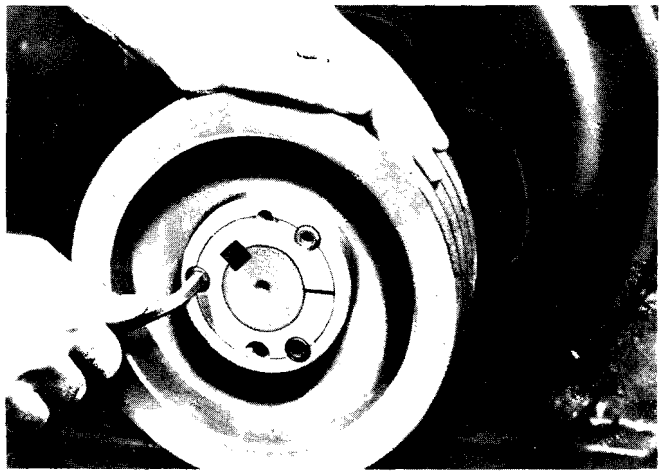
3. Remove sheave from shaft.



THE TAPER-LOCK® BUSHING





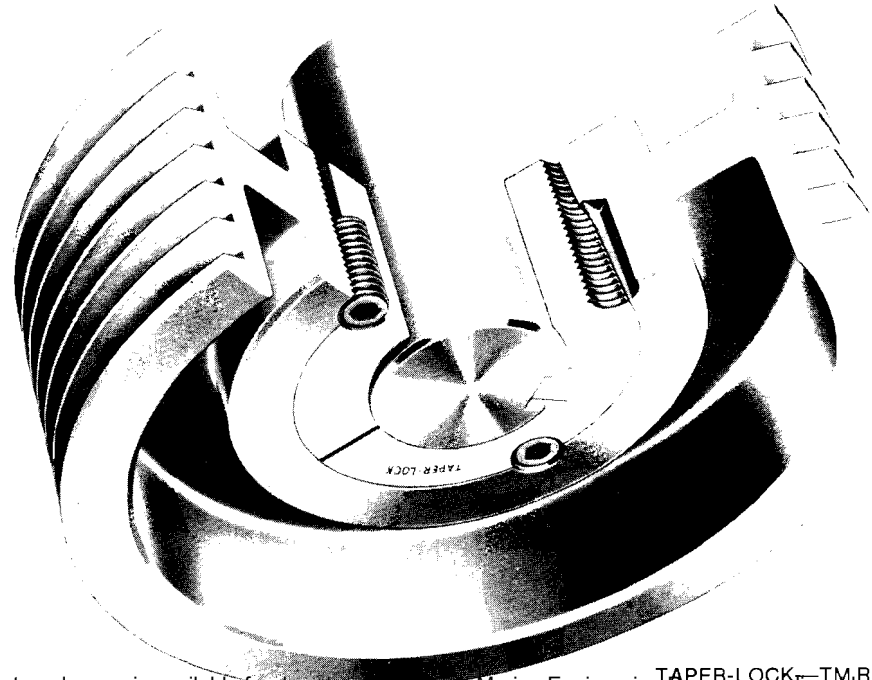


MOUNTING

Insert bushing in hub. Match holes (not threads) and slip entire unit onto shaft. Put screws into the holes that are threaded in hub only. Align the product and tighten screws. As bushing is wedged inward it contracts—evenly—and grips the shaft.

REMOVAL

Take the screws out entirely. Insert one of them into the hole which is threaded in the bushing. Use as jack-screw. This disengages the bushing. Its grip is "unlocked," permitting quick, easy removal of product with no shock to bearings or machinery.



3. CHECKING ALIGNMENT

[illegible] alignment is essential to maintain long V-belt [illegible] life.

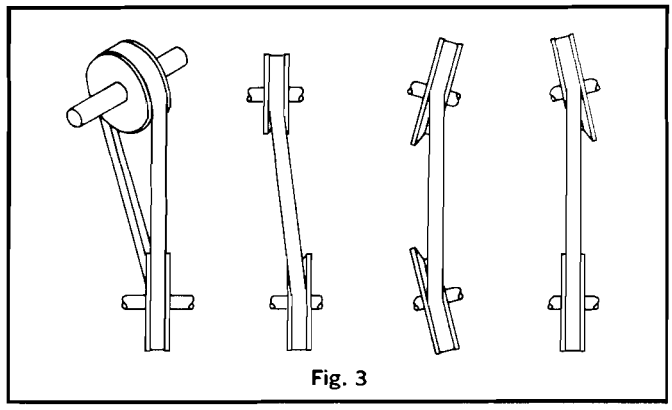


Fig. 3

NOT THIS WAY!

THIS WAY

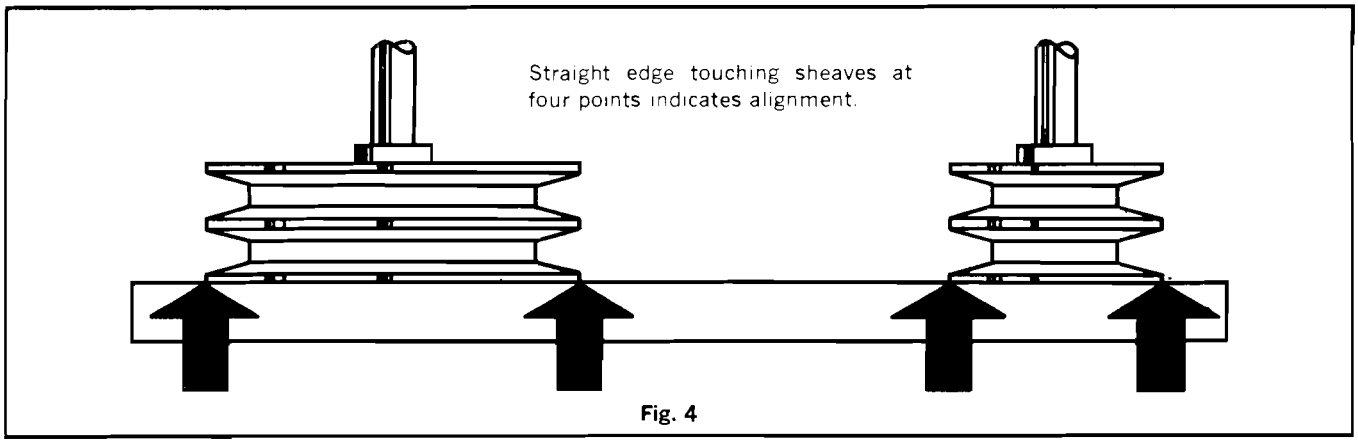


Fig. 4

4. SELECTING BELTS

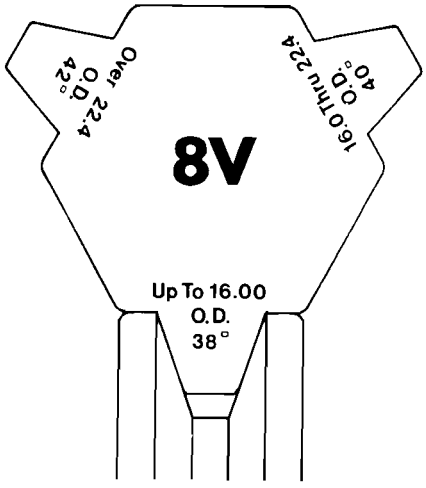


Fig. 5

Sheave groove gauge

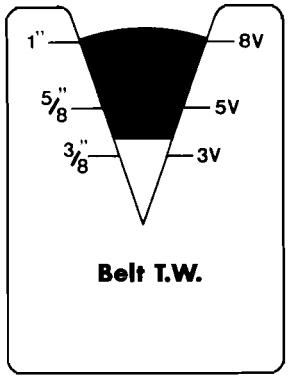


Fig. 6

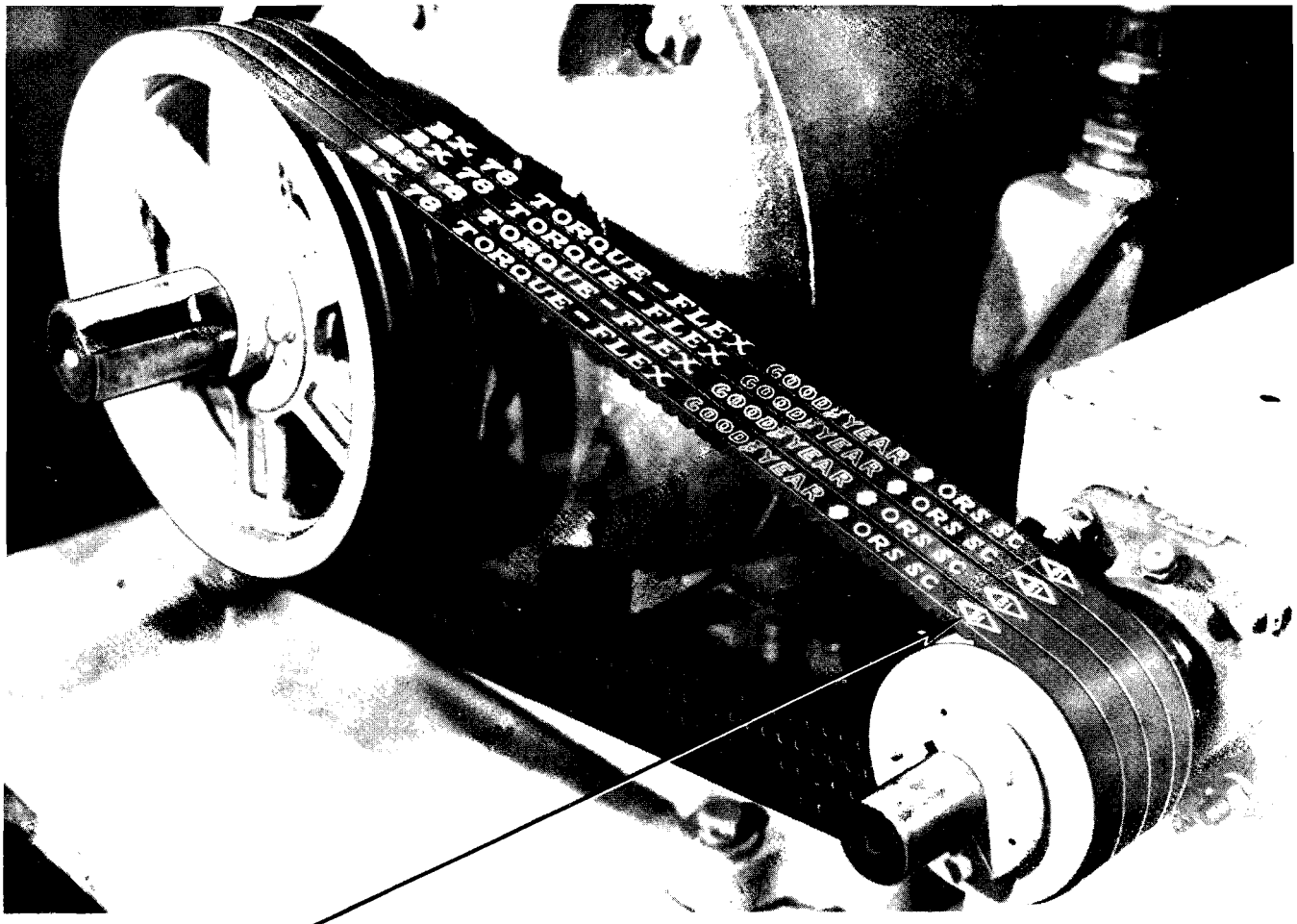
Belt gauge

Always select belts to match sheave groove as in the example above: 8V sheave gauge fits the sheave, use 8V belts.

If the drive requires "A", "B", or "C" section belts, select the grade of belt such as Hy-T, Compass-V-Steel, or the premium Torque-Flex belt. If short life is experienced with standard belts, a higher grade of belt will increase service.

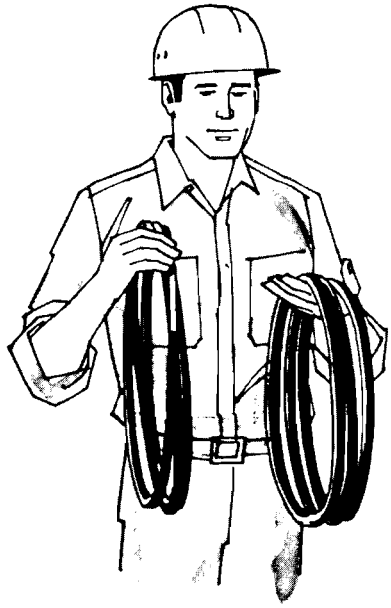
Torque-Team belts (joined belts)—a two belt team will provide the benefits of the joined principal as well as a wider team. A matched set of two- and three-belt teams will provide equal service to a five-belt team, etc. Sheave wear is very important in the life of any V-belt drive, but in the case of Torque-Team, it is critical. Worn sheaves will destroy joined belts very quickly.

5. MATCHING OF BELTS



51 All belts should have the same length code number.

Don't Mix Belt Brands



Belt brands should not be mixed due to the difference in performance characteristics.

Don't Mix New and Used Belts

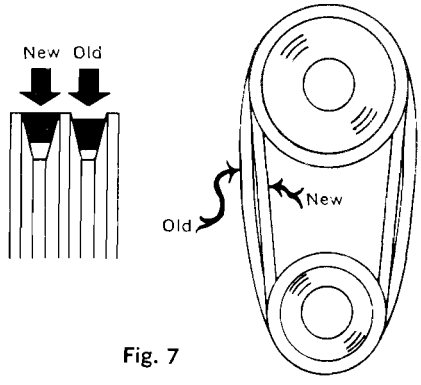
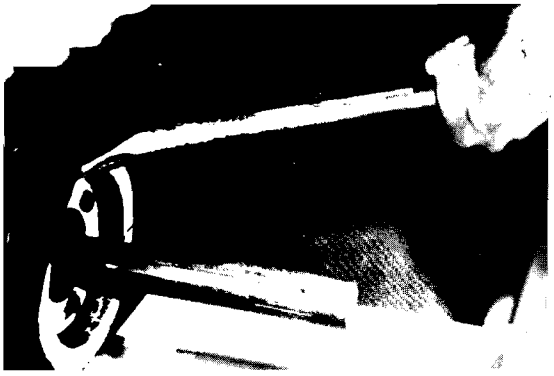


Fig. 7

The new belts will be overloaded

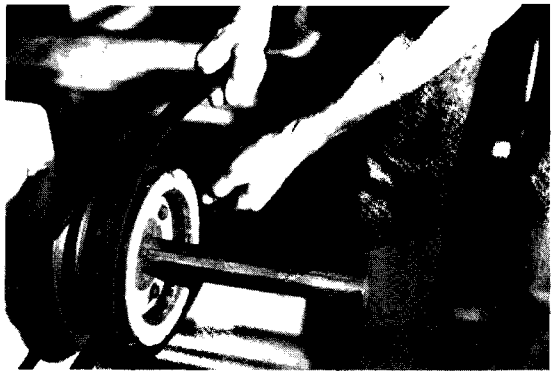
Always replace V-belt drives with a complete new set of belts. Never install a new or used belt as a replacement for a unit of a matched set or you will substantially reduce drive life.

6. INSTALLING BELTS



WRONG

Never force the belts into a sheave with a screwdriver or wedge because you will rupture the envelope fabric and break the cords.



RIGHT

Always move the driver unit forward so the belts can easily be slipped into the sheave grooves without damage to the belts.

Center Distance Allowances for Belt Installation and Take-Up

After calculating the center distance based on the standard pitch length of the belt, make sure that the center distance can be moved closer together by the minimum installation allowance figure shown in Table 3 to insure the belts can be installed without damage. The center distance should also be adjustable to allow for the minimum take-up allowance shown in the last column of Table 3 to allow for manufacturing tolerance and belt stretch.

Table 3

Standard Length* Designation	Minimum Allowance Below Standard Center Distance for Installation of Belts (Inches)										Minimum Allowance Above Standard Center Distance for Maintaining Tension (Inches) All Sections
	A	A Torque Team	B	B Torque Team	C	C Torque Team	D	D Torque Team	E	E Torque Team	
26 to 38	0.75	1.20	1.00	1.50							1.00
38 to 60	0.75	1.20	1.00	1.50	1.50	2.00					1.50
60 to 90	0.75	1.30	1.25	1.60	1.50	2.00					2.00
90 to 120	1.00	1.30	1.25	1.60	1.50	2.00					2.50
120 to 158	1.00	1.50	1.25	1.80	1.50	2.10	2.00	2.90			3.00
158 to 195			1.25	1.80	2.00	2.20	2.00	3.00	2.50	3.40	3.50
195 to 240			1.50	1.90	2.00	2.30	2.00	3.20	2.50	3.50	4.00
240 to 270			1.50	2.00	2.00	2.50	2.50	3.20	2.50	3.60	4.50
270 to 330			1.50	2.20	2.00	2.50	2.50	3.50	3.00	3.90	5.00
330 to 420					2.00	2.70	2.50	3.60	3.00	4.00	6.00
420 and over					2.50	2.90	3.00	4.10	3.50	4.40	1.5% of belt length

*In each group the range is to, but not including, the second length.
All dimensions in inches.

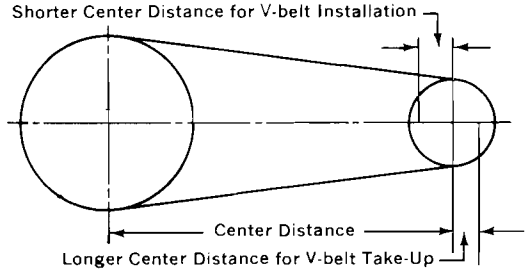
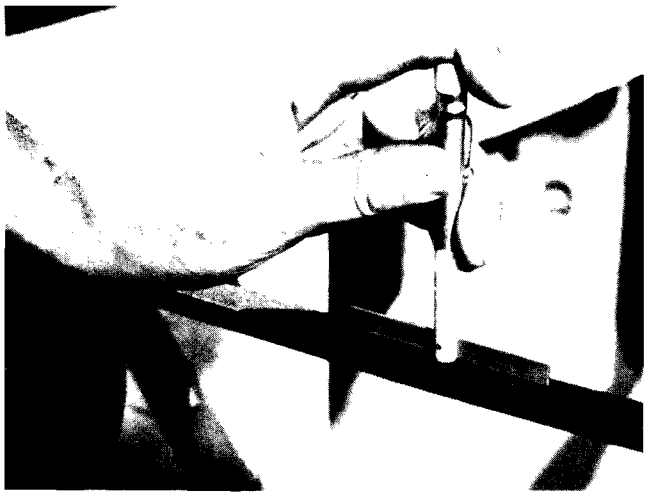


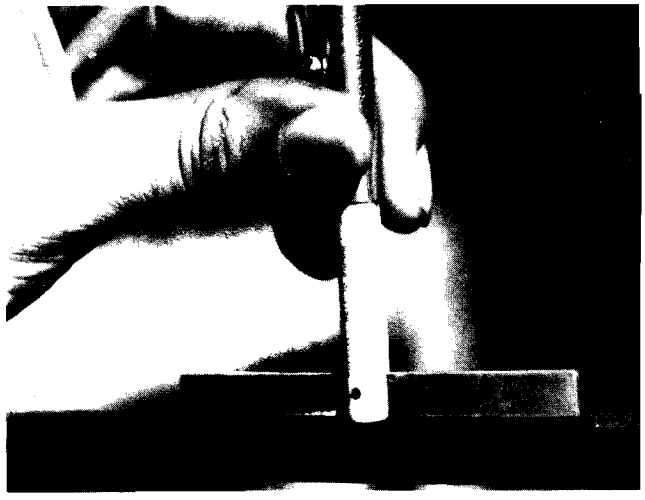
Table 4 — Hy-T Wedge V-belts

Standard Length Designation	Minimum Allowance Below Standard Center Distance For Installation Of Belts, Inches						Minimum Allowance Above Standard Center Distance For Maintaining Tension, Inches All Cross Sections
	3V	3V Torque-Team	5V	5V Torque-Team	8V	8V Torque-Team	
Up To and Incl. 475	0.5	1.2					1.0
Over 475 To and Incl. 710	0.8	1.4	1.0	2.1			1.2
Over 710 To and Incl. 1060	0.8	1.4	1.0	2.1	1.5	3.4	1.5
Over 1060 To and Incl. 1250	0.8	1.4	1.0	2.1	1.5	3.4	1.8
Over 1250 To and Incl. 1700	0.8	1.4	1.0	2.1	1.5	3.4	2.2
Over 1700 To and Incl. 2000			1.0	2.1	1.8	3.6	2.5
Over 2000 To and Incl. 2360			1.2	2.4	1.8	3.6	3.0
Over 2360 To and Incl. 2650			1.2	2.4	1.8	3.6	3.2
Over 2650 To and Incl. 3000			1.2	2.4	1.8	3.6	3.5
Over 3000 To and Incl. 3550			1.2	2.4	2.0	4.0	4.0
Over 3550 To and Incl. 3750					2.0	4.0	4.5
Over 3750 To and Incl. 5000					2.0	4.0	5.5

7. TENSIONING BELTS



Check the tension on a newly installed V-belt drive



A tension tester is a quick and convenient means of establishing tensioning value

General Common Sense Rules of Tensioning:

a. Ideal tension is the lowest tension at which the belt will not slip under peak load conditions.

b. Check tension frequently during the first 24-48 hours of run-in operation.

c. Over tensioning shortens belt and bearing life.

d. Keep belts free from foreign material which may cause slip.

e. Make V-drive inspection on a periodic basis. Tension when slipping.

f. Maintain sheave alignment while tensioning the drive. (See picture, page 10.)

If you want to check the tension in a conventional V-belt drive, use the procedure below:

a. Measure the span length, t.

b. At the center of the span (t) apply a force (perpendicular to the span) large enough to deflect the belt 1/64" for every inch of span length. For example, the deflection of a 100 inch span would be 100/64 or 1 9/16 inches.

c. Compare the force you have applied with the values given in Tables 5 and 6. If the force is between the values for normal tension and 1½ times normal tension, the drive tension should be satisfactory. A force below the value for normal tension indicates an undertensioned drive. If the force exceeds the value for 1½ times normal tension, the drive is tighter than it needs to be. A new drive can be tightened initially to two times normal tension to allow for the normal drop in tension during run-in.

Table 5 — Belt Deflection Force (Pounds)

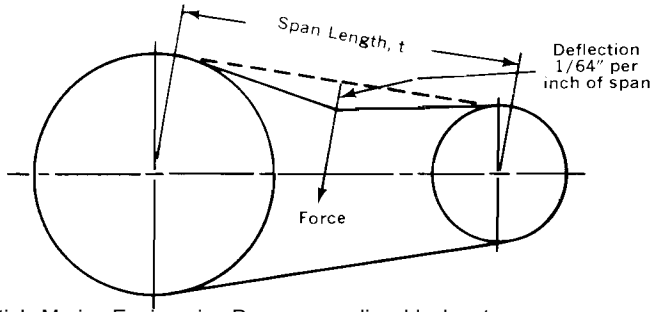
Based on operating speeds of 1000-3000 feet per minute. For belt speeds in excess of 3000 feet per minute, reduce the deflection forces by 20%. (Check factory for operating speeds less than 1000 F.P.M.)

		CVS		HY-T		TORQUE-FLEX	
Cross Section	Small Diameter Range	Pounds Force For Normal Horsepower	Pounds Force For 1½ Times Normal Horsepower	Pounds Force For Normal Horsepower	Pounds Force For 1½ Times Normal Horsepower	Pounds Force For Normal Horsepower	Pounds Force For 1½ Times Normal Horsepower
A	3.0— 3.6	3.2	4.5	3.6	5.2	5.0	7.0
A	3.8— 4.8	3.8	5.2	4.3	6.2	5.9	8.4
A	5.0— 7.0	4.4	6.0	5.0	7.2	6.7	9.6
B	3.4— 4.2	4.6	6.1	4.9	6.9	7.1	10.1
B	4.4— 5.6	5.8	8.0	6.5	9.3	7.7	11.0
B	5.8— 8.6	7.1	10.0	8.2	11.8	9.6	13.8
C	7.0— 9.0	11.5	15.4	15.5	22.1	16.9	23.6
C	9.5—16.0	14.4	20.0	16.9	24.3	18.8	27.4
D	12.0—16.0	24.4	33.9	28.1	40.9		
D	18.0—27.0	29.5	41.8	34.7	50.4		
E	20.0—32.0						

Table 6 — Hy-T Wedge V-belts

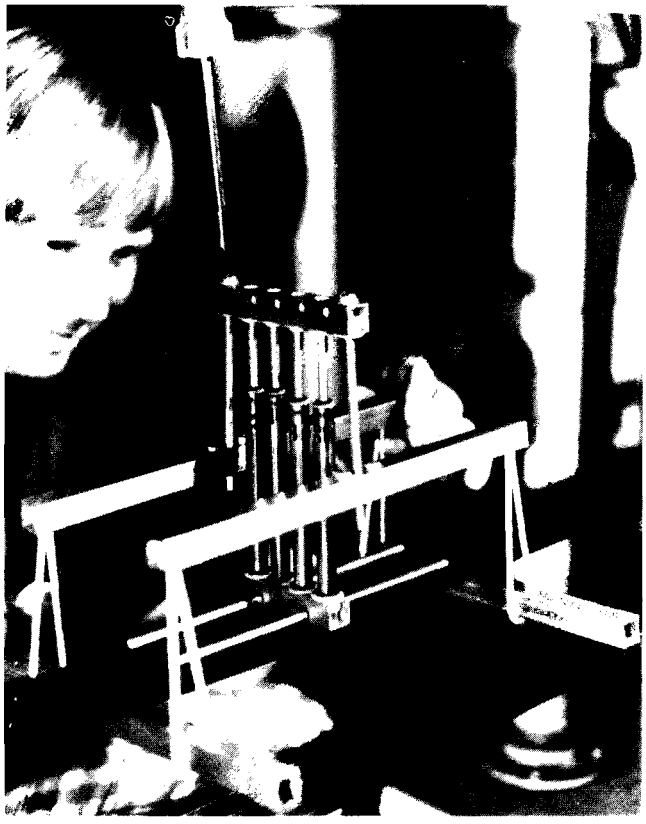
Belt Deflection Force (Pounds)

Cross Section	Small Diameter Range	For Normal Tension	For 1½ Times Normal Tension
3V	2.65 to 3.65	4.1	5.9
3V	4.12 to 6.90	6.7	8.3
5V	7.1 to 10.9	14.3	21.1
5V	11.8 to 16.0	17.0	25.2
8V	12.5 to 17.0	34.6	51.0
8V	18.0 to 22.4	39.4	58.1



7. TENSIONING BELTS (Cont.)

Torque-Team Belt Tensioning

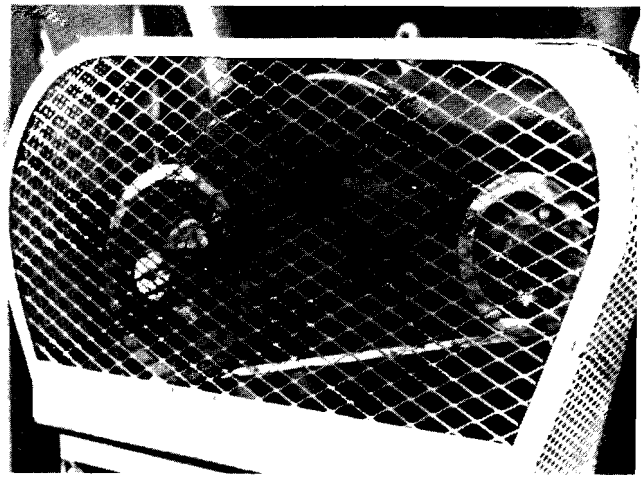


A multiple gauge tensioning device is recommended to establish the proper tension on Torque-Team belts.

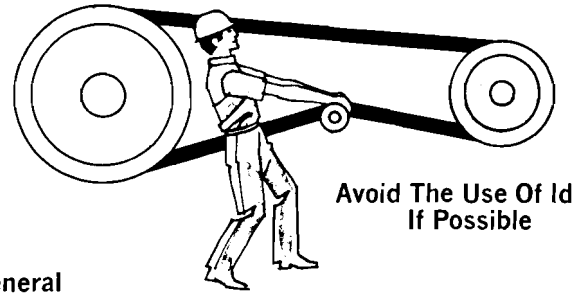
Double-check sheaves with steel straight edge for proper alignment after tensioning the drive.

8. BELT GUARDS

Guards for drives insure safety and cleanliness. Screened, meshed or grilled belt guards are the most satisfactory because they allow air to circulate and heat to escape.



9. IDLERS

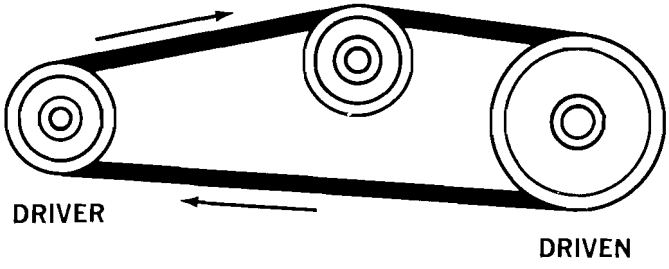


General

A properly designed multiple V-belt drive will not require an idler to deliver fully rated horsepower if proper tension can be maintained. Idlers always put an additional bending stress point on the belt which reduces the belt horsepower rating and reduces belt life. The smaller the idler, the greater the reduction in belt life due to the increased bending stresses.

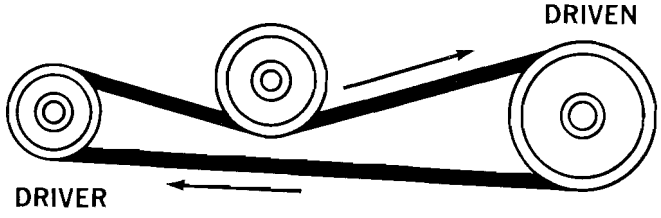
Inside Idler

A V-grooved idler located on the inside of the belts on the slack side of the drive is recommended over a back side idler. The idler should be located near the large sheave to avoid reduction of the arc of contact with the small sheave. The size of the V-idler pulley should be equal to or preferably greater than the diameter of the small sheave.



Back Side Idler

A back side idler increases the arc of contact on both sheaves, however, it forces a backward bend in the V-belt that contributes to premature failure. The idler puts additional stresses in the bottom portion of the belt which will result in bottom cracking. If a back side idler is used, the diameter of the flat idler pulley should be at least 1½ times the diameter of the small sheave and located as close as possible to the small sheave.

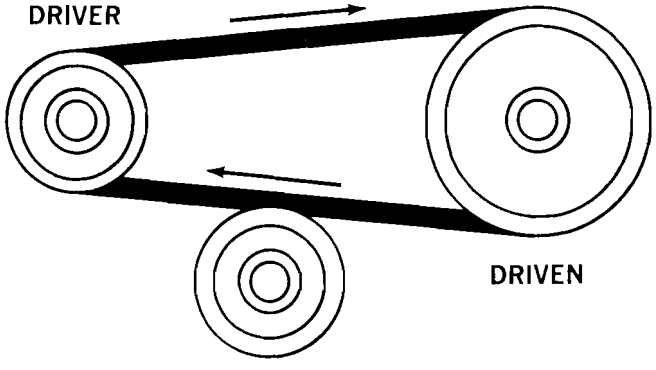


Kiss Idler

A kiss idler differs from the back side idler because it does not penetrate the belt span creating a back bend on the belt and consequently does not contribute to premature failure of the belt.

The useage of kiss idlers is not too common, however it provides a method of controlling belt vibration and whip on shock and pulsating load drives. The kiss idler could be used in single belt drives where joined belts are not applicable.

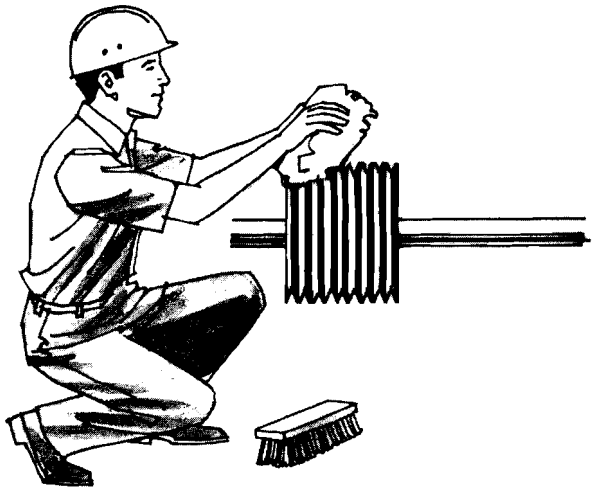
If a kiss idler is used, the diameter of the flat pulley should be at least 1½ times the diameter of the small sheave.



POLY-V® BELTS

1. INSPECT SHEAVES

Worn sheaves can reduce belt life substantially. If the grooves are worn, the sheave points will cut the belt. If the side walls are "dished out," slippage may result and burn the belt.



Check sheaves for rust and wear. Wipe clean of oil and grease.

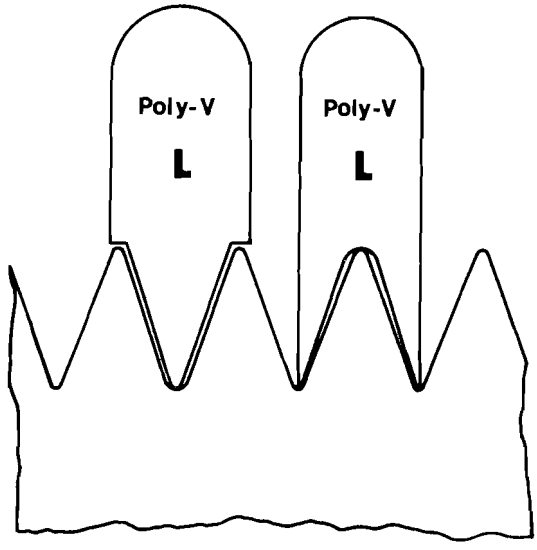
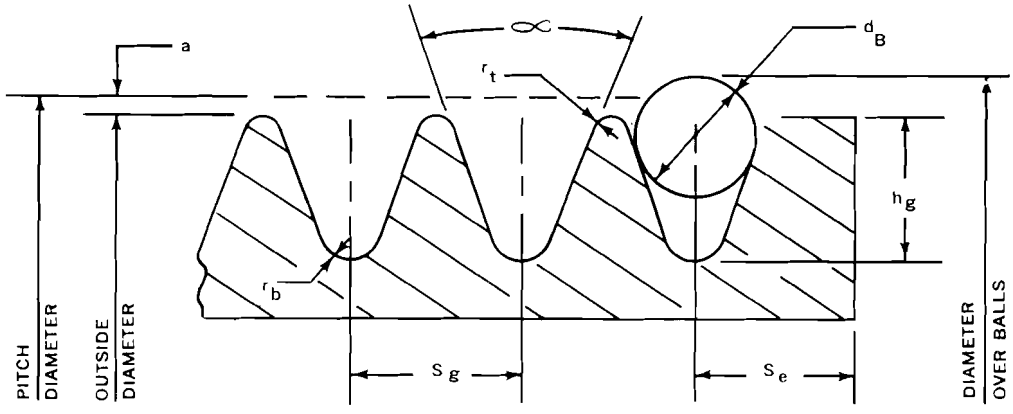


Fig. 8

Check sheave groove with Poly-V groove gauge.

Table 7

Industry Poly-V Sheave Groove Dimensions and Tolerances



Cross Section	Minimum Recommended Outside Diameter inches	Groove Angle ∝ ±0.25 degrees	S_g* inches	r_t +0.005 −0.000 inches	a inches	r_b inches	h_g Minimum inches	d_B ±0.0005 inches	S_e inches
H	0.50	40°	0.063 ±0.001	0.005	0.010	0.013 +0.000 −0.005	0.041	0.0469	0.080 +0.020 −0.010
J	0.80	40°	0.092 ±0.001	0.008	0.015	0.015 +0.000 −0.005	0.071	0.0625	0.125 +0.030 −0.015
K	1.50	40°	0.140 ±0.002	0.010	0.019	0.020 +0.000 −0.005	0.122	0.1093	0.125 +0.050 −0.000
L	3.00	40°	0.185 ±0.002	0.015	0.029	0.015 +0.000 −0.005	0.183	0.1406	0.375 +0.075 −0.030
M	7.00	40°	0.370 ±0.003	0.030	0.058	0.030 +0.000 −0.010	0.377	0.2812	0.500 +0.100 −0.040

*Summation of the deviations from "Sg" for all grooves in any one sheave shall not exceed ±0.010.

2. MOUNTING SHEAVES

Poly-V belt sheaves are installed and removed in the same manner as conventional V-belt sheaves. Follow the same procedures as outlined on pages 3, 4 and 5 in this manual and as recommended by the sheave manufacturer.

3. CHECKING ALIGNMENT

Proper alignment is more critical for Poly-V sheaves than for conventional V-belt drives. Basically, the alignment checking procedures for Poly-V belts are the same as for V-belts which are outlined on page 6 of this manual.

4. SELECTING BELTS

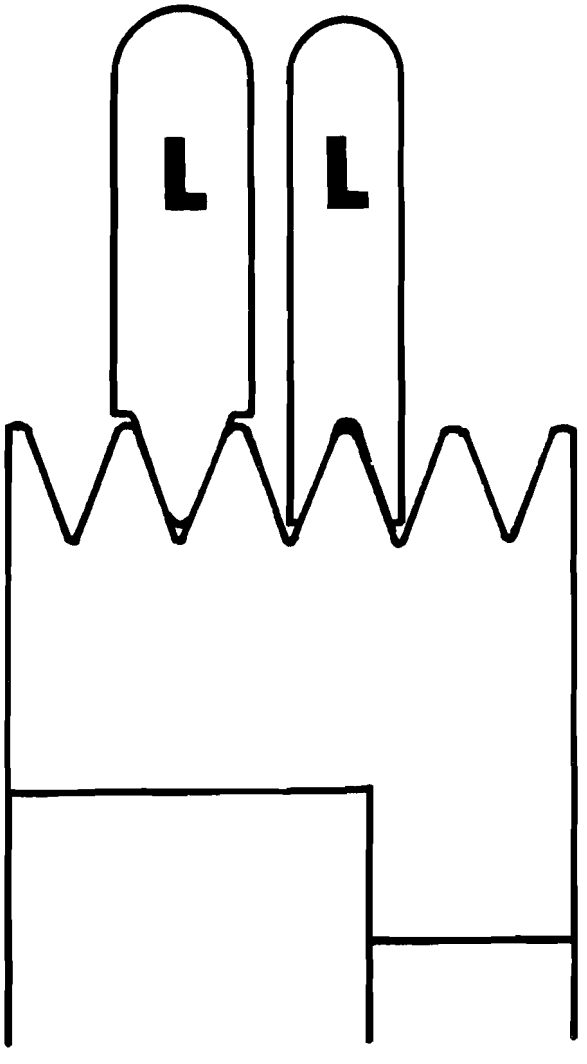


Fig. 9
Sheave groove gauge

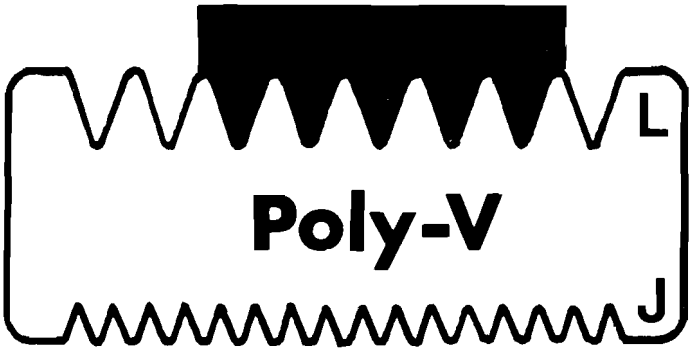
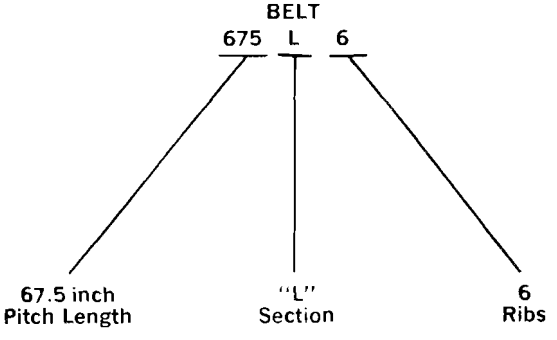
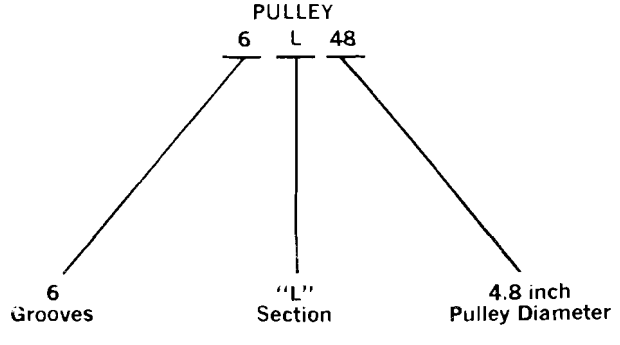


Fig. 10
Belt gauge

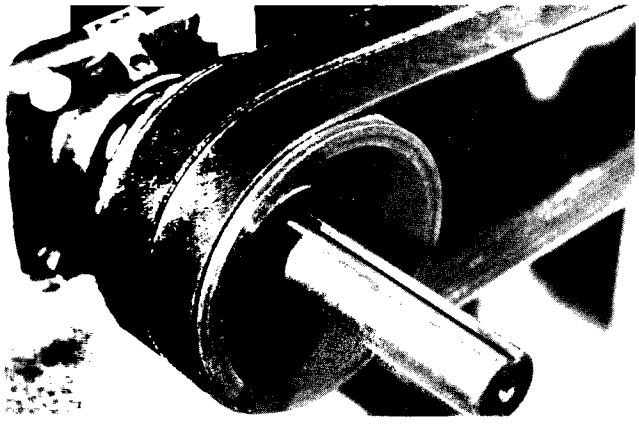
Select belts to match sheave as in the example above: "L" section sheave gauge fits pulley, so use "L" belts.

SIZE NOMENCLATURE





5. MATCHING BELTS

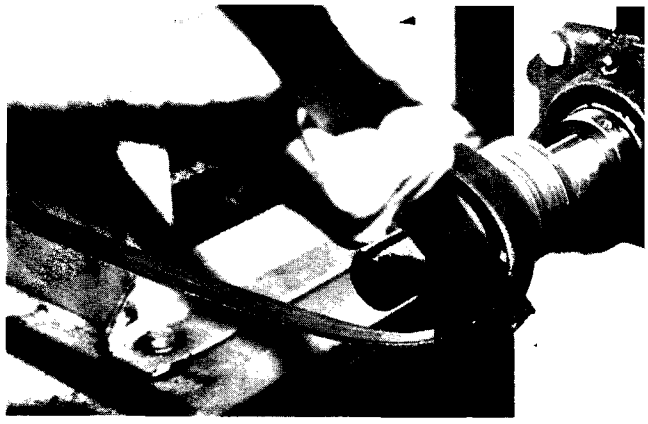


Note: leave one sheave groove open to eliminate possible intereference between belts.

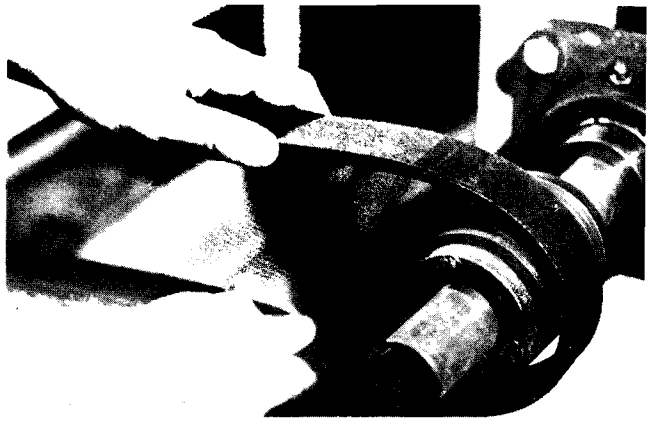
Matching

Matching is not required for most Poly-V belt drives. However, if you have a special application where matching is required, specify "matched belts" on the order and allow sufficient lead time. Matching code numbers will not appear on the belts.

6. INSTALLING BELTS



WRONG
Never force the belts onto a sheave with a screwdriver or wedge because you will rupture the fabric and break the cords.



RIGHT
Always move the driver unit forward so the belts can easily be slipped into the sheave grooves without damage to the belts.

Table 7 — Poly-V Belt Recommended Installation and Take-Up Allowances

Standard Effective Length, Inches	Minimum Allowance Below Standard Center Distance for Installation of Belts, inches			Minimum Allowance Above Standard Center Distance for Maintaining Tension, inches All Cross Sections
	J	L	M	
Up To and Incl. 20.0	0.4			0.3
Over 20.0 To and Incl. 40.0	0.5			0.5
Over 40.0 To and Incl. 60.0	0.6	0.9		0.7
Over 60.0 To and Incl. 80.0	0.6	0.9		0.9
Over 80.0 To and Incl. 100.0	0.7	1.0	1.5	1.1
Over 100.0 To and Incl. 120.0	0.8	1.1	1.6	1.3
Over 120.0 To and Incl. 160.0		1.2	1.7	1.7
Over 160.0 To and Incl. 200.0		1.3	1.8	2.2
Over 200.0 To and Incl. 240.0		1.4	1.9	2.6
Over 240.0 To and Incl. 300.0			2.2	3.3
Over 300.0 To and Incl. 360.0			2.3	3.9
Over 360.0 To and Incl. 420.0			2.6	4.6
Over 420.0 To and Incl. 480.0			2.9	5.2
Over 480.0 To and Incl. 540.0			3.2	5.8
Over 540.0 To and Incl. 600.0			3.6	6.5

7. TENSIONING BELTS

A tension tester is a quick and convenient means of establishing tensional value. Refer to page 10 tensioning of Torque-Team belts for procedure and illustration of tensioning devices.

Installation Tensioning

Hy-T Poly-V drives will be properly tensioned if the deflection force "F" is applied mid-way between the belt's tangent points with the pulley, as shown in Fig. 11, and is used to deflect the belt. The deflection should be equal to .015" per inch of unsupported belt span. The force "F" should be the value shown in the following table.

To improve tensioning accuracy, the drive should be run briefly to properly seat the belt. At least one sheave should be freely rotating during the tensioning procedure.

Table 8 — Belt Deflection Force

Belt Cross Section	Small Sheave Diameter Range	Force "F" lbs. per rib
J	1.32 — 1.67	0.4
J	1.77 — 2.20	0.5
J	2.36 — 2.95	0.6
L	2.95 — 3.74	1.7
L	3.94 — 4.92	2.1
L	5.20 — 6.69	2.5
M	7.09 — 8.82	6.4
M	9.29 — 11.81	7.7
M	12.40 — 15.75	8.8

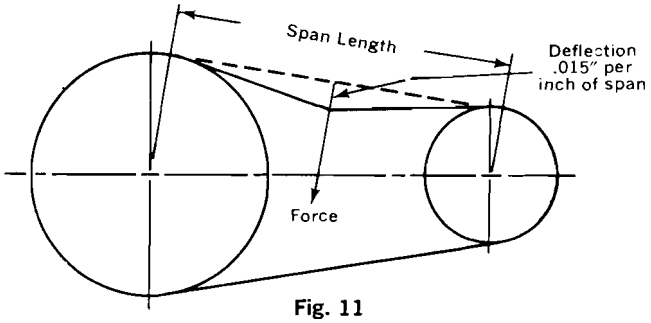


Fig. 11

Minimum Sheave Diameters

If the driver is a Standard Electric Motor, refer to Table 9 to be sure that the sheave diameter selected will meet the National Electrical Manufacturers Association Standard for minimum sheave diameters for electric motors 0.75 HP and larger. If the motor sheave is SMALLER than the minimum diameter shown in this table, increase the sheave diameter so that the motor-sheave will conform with the chart **unless either an oversize or an outboard bearing is installed.**

Table 9

MINIMUM RECOMMENDED SMALL SHEAVE DIAMETERS FOR ELECTRIC MOTORS (FOR POLY-V & V-BELT DRIVES)

Motor Nameplate Horsepower	STANDARD MOTOR R.P.M.					
	3450	1750	1160	870	675	575
	Small Sheave Diameters—Inches					
.12 or less	1.25	1.25	1.50			
.25	1.25	1.25	1.50			
.33	1.50	1.50	2.00			
.50	2.00	2.00	2.50			
.75	2.25	2.25	2.50	3.00	3.00	3.00
1	2.25	2.25	2.50	3.00	3.00	3.00
1.5	2.25	2.50	2.50	3.00	3.00	3.00
2	2.50	2.50	2.50	3.00	3.00	3.75
3	2.50	2.50	3.00	3.00	3.75	4.50
5	2.50	3.00	3.00	3.75	4.50	4.50
7.5	3.00	3.00	3.75	4.50	4.50	5.25
10	3.00	3.75	4.50	4.50	5.25	6.00
15	3.75	4.50	4.50	5.25	6.00	6.75
20	4.50	4.50	5.25	6.00	6.75	8.25
25	4.50	4.50	6.00	6.75	8.25	9.00
30		5.25	6.75	6.75	9.00	10.00
40		6.00	6.75	8.25	10.00	10.00
50		7.00	8.38	9.00	10.00	11.00
60		7.63	9.00	10.00	11.00	12.00
75		9.00	10.00	10.00	13.00	14.00
100		10.00	13.00	13.00	15.00	18.00
125		11.00	13.00	15.00	18.00	20.00
150			13.00	18.00	20.00	22.00
200				22.00	22.00	22.00
250					22.00	22.00
300					27.00	27.00

8. BELT GUARDS

Guards for drives insure safety and cleanliness. Screened, meshed or grilled belt guards are the most satisfactory because they allow air to circulate and heat to escape. See page 11.

9. IDLERS

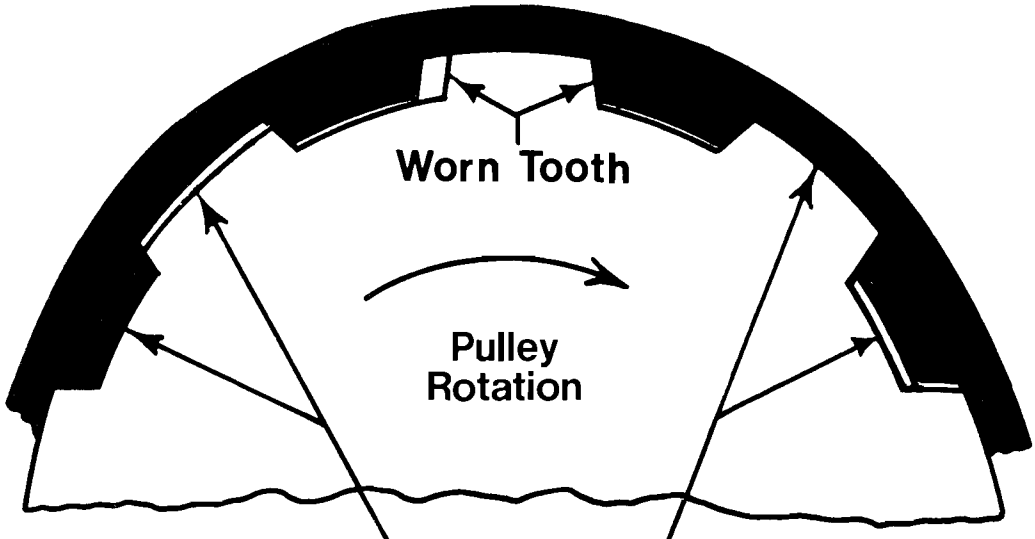
Idlers are not recommended and should only be used when necessary. However, usage of idlers is not as detrimental to Poly-V belt operation as it is for conventional V-belts.

POSITIVE DRIVE

1. INSPECT PULLEYS

Check pulleys for rust and wear and wipe clean of oil and grease.

Typical Positive Drive Pulley Groove Profiles



Worn Outside Diameter Belt Bottoms — Correct Fit

Fig. 12

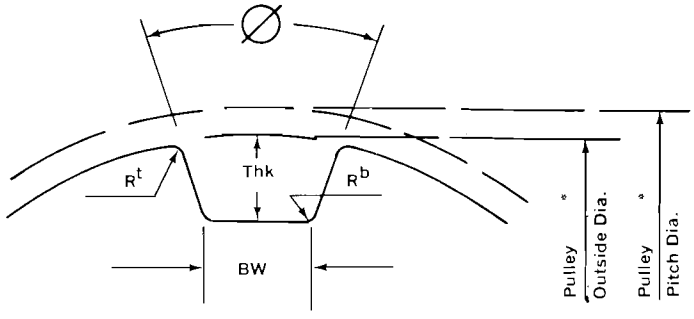


Table 10

Stock Belt Pitches	Approx. Pitch	Belt Tooth Profile	BW	Thk	∅	Rb	Rt
	.187	F	$.068^{+.002}_{-.000}$	$.060^{+.000}_{-.002}$	40° ± 3°	1/64 max.	$.015^{+.002}_{-.000}$
1/5 (XL)	.200	H	$.052^{+.002}_{-.000}$	$.065^{+.000}_{-.003}$	50° ± 3°	1/64 max.	$.025^{+.002}_{-.000}$
	.234	D	$.080^{+.003}_{-.000}$	$.073^{+.000}_{-.004}$	40° ± 3°	1/32 max.	$.030^{+.005}_{-.000}$
3/8 (L)	.375	C	$.120^{+.004}_{-.000}$	$.105^{+.000}_{-.004}$	40° ± 3°	3/64 max.	$.046^{+.005}_{-.000}$
1/2 (H)	.500	B	$.165^{+.005}_{-.000}$	$.120^{+.000}_{-.005}$	40° ± 3°	1/16 max.	$1/16^{+.005}_{-.000}$
7/8 (XH)	.875	G	$.311^{+.006}_{-.000}$	$.281^{+.000}_{-.005}$	40° ± 3°	5/64 max.	$3/32^{+.005}_{-.000}$
1 1/4 (XXH)	1.250	E	$.479^{+.007}_{-.000}$	$.406^{+.000}_{-.005}$	40° ± 3°	3/32 max.	$1/8^{+.005}_{-.000}$

*NOTE: Pulley diameter taper must be held to a minimum, preferably zero. Taper will result in excessive belt side thrust and early failure.

It should be realized that if commercially available pulleys or tooling is used a slightly different tooth profile will result depending upon the number of teeth in the pulley and the type of hob or shaper tooling used. The pulley outside diameter however should remain the same.

Since it is difficult to check the groove profile, we suggest that you check for wear and proper diameter. Purchase new pulleys from a reputable source.

1. TYPE PULLEYS

Various types of pulleys are used on Positive Drive Belt drives. The type furnished — spoke, web, etc. — is governed by the number of grooves and the pulley manufacturer's preference. Generally pulleys of small diameter do not use bushings but are of the integral hub type. The larger pulleys are generally used with bushings. The basic types of Positive Drive Belt pulleys are shown below and are typical of the wide variety used. The minimum recommended pulley diameters are shown in Table 11.

Plastic pulleys are only recommended for light duty applications.

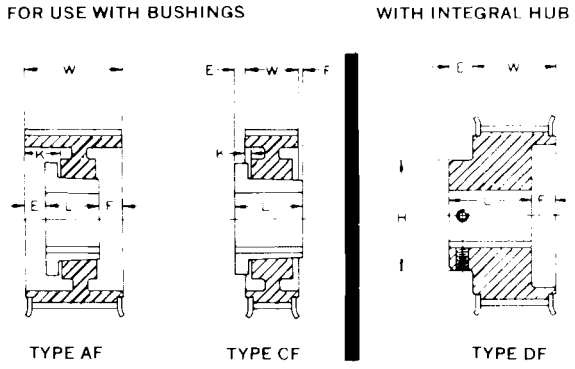


Fig. 13

Table 11

Minimum Pulley Diameters

		Recommended Minimum *	
Pitch	Speed Rpm	Pitch Diam. in.	No. of Grooves
1/5 in. (XL)	3500	.764	12 XL
	1750	.700	11 XL
	1160	.637	10 XL
⅜ in. (L)	3500	1.910	16 L
	1750	1.671	14 L
	1160	1.432	12 L
½ in. (H)	3500	3.183	20 H
	1750	2.865	18 H
	1160	2.546	16 H
⅞ in. (XH)	1750	7.241	26 XH
	1160	6.685	24 XH
	870	6.127	22 XH
1¼ in. (XXH)	1750	10.345	26 XXH
	1160	9.549	24 XXH
	870	8.753	22 XXH

*Smaller diameter pulleys can be used if a corresponding reduction in belt service life is satisfactory

2. MOUNTING PULLEYS

Positive Drive pulleys are mounted and removed in the same manner as conventional V-belt sheaves. Follow the same procedures as outlined on pages 3, 4 and 5 of this manual and as recommended by the pulley manufacturer.

3. CHECKING ALIGNMENT

The proper alignment of Positive Drive pulleys is more critical than for conventional V-belt drives. Essentially however, the alignment checking procedure is the same as for V-belts as detailed on page 6 of this manual.

Determine Direction Of Side Travel

Stock or standard Positive Drive belts will ride toward the left flange. If only one flange is used, it should be placed on the left. If a drive requires that the belt ride toward the right flange, "special order" the belts in mandrel quantities from the manufacturer.

DETERMINE DIRECTION OF SIDE TRAVEL

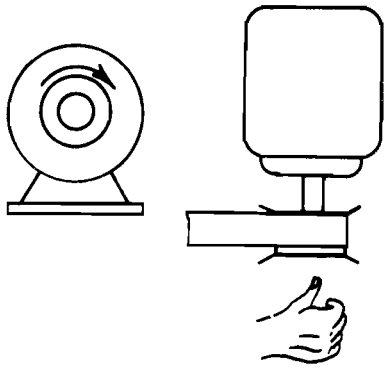
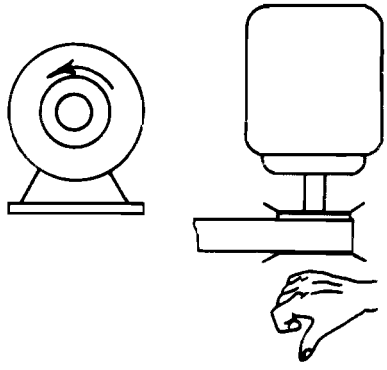


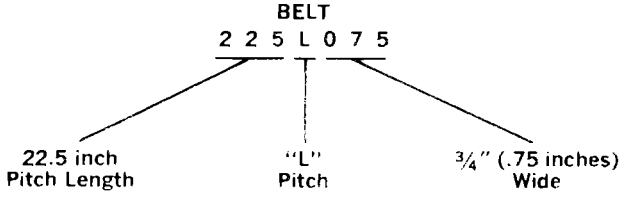
Fig. 14

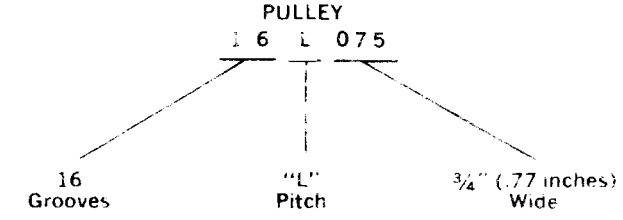


USE OF THE RIGHT-HAND RULE

4. SELECTING BELTS

SIZE NOMENCLATURE





5. MATCHING BELTS

Matching is not required for most Positive Drive belt drives. However, if you have a special application where matching is required, specify "matched belts" on the order and allow sufficient lead time. Matching code numbers will not appear on the belts. Two belts 2 inches wide will operate satisfactorily on a 4-inch wide pulley.

6. INSTALLING BELTS

The belt should never be forced or pried over the pulley flange during installation. Reduction of center distance or idler tension will permit the belt to slide onto the pulley easily. Otherwise, one or both pulleys should be removed.

To assure smooth operation and prevent premature failure, belts in storage should be protected against sharp bending or creasing. They should not be subjected to extreme heat, low temperature or high humidity.

7. TENSIONING BELTS

Positive Drive belts should be installed with a snug fit. The snug fit will provide longer belt life, less wear on bearings and quieter operation. The belt's positive grip eliminates the need for high initial tensioning which could cause premature belt failure. A belt in either the XH or XXH pitch can be installed with some slack because of the deeper tooth section unless shock loads or reversals are abnormally high.

If the torque is unusually high, a loose belt may "jump teeth" during startup. If this condition occurs, gradually increase the tension until the belt operates satisfactorily. A good rule of thumb is to install the belt under ½ of the allowable working tension shown on page 60 of the Goodyear Positive Drive engineering design manual. The precise tension can be determined by using the method shown below.

Tensioning Method

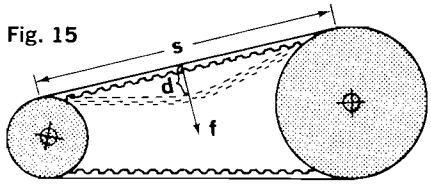
The procedure to properly tension a Positive Drive belt is as follows:

1. Apply a force at the midpoint of the span between the two pulleys. Deflect the belt 1/64" for each inch of span length.
2. Installation tension should be regulated so that the value of this applied force equals the value of f given in the following formula:

$$f = \frac{T + (s/L)\,K}{16}$$

where s = the span distance in inches.
T = the tension in pounds found in the Table.
K = the constant from the Table.
L = the length of the belt.

Fig. 15



d is to be 1/64 of the value of s in inches.

3. If the deflecting force is less than that given in the formula, the belt is too loose. If the deflecting force is greater than that given in the formula the belt is too tight.

Table 12 — Table of Values

	3/16	1/4	5/16	3/8	7/16	1/2	9/16	5/8	3/4	7/8	1	1 1/4	1 1/2	1 3/4	2	2 1/2	3	3 1/2	4	5	6	7	8	9	10	11	12	13	14
5" Pitch T	2	3	4	5 5	7	8.5	10	11.5	14.5	17.5	20.5																		
5" Pitch K	.5	.85	1.2	1 7	2.2	2.7	3.1	3.6	4.7	5.6	6.7																		
3" Pitch T				7.5	9.5	11.5	13.5	15.5	19.5	23.5	27.5	35.5	43	50.5	59	75	92.5												
3" Pitch K				8.5	9	9.9	12	14	17	20	24	30	37																
2" Pitch T						29.5	35	40	49.5	60	70	90.5	109	129	150	190	235	284	333	430	525								
2" Pitch K						17	18	22	32	38	46	57	85	85	95	125	152	181	210	265	320								
3" Pitch T															204	260	321	387	454	587	716	849	985	1117	1251	1376	1512	1639	1778
3" Pitch K															190	250	305	370	440	568	700	820	1080	1200	1330				
4" Pitch T															254	318	393	375	557	719	877	1040	1207	1369	1532	1686	1853	2007	2178
4" Pitch K															310	410	500	610	710	920	1100	1300	1500	1700					

8. BELT GUARDS

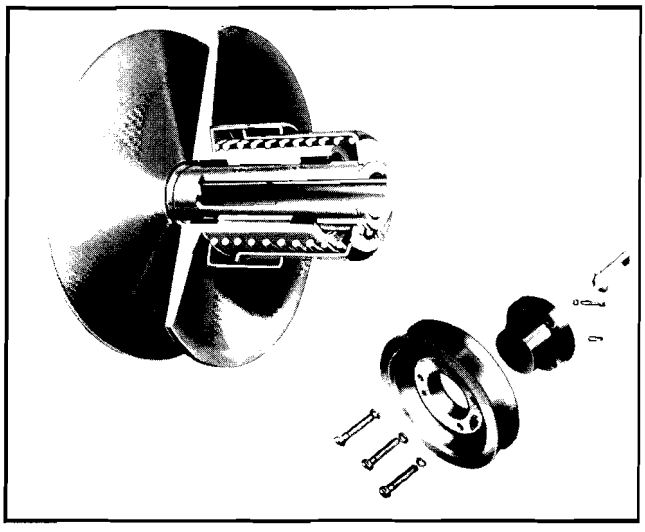
Belt guards insure safety and cleanliness. Screened, meshed or grilled belt guards are the most satisfactory since they permit air to circulate and allow heat to escape.

9. IDLERS

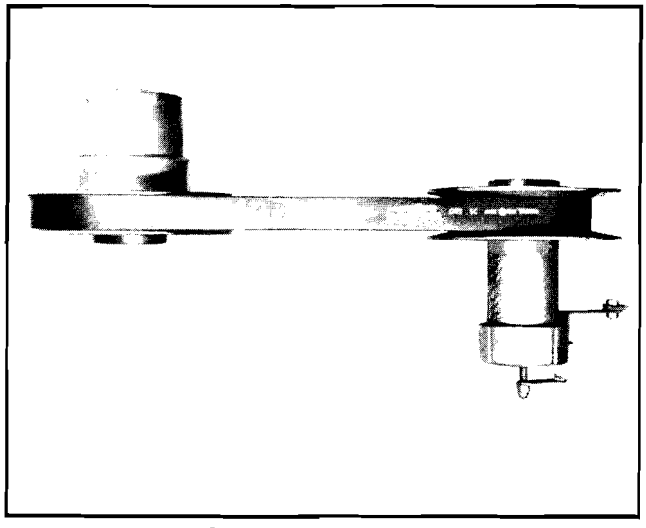
Neither inside nor outside idlers are recommended for Positive Drive belts and should not be used except for power take-off or functional use. If an idler is necessary, it should be on the slack side of the belt. Inside idlers must be grooved unless in excess of 40 grooves. Flat idlers must not be crowned (use edge flanges). Idler diameters must exceed the diameter of the small pulley. Idler arc of contact should be held to a minimum.

VARIABLE SPEED DRIVES

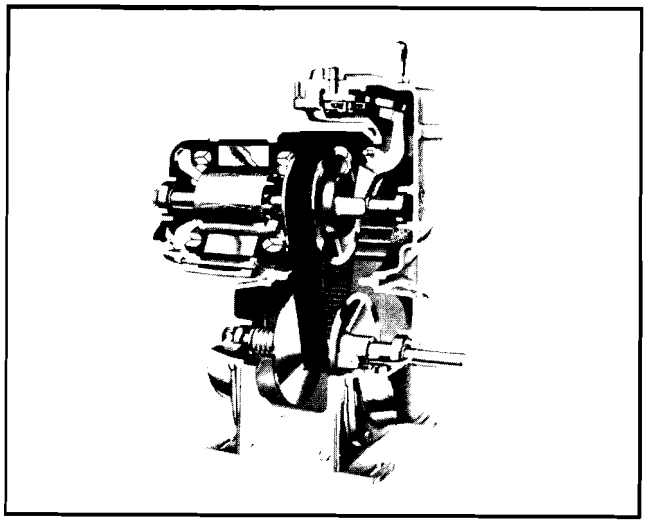
Types of Variable Speed Drives



Variable To Fixed Sheave

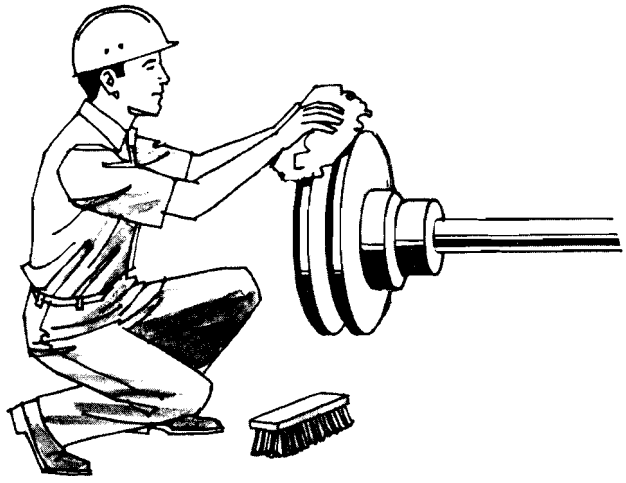


Both Sheaves Variable

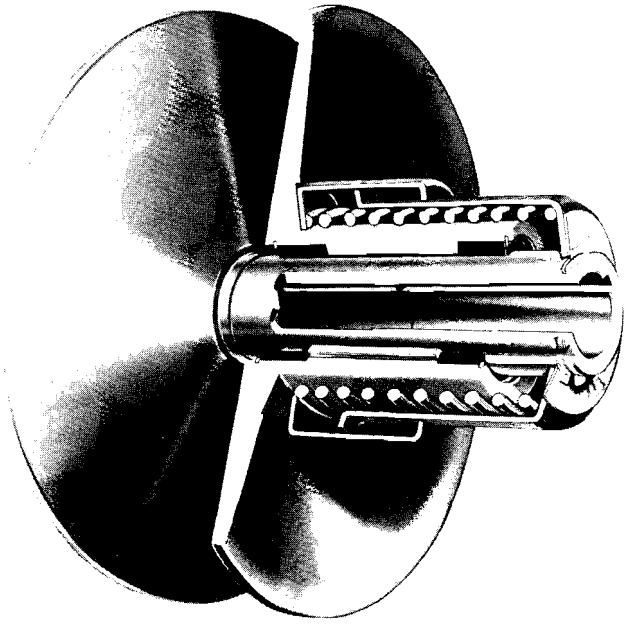


Motorized Unit Both Sheaves Variable

1. INSPECT SHEAVES



The condition of the sheaves should be checked before a new set of variable speed belts are installed. Dirty or rusty sheaves impair the drive's efficiency and abrade the cover of the belt which results in premature failure. Remove any rust and wipe sheaves clean of oil and grease.



Inspect all moving parts for freedom of movement and wear. Worn sheaves or worn moving parts cause vibration and reduce belt life.

2. ALIGNING SHEAVES

Typical Variable Speed Drive

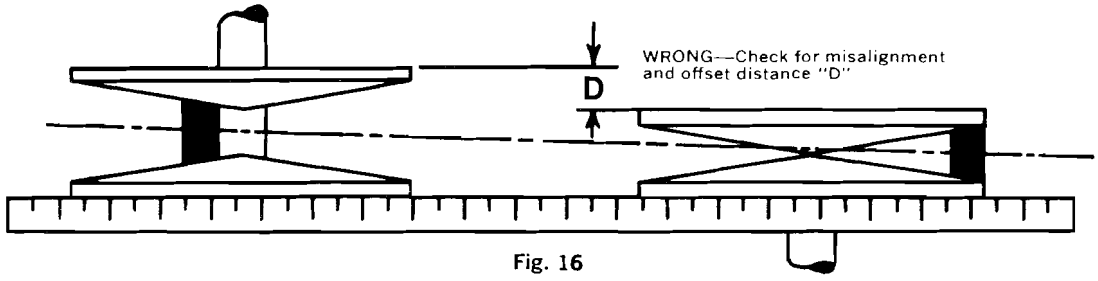


Fig. 16

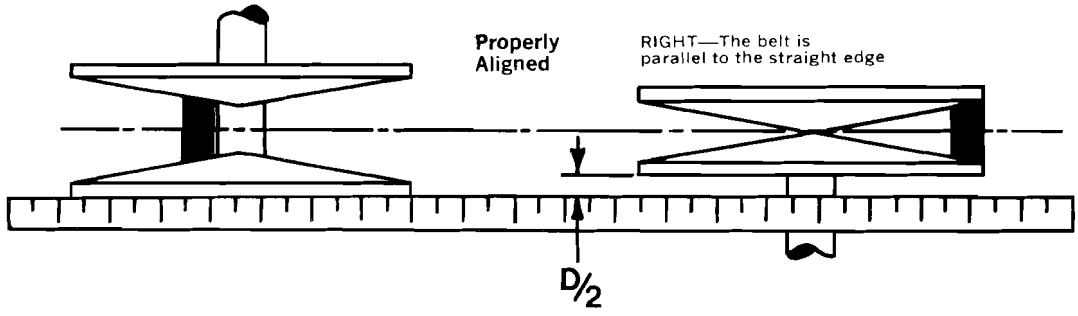


Fig. 17

Note belt misalignment in Fig. 16. To correct move one sheave so that the straight edge (Fig. 17) is equidistant from both sides of the narrow sheave and so that the belt edge is equidistant from the straight edge.

3. SELECTING BELTS

Refer to manufacturer's recommendations. The belt length on fixed center drives with both pulleys variable is critical and affects drive speed variations. Belt length with one variable and one fixed pulley is only critical as it pertains to allowable increase and decrease in center distances.

4. INSTALLING BELTS

Special care should be taken when installing variable speed belts so that the belts and sheaves are not damaged. The variator sheaves may have to be fully opened to facilitate installation. The drive center distance may also have to be shortened to allow for installation. One or both sheaves may have to be removed. After assembly, drive center distance should be returned to normal and the drive alignment should be rechecked as outlined above.

5. TENSIONING BELTS

The spring loaded pulley applies proper tension to the belt to handle the design load.

6. BELT GUARDS

Belt guards insure safety and cleanliness. Screened, meshed or grilled belt guards are the most satisfactory

since they permit air to circulate and allow heat to escape.

7. IDLERS

Idlers are not recommended for variable speed drives.

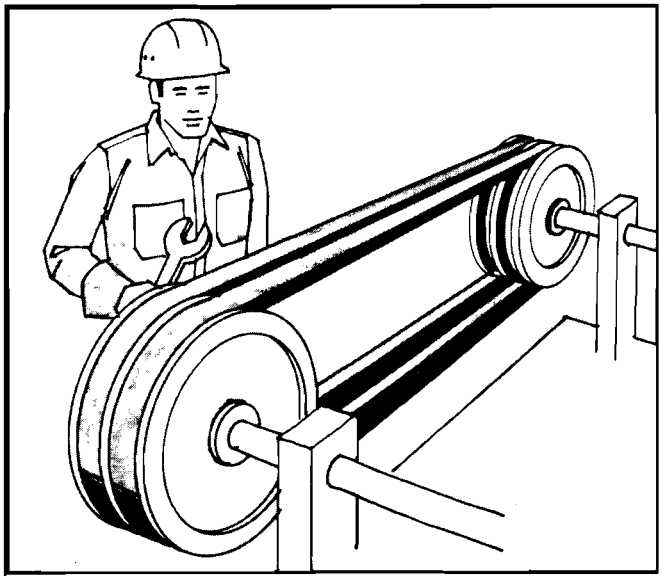
MAINTENANCE

V-belt drives are recognized as an extremely reliable and efficient means of power transmission. Since they are basically trouble-free, they are often ignored and do not receive the minimal attention required to realize their full benefit and life.

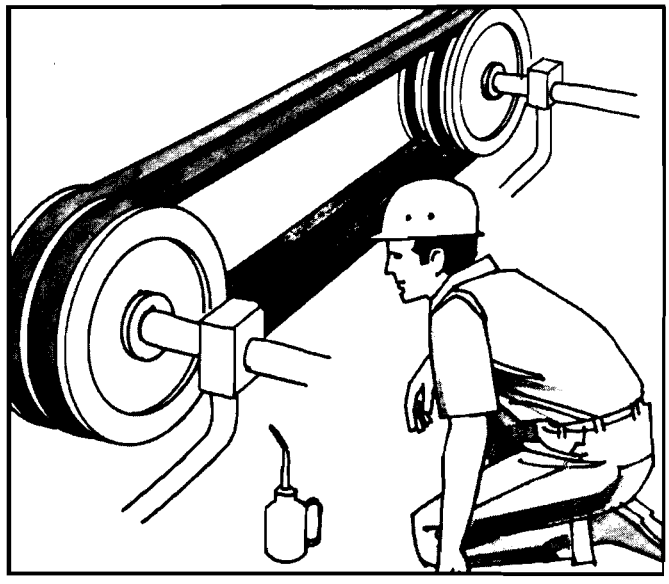
V-belt drive maintenance is not complicated, nor does it require a great deal of time or a large variety of tools. The main ingredients of good maintenance are to look and listen and then to correct apparent drive problems.

The following maintenance and trouble shooting pointers provide information to help you establish an effective V-belt drive maintenance program.

Look and Listen

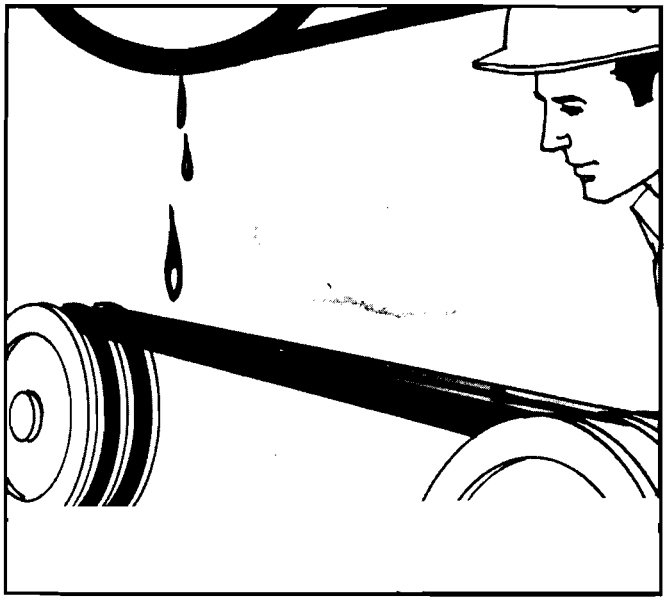


Following installation of V-belts, inspect the drive and watch it while it runs.



Inspection of a V-belt drive is simply a matter of looking and listening.

WHAT TO LOOK FOR:



1. OIL AND GREASE

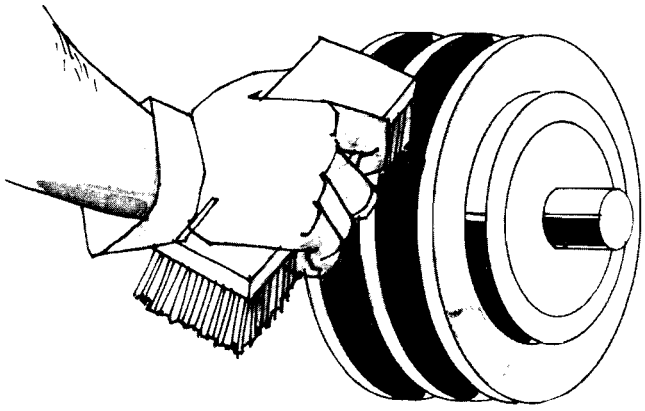
Belts exposed to oil in spray, liquid or paste form fail prematurely. A drive should be well "policed." Leaky bearings should be repaired immediately. Excess oil on a bearing will splash on the belts. If these conditions cannot be corrected special oil-resistant belts should be used.

Too little oil will cause bearing failure which, in many cases, is blamed on the belts. This condition causes belts to burn out due to overload.

2. DIRT

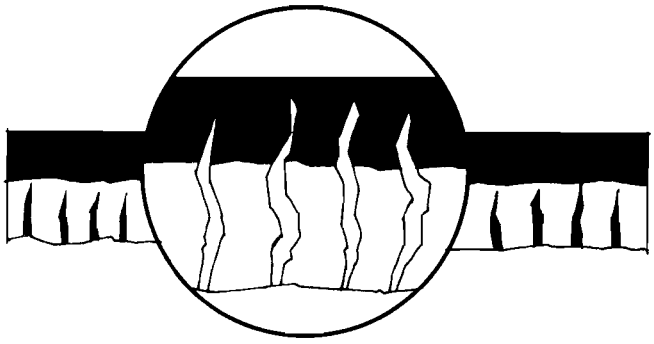
No equipment operates best when it is dirty and belts are no exception. Dirt accelerates belt wear and dirt buildup in a sheave groove impairs traction.

Remove Dirt



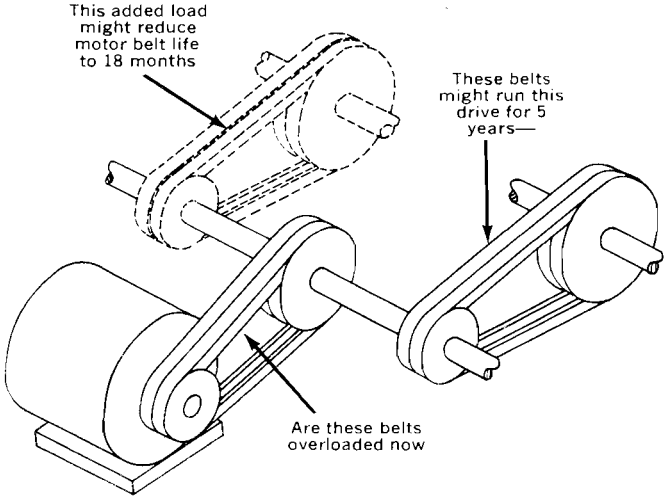
5. CRACKING

Bottom cracking will not reduce the tensile strength or the operating efficiency of the belt. High temperatures, small diameter pulleys and dust will accelerate bottom cracks. Bottom cracking can be reduced by using larger sheaves and larger reverse bend idler sheaves. It is not necessary to replace a belt simply because bottom cracking has been observed.



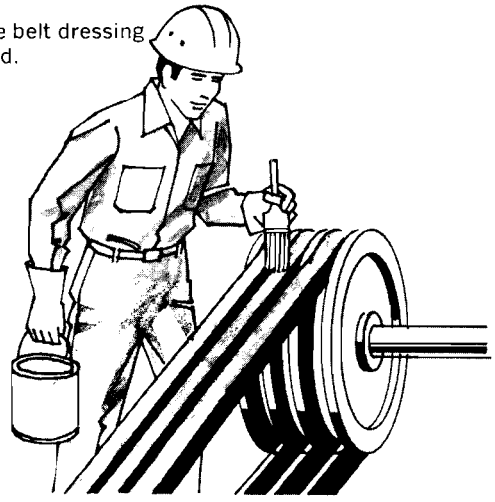
3. ADDED LOADS

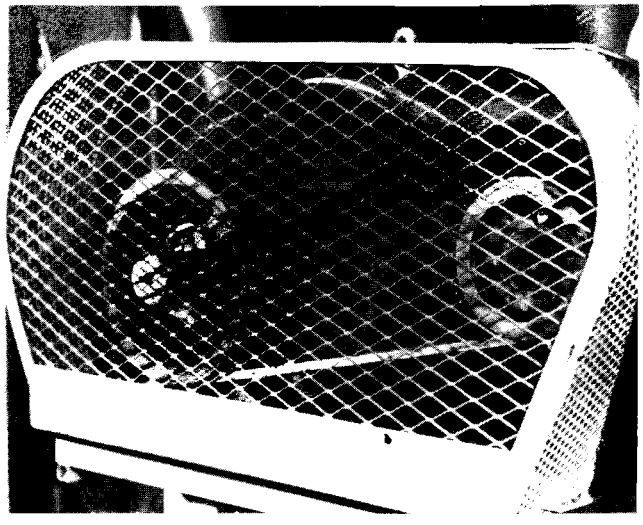
Added loads shorten belt life. A check should be made to see that no additional loads have been added since the original drive was selected. Take note of the drive system shown in the following illustration.



6. BELT DRESSING

Do not use belt dressing of any kind.

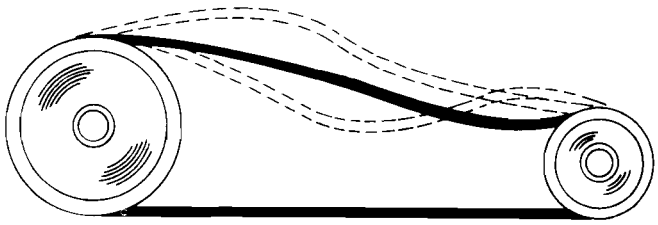




4. BELT GUARDS

Guards for drives insure safety and cleanliness. Screened, meshed or grilled guards are most satisfactory because they allow air to circulate and heat to escape.

7. VIBRATION

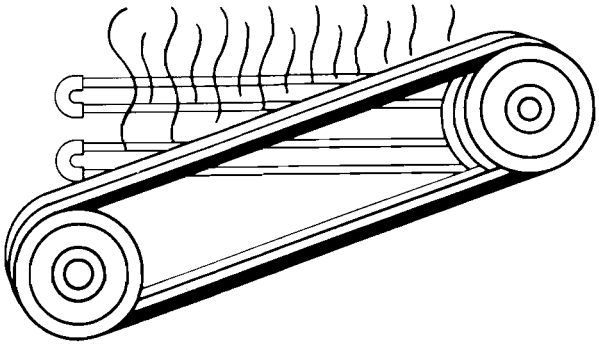


Prevent belt whipping

8. TENSION

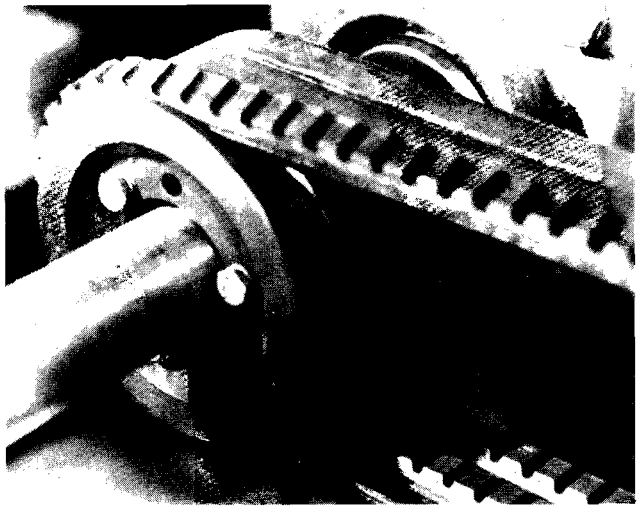
Adjust tension to values shown in tables 5 & 6, page 9 or table 8, page 15.

9. HEAT



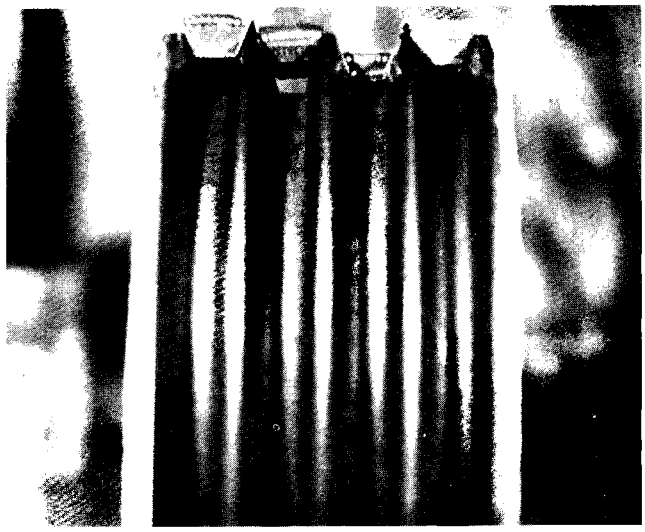
All belts are cured in a scientifically controlled time and temperature process. Belts operating in temperatures of less than 140°F. are not materially affected; however, at higher temperatures overcuring takes place and shortens belt life. Belts operating in temperatures above 140°F. should be checked frequently and a special heat-resistant construction should be considered if belt life is not satisfactory.

10. BELT TURN OVER



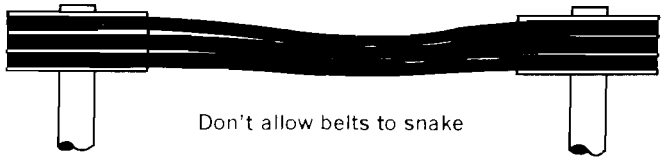
Turned over belts indicate conditions of drive misalignment, worn sheaves or excessive vibration.

11. CHANGE IN RIDE OUT



Change in ride out indicates uneven belt wear or worn sheaves

12. LATERIAL VIBRATION

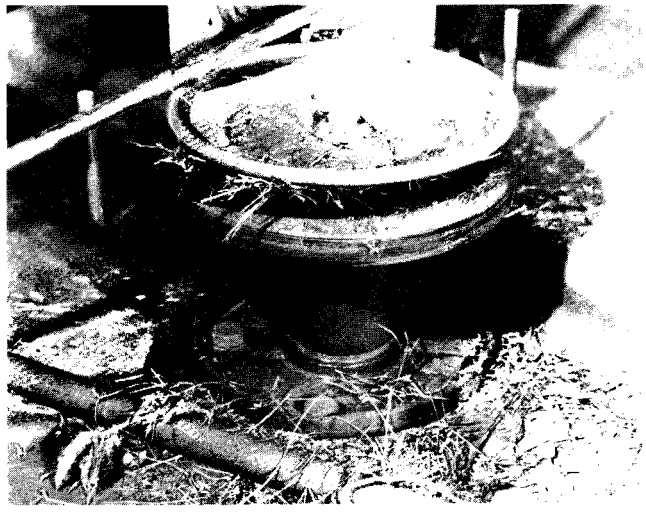


Don't allow belts to snake

13. BELT WEAR

Wear on sidewalls indicates constant slippage, excessive dust, or rough sheaves.

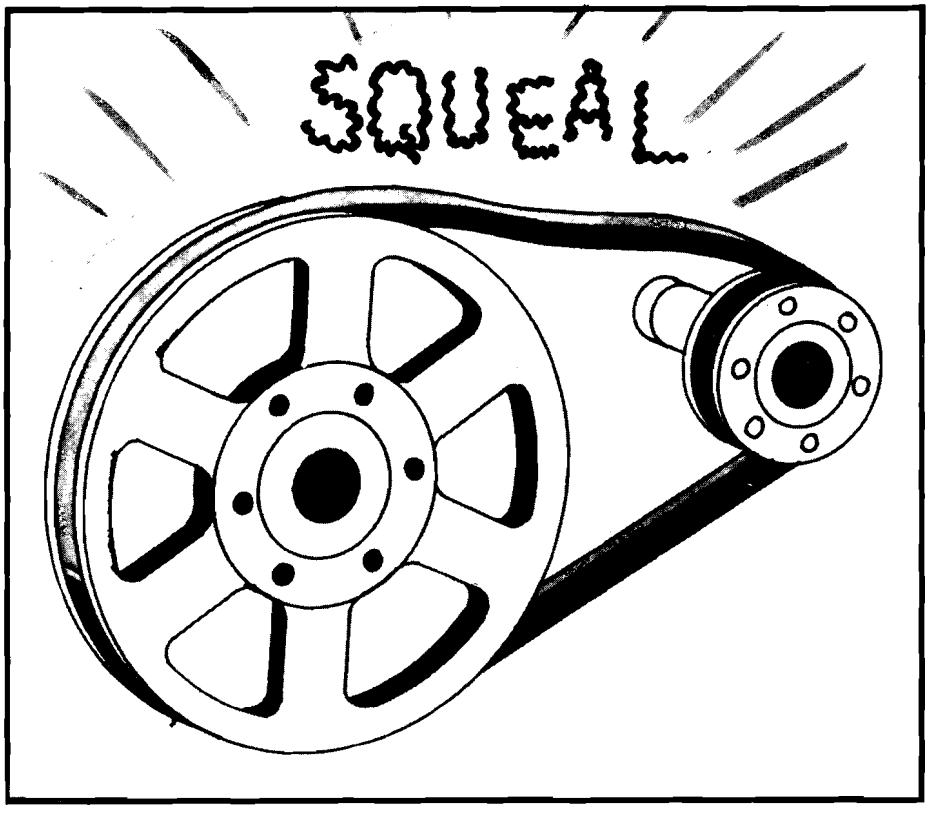
14. FOREIGN MATTER



Broken belts or excessive wear can result from the presence of foreign material.

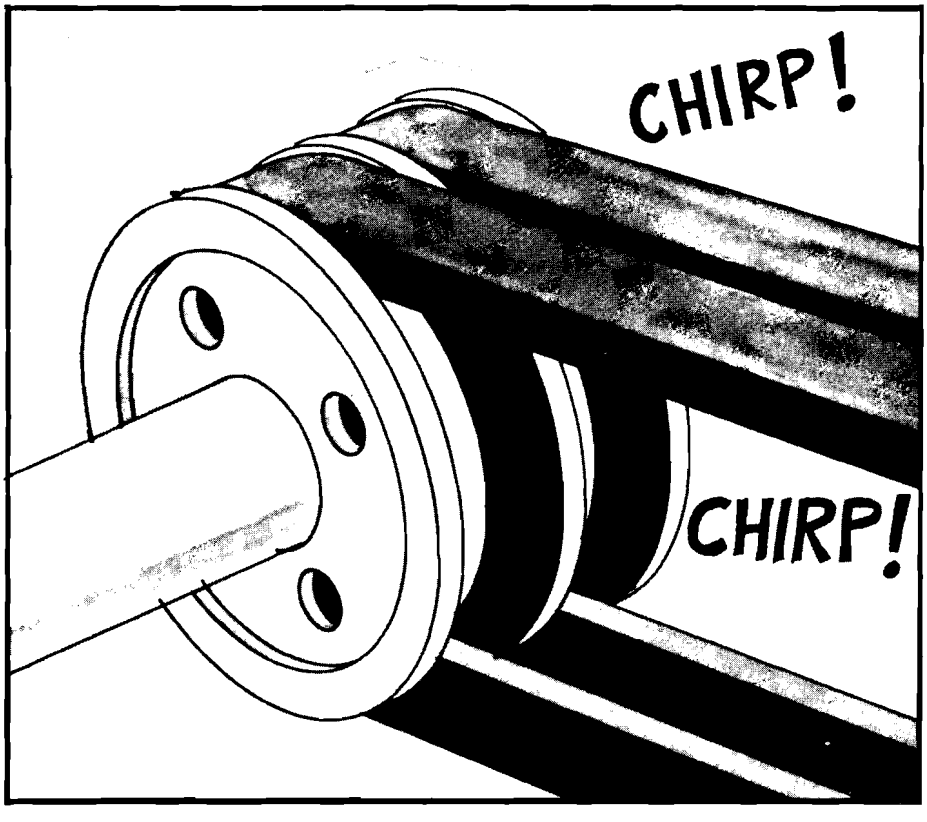
WHAT TO LISTEN FOR

1. SQUEAL



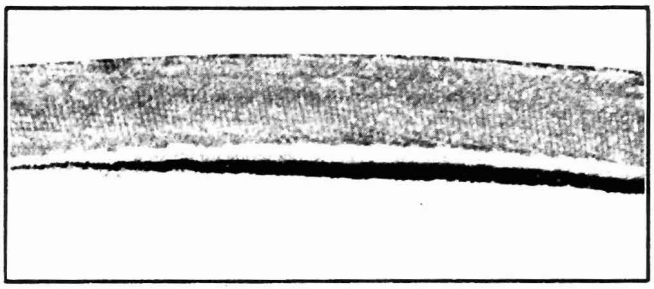
This noise occurs during motor acceleration or when the motor is operating near or at full load. It is a definite indication of belt slippage and requires prompt investigation. Squeal usually is a result of insufficient belt tension. If it persists after all belts have been checked and tension adjusted, the drive itself should be examined for overloading.

2. SQUEAK



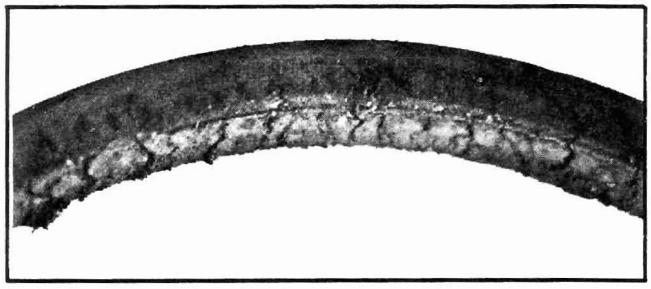
This sound is like that of a chirping bird or a dry bearing. It occurs on all types and all makes of belts. Dust is often a contributing factor. Never apply dressing or oil to a belt in an effort to eliminate squeak. Realignment of an idler may help. Squeak is often annoying, but it will not harm belts.

TROUBLESHOOTING – V-BELT PERFORMANCE ANALYSIS



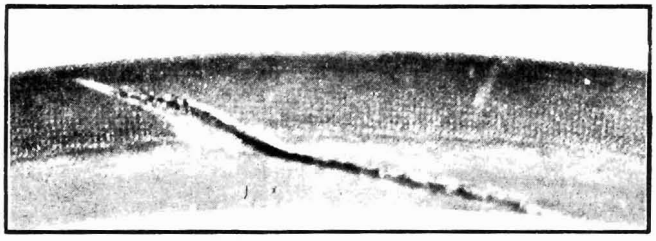
Cause of Failure — Excessive exposure to oil or grease has caused the belt to swell, become soft and the bottom envelope seam to "open up."

Correction — Provide splash guards, do not over lubricate, clean belts and sheaves with gasoline.



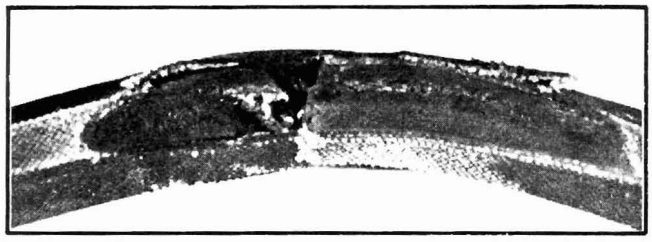
Cause of Failure — Weathering or "crazing" caused by the elements and aggravated by small sheaves.

Correction — Provide protection for the drive and replace belt or belts.



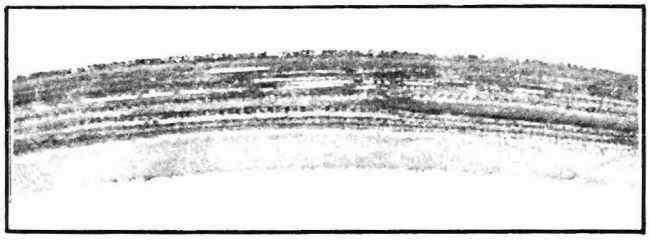
Cause of Failure — Cut bottom and sidewall indicate belt was pried over sheave and damaged during installation.

Correction — Be sure to use proper length belt and move tensioning all the way "in" when installing belt.



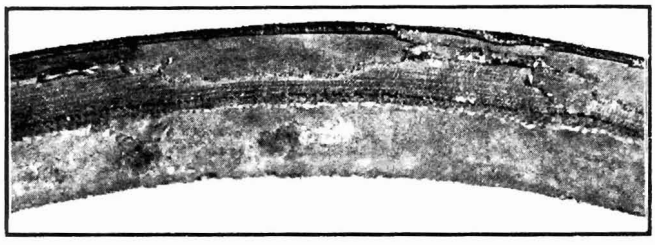
Cause of Failure — Spin burn caused by a frozen or locked driven sheave.

Correction — Determine that the drive components turn freely and tighten belt, if necessary.



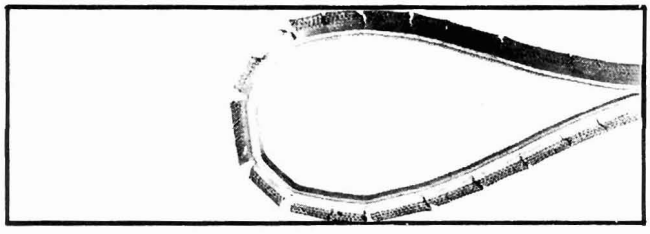
Cause of Failure — Constant slippage caused by insufficient tension in belt.

Correction — Tension drive in accordance with equipment manufacturers and this manual's recommendations.



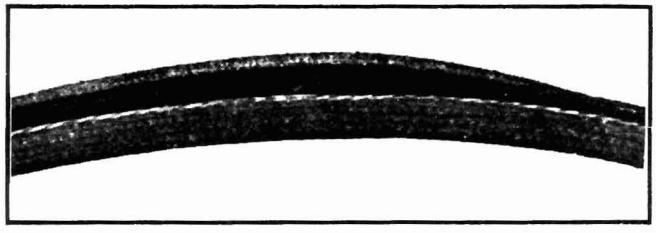
Cause of Failure — Rough sheave sidewalls cause the cover to wear off in an uneven pattern.

Correction—File or machine out the rough spot on the sheave groove. If beyond repair, replace the sheave.



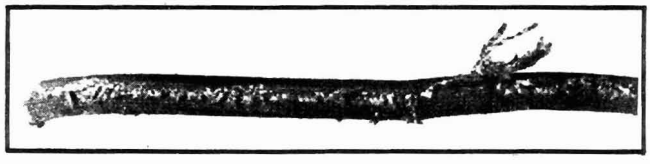
Cause of Failure—Belt has evenly spaced deep bottom cracks from use of a substandard backside idler.

Correction—Replace backside idler with an idler which is in accordance with the minimum size recommendation.



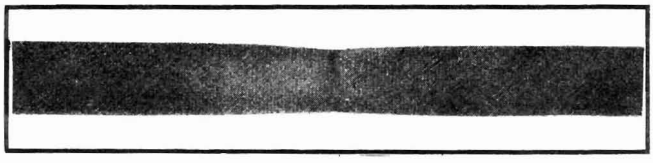
Cause of Failure — Ply separation caused by substandard sheave diameter.

Correction — Redesign drive to utilize proper size sheaves.



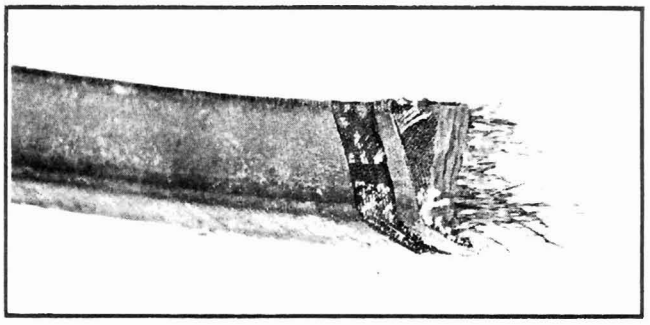
Cause of Failure—Split on side at the belt pitch line indicates use of a sheave with a substandard diameter.

Correction — Redesign drive to utilize proper size sheaves.



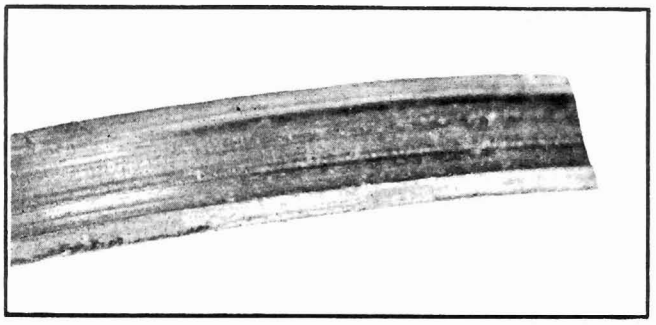
Cause of Failure—The load carrying member has been broken by a shock load or damage during installation.

Correction — Maintain proper tensioning and observe proper installation procedures.



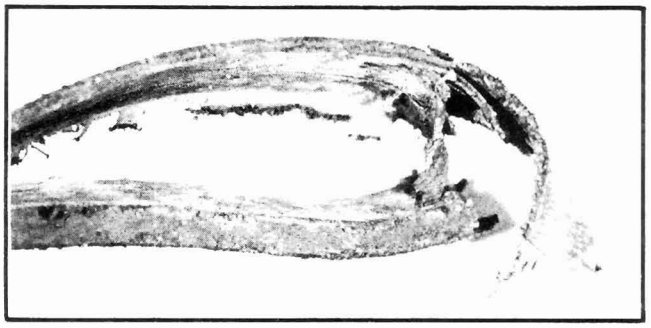
Cause of Failure — Tensile breaks can be caused by high shock loads, foreign object between the bottom of the sheave and the bottom of the belt or damage during installation.

Correction — Maintain proper drive tension and installation procedures. Provide guard to keep foreign material from coming in contact with the drive.



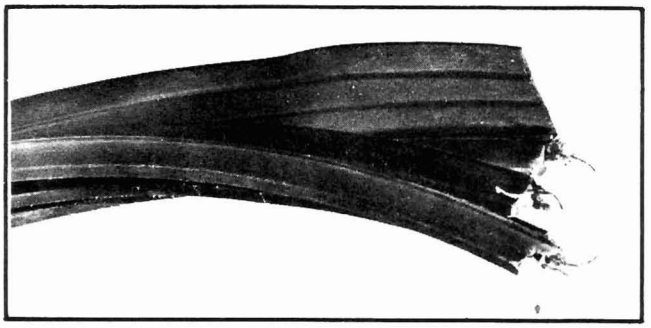
Cause of Failure — Back of the belt has been rubbing on a belt guard or other appurtenance.

Correction — Provide adequate clearance between belt and guard or any appurtenances.



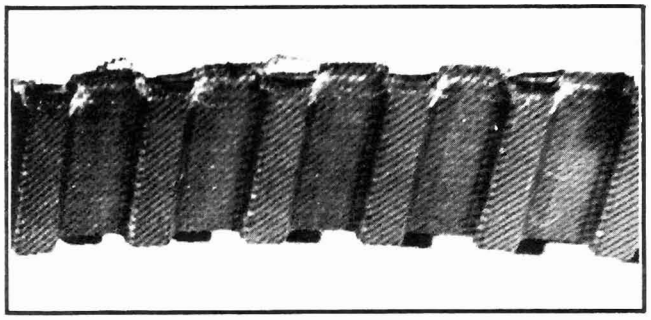
Cause of Failure—Excessive dust and rough sheaves combine to cause severe envelope wear and early belt failure.

Correction — Maintain sheave condition, alignment and attempt to protect drive from excessive dust exposure.



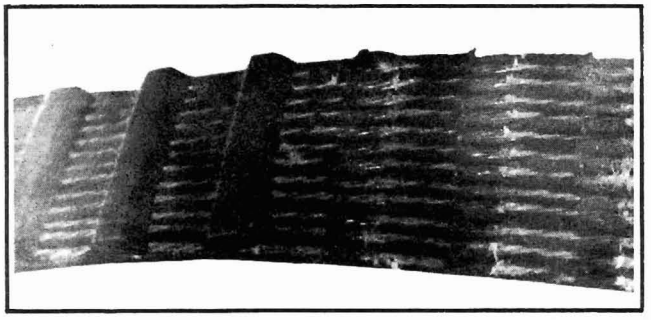
Cause of Failure — Worn sheave grooves allows the joined belt to ride too low cutting thru to the top band.

Correction — Replace sheaves and maintain proper belt tension and sheave alignment.



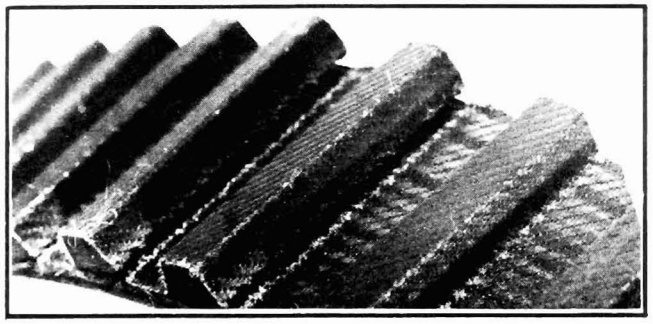
Cause of Failure — Flange wear on PD synchronomous belt.

Correction — Adjust and maintain proper pulley alignment.



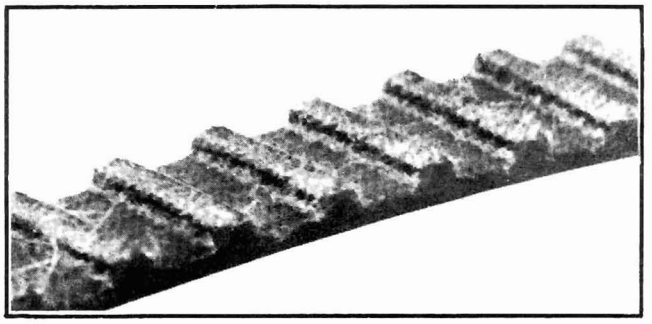
Cause of Failure — Web fabric wear caused by improper belt and pulley fit.

Correction — Check belt/pulley fit and replace worn or out-of-spec pulleys.



Cause of Failure — Tooth shear caused by belt overload condition from improper application or shock loads.

Correction — Consult engineering manual for proper application and maintain proper belt tension.



Cause of Failure — Fabric wear caused by insufficient belt tension or pulleys which are not to the standard PD pulley dimensions and tolerances.

Correction — Maintain proper tension and replace the out-of-spec pulleys.