Mechanical Equipment - Course 230.1

CHAIN DRIVES

Chain drives are used where the working environment is not suitable for belts, such as high temperatures, corrosive atmosphere, very high loads or where a positive drive with no slip can be tolerated. Gear drives could also be used in these situations however, a gear drive would be more expensive than an equivalent chain drive, generally. For example, consider the extra expense involved in using gears to drive a bicycle.

Chain and Sprockets

Probably the chain with which most people are familiar is the roller chain which is used on bicycles. The basic unit of a roller chain is the roller link as shown assembled in Figure 1. It is made up of pieces illustrated in Figure 2. Two rollers (a) are mounted on bushings (b) which are riveted into link plates (c). A chain is formed when the individual roller links are fastened together by the link pins (d) and the link plates (e). A section of single strand chain is shown in Figure 3(a) and a multistrand chain in Figure 3(b).

Roller Link

Figure 1

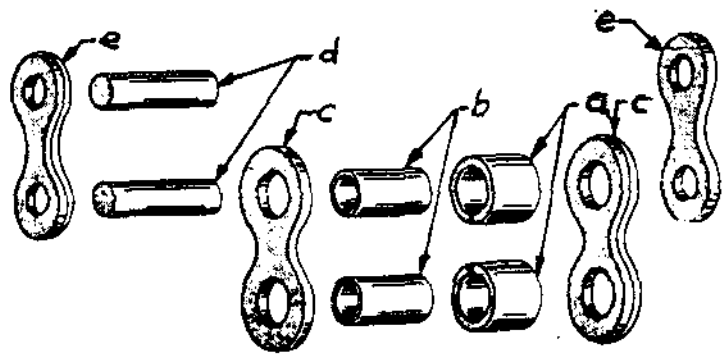


Figure 2

(a) (b)

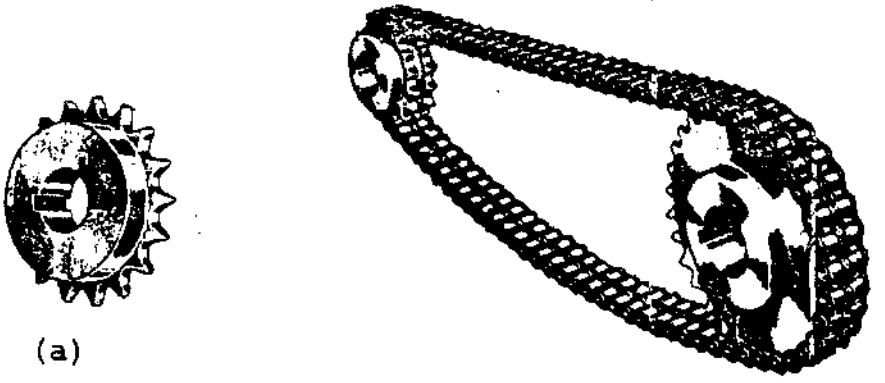
Figure 3

The pitch of the chain is the centre to centre distance between the link plate holes, therefore there is a close tolerance maintained on this dimension. The link pins, the bushings and the rollers are case hardened and ground for wear strength and precision. The pins may be riveted into the link plates or else they may be held in place by cotter pins as shown in Figure 3 (a) and (b).

Another style of chain used frequently as a drive chain on construction machinery is the offset side bar chain, Figure 4. The ends of the pins may be riveted instead of having cotter pins as in the illustration. Some offset chains are made without the rollers.

Figure 4

Sprockets for roller chains and offset side bar chains can be grouped according to their style of construction. There are steel plate sprockets without hubs, with hubs on one side or with hubs on both sides. They may be obtained with removable taper lock bushings which provide a quick and easy way to install and replace them or they can be keyed directly to the shaft. There are proper sprockets for single or multistrand chain drives. For proper meshing, the pitch of the sprocket teeth must match that of the chain, and with multistrand drives the distance between adjacent sets of teeth must also be the same as the chain. Figure 5(a) shows a sprocket with a hub on one side and Figure 5(b) is an illustration of a double strand drive.



(a) (b)

Figure 5

It is recommended that the chain wrap on the smaller sprocket be at least 120°. The slack should be on the lower side to prevent rubbing between the top and bottom. If it is necessary to keep the drive tight, and there is no provision for adjusting the centre to centre distance then an idler will be used. Figure 6 shows an installation using idlers.

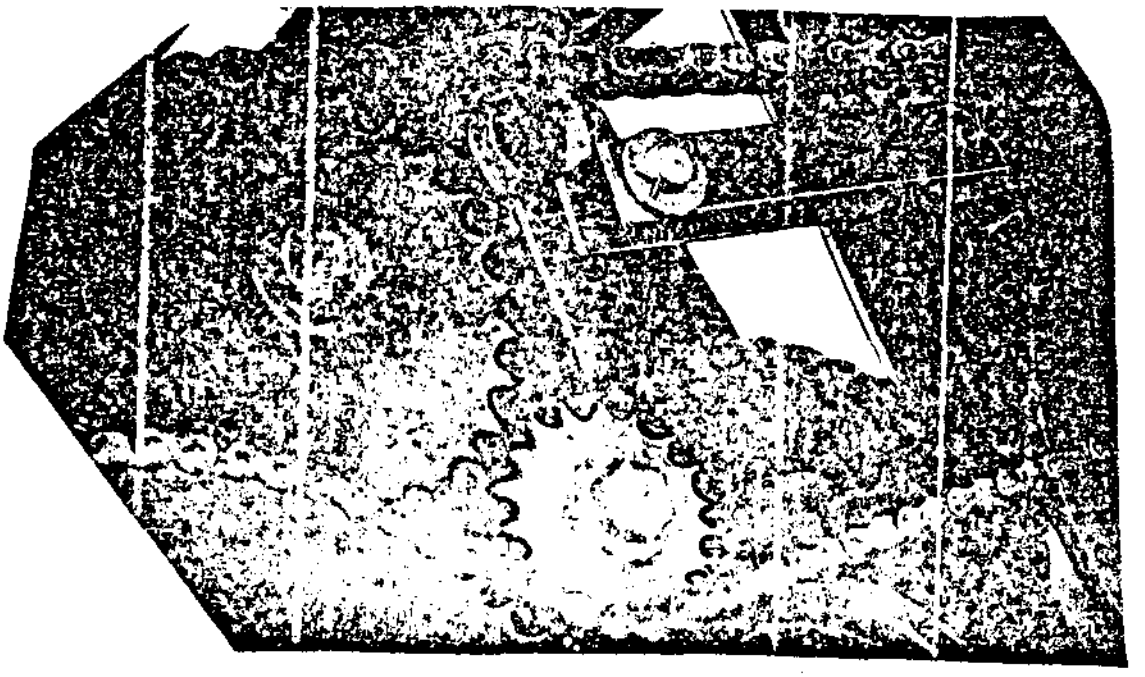
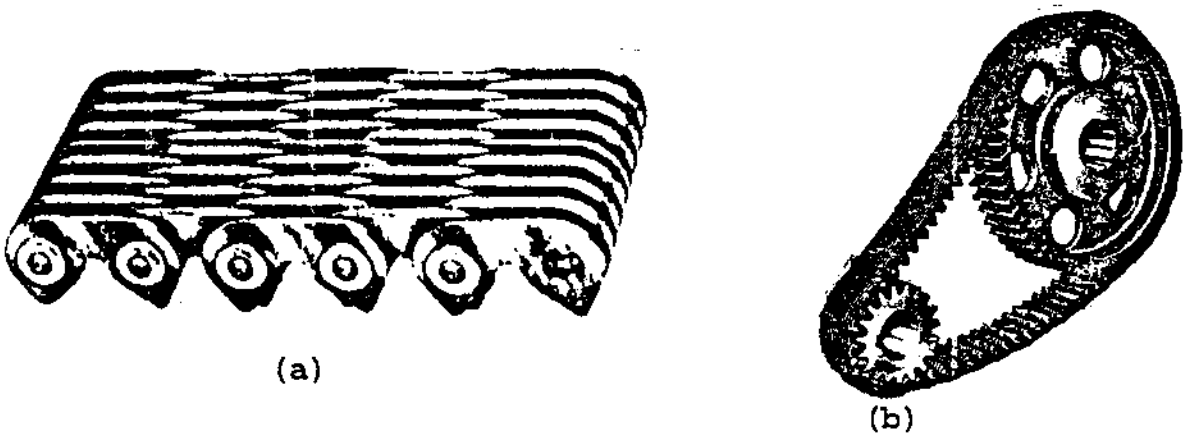


Figure 6

The silent or inverted tooth chain, shown in Figure 7(a) and (b) is a high speed chain used mainly for prime mover take-off drives, such as power shovels, machine tools and pumps.

These chains are made of a series of flat plates each of which have two projections or teeth, one at each end. The outer face of the tooth is ground to a given angle to work against the faces of the sprocket.

The chain passes over the face of a gear-like sprocket like a belt. The sprocket teeth do not protrude through the chain. In operation there is no sliding action between the chain and the sprocket resulting in a smooth, quiet action. The chain is held on the sprocket either by a row of centre guide plates, fitting a groove in the sprocket, Figure 7(b), or by side guide plates on each side of the chain straddling the sprocket.



(a) (b)

Figure 7

Maintenance

While the drive is running, watch the chain for excessive vibration or rubbing against adjacent parts. If the chain is running close to the tips of the teeth of the large sprocket, the chain should be replaced.

With the drive shut down and suitably tagged according to the safety regulations, the chain and sprockets should be examined for uneven or excessive wear on the sides of the sprocket teeth or the inside of the roller link plates.

Check the tension of the chain by trying to lift it away from the large sprocket.

H. Timmins
L. Laplante

ASSIGNMENT

1. Why might you use a chain drive instead of a belt drive?

2. What are some of the items that should be checked to ensure correct chain drive operations?