April 10, 1945. C. H. DUFFY 2,373,107

MECHANICAL MOVEMENT

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Fig. 1.

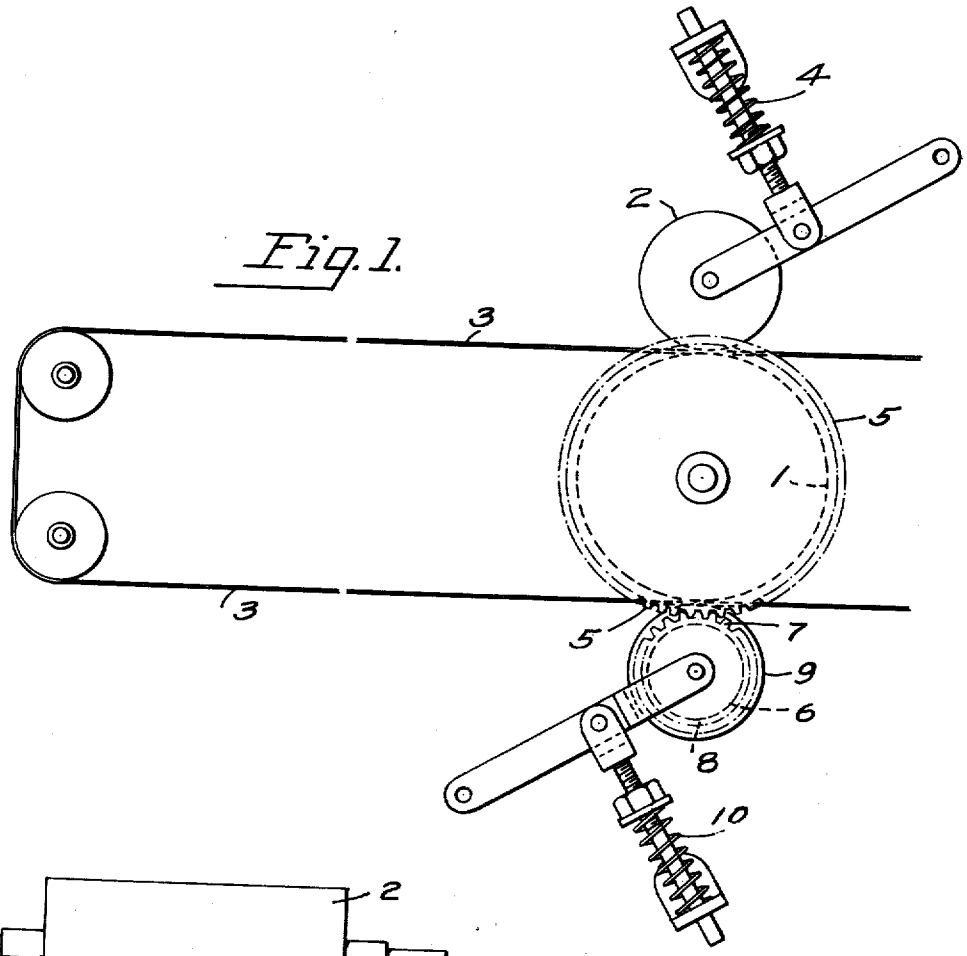
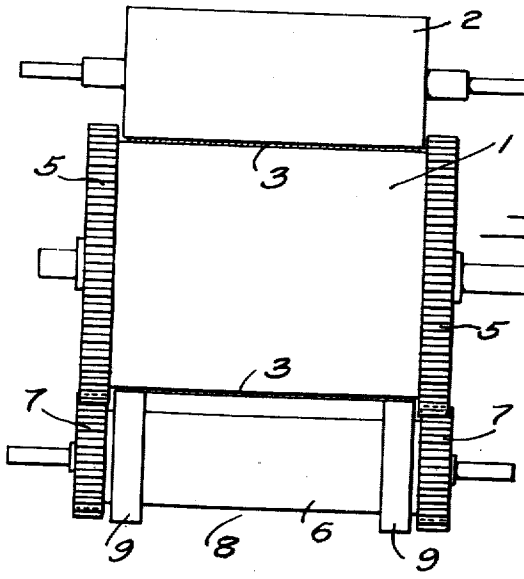


Fig. 2.



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MECHANICAL MOVEMENT

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5 Claims. (Cl. 271—2.3)

(Granted under the act of March 3, 1883, as amended April 30, 1928; 370 O. G. 757)

The invention described herein may be manufactured and used by or for the Government of the United States for governmental purposes without the payment to me of any royalty thereon in accordance with the provisions of the act of April 30, 1928, (Ch. 460, 45 Stat. L. 467).

This invention relates to a novel mechanical movement particularly designed for feeding and drawing a strip or tape of flexible material, the elements being so constructed and arranged that the rotation of the strip or tape feeding member also functions to draw the strip or tape and tends to draw the same at a speed slightly in excess of the speed at which the strip or tape is fed by the feeding member, thus subjecting the strip or tape to tension, the force of which may be varied as conditions may require.

The invention consists of the novel mechanism employed for the accomplishment of the above stated purpose, all of which will first be fully described and afterwards specifically pointed out in the appended claims.

Referring to the accompanying drawing:

Fig. 1 is a diagrammatic view of the mechanical movement illustrating a strip or tape as being fed and drawn thereby; and

Fig. 2 is an end elevation of the same.

In mechanical movements of this type it is usual to arrange a concentric strip or tape feeding wheel or roller in frictional contact with the strip or tape so that the strip or tape will be advanced by the rotation of the wheel, and to return the strip or tape into frictional contact with the same concentric feeding wheel, whereby the strip or tape is both advanced and drawn by the feeding wheel at uniform speed and without imparting any tension to the strip or tape. If and when slippage occurs, or any stretching or elongation of the strip or tape results during its travel from the tape feeding wheel back to the said wheel, the strip or tape becomes slack and will remain slack, since such mechanisms contemplate no function of subjecting the strip or tape to tension by tending to draw the tape at a greater speed than it is being fed. Such mechanisms are therefore faulty in this most important respect.

In order to feed a strip or tape by frictional contact with a rotating element and to draw the tape by frictional contact with the same rotating element and subject the strip or the tape to a constant tension by tending to draw the same at a speed greater than it is being fed by the same rotating element, I provide the strip or tape feeding and drawing wheel 1 and a spring tensioned roller 2 in contact therewith. The strip or tape 3 passes between this wheel and roller 1 and 2 and as the wheel 1 is rotated the strip or tape 3 is fed at the same peripheral speed at which the roller 1 is driven, the tension exerted by the spring 4 on the roller 2, being such as to provide the friction sufficient to feed the tape between the wheel and roller 1 and 2.

Concentrically fixed to the sides or faces of the feeding and drawing wheel and rotatable therewith, are light spur gears 5, while under said wheel 1 is a roller 6 having fixed to the sides or faces thereof and rotatable therewith light spur gears 7 meshing with the spur gears 5 on the wheel 1, so that the roller 6 will be positively rotated by the feeding and drawing wheel 1. While I have illustrated two pairs of the spur gears 5 and 7, a single pair of such gears will be sufficient to communicate the rotary motion of the wheel 1 to the roller 6.

It will be noted that the diameters of the spur gears 5 fixed on the wheel 1 are slightly greater than the diameter of the wheel, and it will be noted that the diameters of the spur gears 7 fixed on the roller 6 are slightly less than the maximum diameter of the roller 6. It will also be noted that nearly the entire surface of the roller 6 is reduced at 8 to a slightly less diameter than the two end portions 9 thereof, between which portions 9 and the feeding and drawing wheel 1, the strip or tape 3 is drawn.

The end portions 9 of the roller 6 are held in contact with the strip or tape 3 by pressure exerted by a spring 10 to provide frictional contact with the strip or tape of both the roller 6 and wheel 1. The spring pressure exerted on the roller 6 is adjustable as well as the spring pressure exerted on the uppermost roller 2, so that the friction between the strip or tape 3 and the wheel 1 and roller 2 is at all times greater than the friction between the strip or tape 3 and the wheel 1 and roller 6.

Having thus described the several parts of the movement, its operation is as follows:

After the strip or tape 3 is fed from between the wheel 1 and the uppermost roller 2 for any desired purpose, it is returned to the wheel 1, as shown in Fig. 1, and passes between said wheel 1 and the lowermost roller 6, so that the wheel 1 is both a tape feeding and tape drawing wheel.

The strip or tape is fed by the feed wheel 1 at the same peripheral speed as that of the wheel 1, and as the spur gears 5 and 7 are driven by the wheel 1 and are in mesh, the peripheral speeds of these spur gears 5 and 7 are the same. But it will be noted that since the diameters of the spur

gears 5 are slightly greater than the diameter of the wheel 1, the peripheral speed of said spur gears 5 is slightly greater than the peripheral speed of the feeding wheel 1 in operation, and consequently the peripheral speed of the spur gears 7 is also slightly greater than the peripheral speed of the feeding roller 1. It will also be noted that the diameters of the end portions 9 of the roller 6 are slightly greater than the diameters of the spur gears 7. Consequently the peripheral speed of the end portions 9 of the roller 6 is slightly greater than the peripheral speed of the spur gears 7. Thus the peripheral speed of the end portions 9 of the roller 6 has been stepped up through two stages so that it is slightly greater than the peripheral speed of the feeding wheel 1.

The result of this is that as the strip or tape is drawn between the feeding wheel 1 and the lowermost roller 6, the end portions 9 which are in frictional contact with the strip or tape are rotating at a peripheral speed which is slightly in excess of the peripheral speed of the feeding wheel 1, at which latter speed the strip or tape is being fed by the feed wheel 1. As a consequence of this, the end portions 9 of the roller 6 tend to draw the strip or tape between the roller 6 and the wheel 1 at a greater speed than the roller 1 is feeding it. But as the friction between the feeding wheel 1 and the strip or tape 3 by the pressure of the uppermost roller 2 is maintained greater than the friction between the feeding wheel 1 and the lowermost roller 6, slippage occurs between the end portions 9 of the roller 6 which are in frictional contact with the strip or tape 3, so that the strip or tape is put under a tension, the force of which may be regulated by increasing or diminishing the spring pressure exerted on the roller 6.

It will be noted that no part of the lower roller 6 is in frictional contact with the wheel 1 and that no slippage occurs between the roller 6 and the wheel 1 since the roller 6 is positively driven by the gears 5 which are fixed on the roller 1 meshing with the gears 7 which are fixed on the roller 6. Consequently all slippage of the faster driven roller 6 occurs between the end portions 9 of the roller 6 and the actual surface of the tape against which it is pressed. The advantages of this construction is that the peripheral speed of the portions 9 of the roller 6 is always maintained in excess of the peripheral speed of the wheel 1 and of the tape 3 so that this relation remains constant regardless of the amount of pressure exerted on the roller 6 to bias the same against the tape. Consequently the tape 3 is, in operation, always subjected to a constant tension of whatever value is required, which is maintained constant over long periods of operation.

If, on the other hand, slippage were provided for between the wheel 1 and the roller 6 a constant relation of peripheral speeds of wheel and roller could not be maintained since slippage might then occur partly between the wheel 1 and roller 6 and partly between the roller 6 and the tape 3, with the preponderance of the friction and consequent drag shifting back and forth from one pair of the friction surfaces to the other, as the smoothness of the surfaces varied due to wear.

It will also be noted that the two spur gears 5 on the feeding wheel 1 act as guides for the strip or tape both as it is being fed and as it is being drawn. It will also noted that the reduced portion 8 of the lowermost roller 6 insures that the whole surface of the strip or tape, except the edge margins thereof are out of contact with the roller 6 so that any printing or other marking thereon will not be smeared or defaced by reason of the slippage of the roller 6 relative to the surface of the strip or tape 3.

What I claim is:

1. The mechanism for feeding and drawing a tape or strip which includes a tape feeding and drawing wheel, a spring pressed roller in cooperative association with the tape feeding and drawing wheel between which tape feeding and drawing wheel and said roller a tape or strip is fed upon rotation of the tape feeding and drawing wheel, a spring pressed roller in cooperative association with the tape feeding and drawing wheel between which tape feeding and drawing wheel and the last mentioned roller the tape or strip is drawn, drive means between the drawing wheel and the last-mentioned spring pressed roller for maintaining the wheel and roller in driving relationship when the axis of rotation of the roller is moved relatively to the axis of rotation of the wheel by the passage between the wheel and roller of strip material of varying thicknesses, which drive means includes spur gears positively fixed on and rotatable with the tape feeding and drawing wheel which are of larger diameter than that of the tape feeding and drawing wheel and spur gears positively fixed on the last mentioned roller and meshing with the spur gears fixed on the tape feeding and drawing wheel which latter spur gears are of smaller diameter than that of the last mentioned roller, said last mentioned roller having its diameter reduced intermediate its end portions so as to avoid contact with the strip or tape except at its end portions, the whole arranged whereby, in operation, the peripheral speed of the last mentioned roller is positively maintained greater than the peripheral speed of the tape feeding and drawing wheel whereby slippage is wholly confined between the last mentioned roller and the surface of the tape, thereby tending to draw the tape or strip between the tape feeding and drawing wheel and the last mentioned roller at a speed greater than it is fed between the tape feeding and drawing wheel and the first mentioned roller, thereby imposing a constant tension on the tape or strip.

2. The mechanism for feeding and drawing a tape or strip which includes a tape feeding and drawing wheel, a resiliently pressed roller in cooperative association with the tape feeding and drawing wheel, between which wheel and roller a tape or strip is fed upon rotation of the wheel, a resiliently pressed roller in cooperative association with the tape feeding and drawing wheel, between which wheel and last mentioned roller the tape or strip is drawn, drive means between the drawing wheel and the last-mentioned spring pressed roller for maintaining the wheel and roller in driving relationship when the axis of rotation of the roller is moved relatively to the axis of rotation of the wheel by the passage between the wheel and roller of strip material of varying thicknesses, which drive means includes a spur gear positively fixed on the tape feeding and drawing wheel of larger diameter than that of the tape feeding and drawing wheel and a spur gear positively fixed on the last mentioned roller and meshing with the spur gear fixed on the tape feeding and drawing wheel and of smaller diameter than that of the last mentioned roller, the whole arranged whereby, in operation, the peripheral speed of the last mentioned roller is posi-

tively maintained greater than the peripheral speed of the tape feeding and drawing wheel whereby slippage is wholly confined between the last mentioned roller and the surface of the tape, thereby tending to draw the tape or strip between the tape feeding and drawing wheel and the last mentioned roller at a speed greater than it is fed by the tape feeding and drawing wheel and the first mentioned roller so as to impose a constant tension on the tape or strip.

3. The mechanism for feeding and drawing a tape or strip which includes a tape feeding and drawing wheel, a resiliently pressed roller in cooperative association with the tape feeding and drawing wheel, between which wheel and roller a tape or strip is fed upon rotation of the wheel, a resiliently pressed roller in cooperative association with the tape feeding and drawing wheel, between which wheel and last mentioned roller the tape or strip is drawn, drive means between the drawing wheel and the last-mentioned roller for maintaining the wheel and roller in driving relationship when the axis of rotation of the roller is moved relatively to the axis of rotation of the wheel by the passage between the wheel and roller of strip material of varying thicknesses for positively rotating the last mentioned roller by the tape feeding and drawing wheel to cause the last mentioned roller, to rotate and maintain, in operation a peripheral speed greater than the peripheral speed of the tape feeding and drawing wheel whereby slippage is wholly confined between the last mentioned roller and the surface of the tape, thereby tending to draw the tape or strip between the tape feeding and drawing wheel and the last mentioned roller at a speed greater than it is fed by the tape feeding and drawing wheel and the first mentioned roller, so as to impose a constant tension on the tape or strip.

4. The mechanism for feeding and drawing a tape or strip which includes a tape feeding and drawing wheel, a roller in cooperative association with the tape feeding and drawing wheel, between which wheel and roller a tape or strip is fed upon rotation of the wheel, a roller in cooperative association with the tape feeding and drawing wheel, between which wheel and last mentioned roller the tape or strip is drawn, drive means between the drawing wheel and the last-mentioned roller for maintaining the wheel and roller in driving relationship when the axis of rotation of the roller is moved relatively to the axis of rotation of the wheel by the passage between the wheel and roller of strip material of varying thicknesses for positively rotating the last mentioned roller to maintain peripheral speed, in operation greater than the peripheral speed of the tape feeding and drawing wheel whereby slippage is wholly confined between the last mentioned roller and the surface of the tape, thereby tending to draw the tape or strip between the tape or strip feeding and drawing wheel and the last mentioned roller at a speed greater than it is fed by the tape feeding and drawing wheel and the first mentioned roller, so as to impose a constant tension on the tape or strip.

5. The mechanism for feeding and drawing a tape or strip which include a tape or strip feeding and drawing wheel for feeding a tape or strip at a speed corresponding to the peripheral speed of the tape feeding and drawing wheel, a roller for pressing the tape or strip into frictional contact with the tape or strip feeding and drawing wheel, drive means between the feeding and drawing wheel and the roller for maintaining the wheel and roller in driving relationship when the axis of rotation of the roller is moved relatively to the axis of rotation of the drawing wheel by the passage between the wheel and roller of strip material of varying thicknesses and to maintain the roller at a peripheral speed greater than the peripheral speed of the tape feeding and drawing wheel to cause the strip or tape to tend to be drawn at a speed greater than it is being fed by the said wheel, whereby a constant tension is imposed on the tape or strip.

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