

Jan. 20, 1942.

G. C. WATERS

2,270,485

PRINTING PRESS

Filed June 10, 1939

2 Sheets—Sheet 1

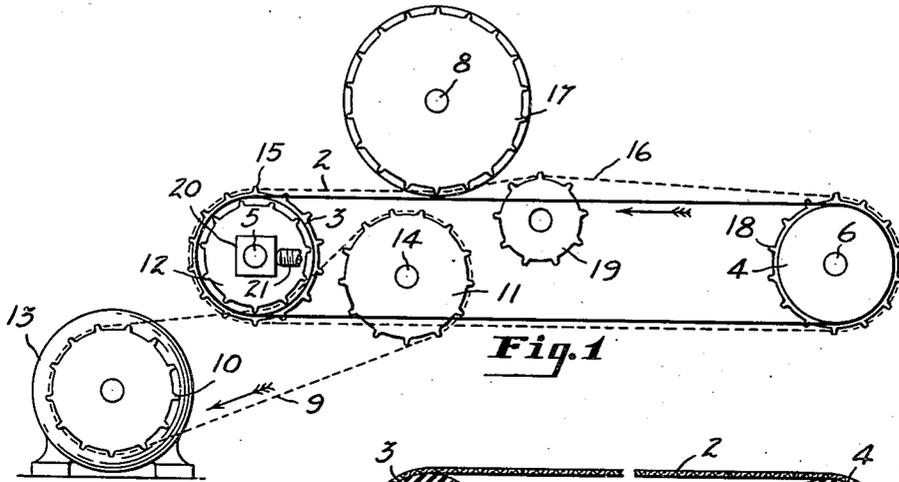


Fig. 1

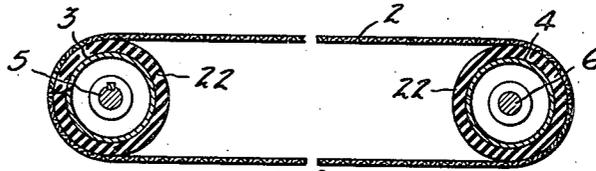
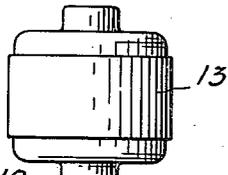


Fig. 3

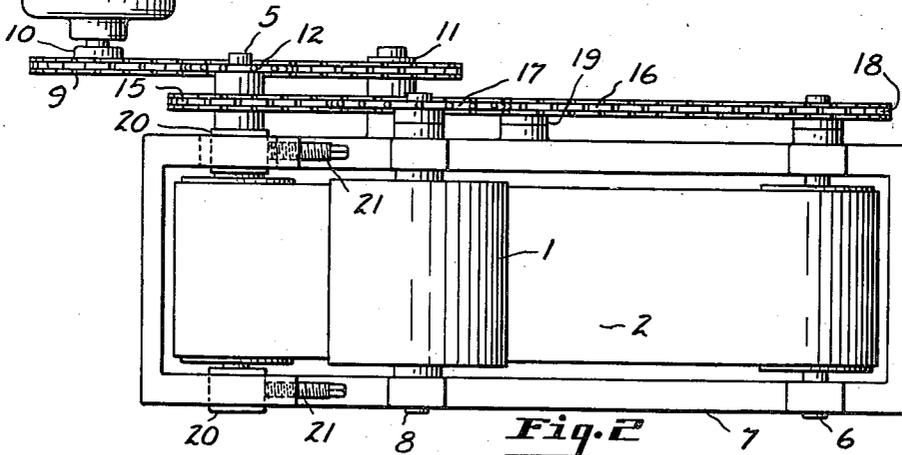


Fig. 4

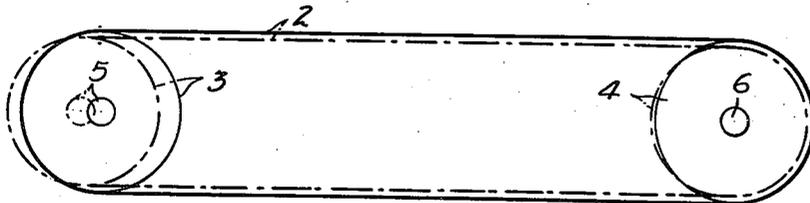


Fig. 5

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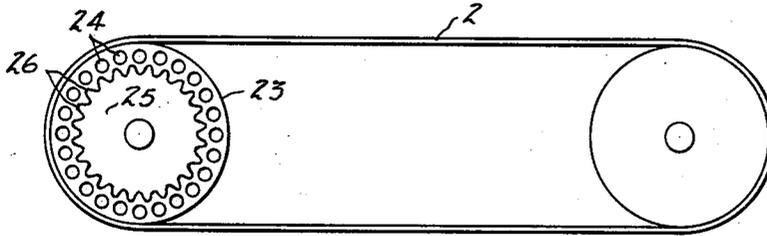


Fig. 5

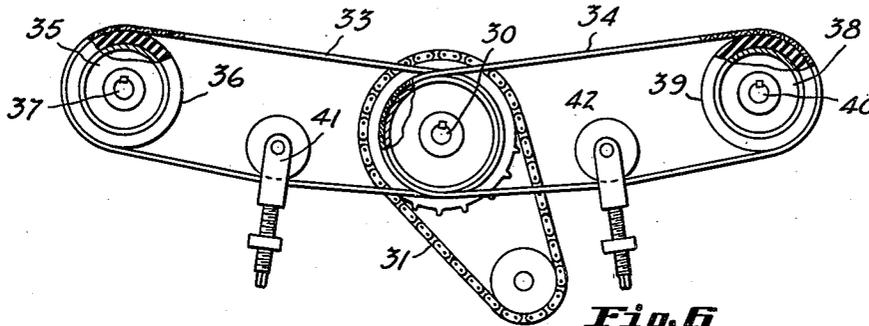


Fig. 6

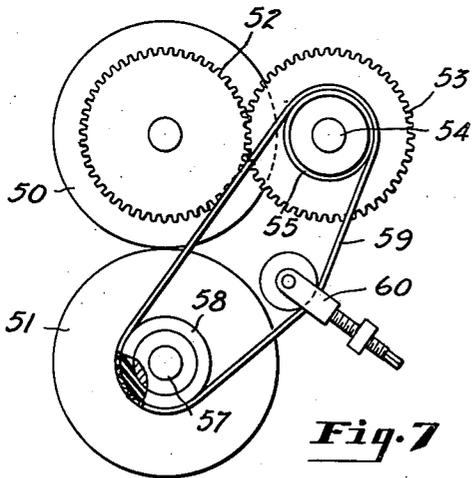


Fig. 7

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6 Claims. (Cl. 74—217)

This invention relates to a change speed mechanism and has for its object to provide a device for effecting minute changes in the speed ratio between a driving and a driven member or between two driven members.

The present application is a continuation in part of my co-pending application Serial No. 117,439, filed December 15, 1936. In my co-pending application a change speed device embodying the present invention is utilized to effect minute adjustments in the ratio of the speeds of a printing cylinder and impression member in order to compensate for variations in the effective diameter of the cylinder due to the slight variations in the thickness of printing plates applied to the surface of the cylinder, and to variations in the effective diameter of a printing cylinder due to applied pressure. The invention is, however, applicable generally to machines in which it is desirable to provide for minute changes in the relative speeds of power driven parts.

It is a further object of this invention to provide a change speed device of the character described which is simple in construction and reliable in operation.

With the above and other objects in view the invention may be said to comprise the device as illustrated in the accompanying drawings hereinafter described and particularly set forth in the appended claims, together with such variations and modifications thereof as will be apparent to one skilled in the art to which the invention appertains.

Reference should be had to the accompanying drawings forming a part of this specification in which:

Figure 1 is a diagrammatic view showing in side elevation the device of the present invention as employed to vary the speed ratio between a printing cylinder and an impression member in the form of a fed belt;

Fig. 2 is a top plan view of the mechanism shown in Fig. 1;

Fig. 3 is a longitudinal section through the belt and belt pulleys;

Fig. 4 is a diagrammatic side elevation of the belt showing the distortion of the rubber covered pulleys effected by an increase in the tension of the belt by which the rate of travel of the belt may be increased or decreased;

Fig. 5 is a side elevation showing a modified pulley construction;

Fig. 6 is a side elevation showing a modification of the invention by which a greater varia-

tion in the relative speeds of two driven shafts may be obtained;

Fig. 7 is a side elevation showing the invention applied to a cylinder press for driving the printing and impression cylinders.

In Figs. 1 to 4 of the drawings the invention is shown applied to a printing press in which the printing member is in the form of a cylinder 1 and the impression member is in the form of an endless belt 2. The belt 2 runs over pulleys 3 and 4 mounted on shafts 5 and 6 journaled in a supporting frame 7.

The cylinder 1 is fixed to a shaft 8 suitably mounted in the frame. Since the present invention is concerned only with the speed change device, the belt supporting and pressure applying devices of the press are not herein illustrated.

The shaft 5 to which the pulley 3 is fixed may be driven by any suitable means such as a sprocket chain 9 running over sprockets 10 and 11 and engaging a sprocket 12 fixed to the shaft 3. The sprocket 10 may be fixed to the shaft of a motor 13 and the sprocket 11 may be carried by a suitable countershaft 14. The shaft 5 has a second sprocket 15 attached thereto which drives a chain 16 which engages a sprocket 17 fixed to the shaft 8. The chain 16 may run over a sprocket 18 on the shaft 6 and chain 16 may be maintained in engagement with the sprocket 17 by means of a suitable idler sprocket 19. It will be apparent that the driving means above described will cause the engaging portions of the cylinder and belt to travel in the same direction and will maintain a fixed speed ratio between the pulley shaft 5 and cylinder shaft 8.

The pulley shaft 5 is mounted in sliding bearings 20 in the frame 7 and may be adjusted longitudinally of the frame to apply tension to the belt 2 by means of suitable adjusting means such as screws 21. The pulley 3 has a covering 22 of relatively soft and elastic material such as rubber. The belt 2 under tension exerts a radial pressure upon the portion of the rubber covering 22 with which it engages and this pressure compresses the rubber on the outer half of the pulley, reducing the effective diameter of the pulley. The belt 2 is, therefore, driven at a slower speed when tension of the belt is increased while the speed of rotation of the cylinder 1 is unaffected. In so far as the ratio of speeds between the belt and cylinder is concerned, the pulley 4 may be a plain steel pulley, but the pulley 4 may also be advantageously provided with a rubber covering 22 to increase the range of pulley adjustment and to provide a more uni-

formly distributed belt tension. The pulley 4 and sprocket 18 on the shaft 6 may either or both be mounted for free rotation on the shaft 6. If the pulleys 3 and 4 are of exactly the same size and the coverings 22 of exactly the same thickness, the shafts 5 and 6 may be geared together through the sprocket chain 16.

In Fig. 5 of the drawings a modified form of expansible pulley is shown. In this modification the rubber sleeve 23 is provided with a smooth outer surface and has closely spaced parallel openings 24 which extend axially the full length of the sleeve. The interior surface of the sleeve 23 may have closely spaced axially extending ribs which enter recesses in the body 25 of the pulley and provide axially extending apertures 26 along the face of the metal body 25. The axial openings 24 and 26 provide spaces into which the rubber of the covering is forced by the compression of the belt and a somewhat greater variation in the effective diameter of the pulley may be obtained by tensioning the belt. It will be apparent that with one pulley a compressible pulley and the other a plain pulley and both pulleys keyed to their shafts as shown in Fig. 5, changes in the ratio of speeds of the two pulley shafts may be obtained by tensioning the driving belt. Each shaft may be geared to one of two mechanisms to be driven at related speeds and minute changes in the ratio of the speeds of the two mechanisms may be obtained by increasing or decreasing the tension of the belt 2.

In Fig. 6 of the drawings there is shown a change speed device embodying the invention in which a shaft 30 driven from a suitable source of power by a belt 31 carries a drive pulley 32 over which run two belts 33 and 34. The belt 33 drives a pulley 35 provided with a compressible covering sleeve 36 and keyed to a fixed shaft 37. The belt 34 drives a pulley 38 provided with a compressible covering sleeve 39 and keyed to a fixed shaft 40. The belt 33 is provided with an adjustable tensioning device 41 and the belt 34 with an adjustable tensioning device 42. An increase in the tension of the belt 33 will cause a reduction in the effective diameter of the pulley 35 and an increase in the speed of rotation of the shaft 37. An increase in the tension of the belt 34 will effect a reduction in the effective diameter of the pulley 38 and an increase in the speed of the shaft 40. The shafts 37 and 40 may be connected by suitable gearing to separate rotating parts of a machine or to separate mechanisms operating synchronously. By tightening one belt and slackening the other the speed of rotation of one of the belt driven pulleys may be increased and the other decreased, thus providing a variation of speed ratios throughout a greater range. Also, by differential adjustments of the tensioning devices very minute changes in speed ratios may be accurately made.

In Fig. 7 of the drawings the invention is shown applied to the driving of the printing and impression cylinders 50 and 51 of a cylinder printing press. In this modification the printing cylinder 50, which may be positively driven, carries a gear 52 which meshes with a gear 53 fixed to a shaft 54 which carries a plain pulley 55. The impression cylinder 51 has a shaft 56 to which is fixed a pulley 57 which has a compressible covering sleeve 58. A belt 59 extends over the pulleys 55 and 57 and this belt is provided with an adjustable tensioning device 60. An increase in the tension of the belt 59 will reduce the

effective diameter of the pulley 57 and reduce the speed of rotation of the impression cylinder.

It will be apparent that the device of the present invention provides a simple and convenient means for effecting minute variation in the ratio of speeds of two driven elements or mechanisms by providing a means for effecting minute variations in the effective diameter of one or more driving pulleys.

The principles of the present invention may be utilized in various ways, numerous modifications and alterations being contemplated, substitution of parts and changes in construction being resorted to as desired, it being understood that the embodiments shown in the drawings and described above are given merely for purposes of explanation and illustration without intending to limit the scope of the claims to the specific details disclosed.

What I claim is:

1. A change speed device comprising two power transmission members, one an endless belt and the other a pulley having a body portion and a peripheral portion over which the belt passes composed of elastic compressible material and extending around the body portion, and means for varying the tension of the belt to vary the radial pressure exerted by the belt on the periphery of said pulley and thereby vary the effective diameter of the part of the pulley engaged by the belt.

2. A change speed device comprising two power transmission members, one an endless belt and the other a normally cylindrical pulley over which the belt passes, said pulley having a body portion and a peripheral belt engaging portion composed of elastic rubber extending around its belt-engaging periphery, and an adjustable tensioning device for varying the tension of the belt to vary the radial pressure exerted by the belt on the elastic rubber periphery of said pulley and thereby vary the effective diameter of the part of the pulley engaged by the belt.

3. A change speed device comprising a driving shaft, a driven shaft, pulleys fixed to said shafts, one of said pulleys having its periphery formed of a compressible material, a belt running over said pulleys, and means for varying the tension of the belt to vary the effective diameter of the belt engaging part of the pulley which has a compressible periphery.

4. A change speed device comprising a drive shaft, two driven shafts, pulleys attached to said shafts, the pulleys on the driven shafts, each having a body portion and a compressible covering forming the belt engaging periphery thereof, separate driving means from the drive shaft to each of the driven shafts including a belt running over each of the driven pulleys, and means for independently tensioning said belts to vary the effective diameter of the portions of the driven pulleys engaged by the belts and thereby vary the speed ratios between said drive shaft and said driven shafts.

5. A change speed device comprising two power transmission members, one in the form of a belt and the other in the form of a pulley member over which the belt passes, said pulley member having a belt engaging periphery which is normally cylindrical in shape and including means forming a part thereof whereby the effective diameter of that part of the member in contact with the belt is varied in response to variations in belt tension, and means for varying the tension of the belt to increase or decrease the effective

diameter of the part of the pulley member in contact with the belt and thereby vary the speed ratio between the pulley and belt.

6. A change speed device comprising a driving shaft, a driven shaft, a driving belt, pulley members over which the belt passes, one of said pulley members having a belt engaging periphery which is normally cylindrical in shape and including means forming a part thereof whereby the ef-

fective diameter of that part of the member in contact with the belt is varied in response to variations in belt tension, and means for varying the tension of the belt to increase or decrease the effective diameter of the part of the pulley member in contact with the belt and thereby vary the speed ratio between the pulley and belt.

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