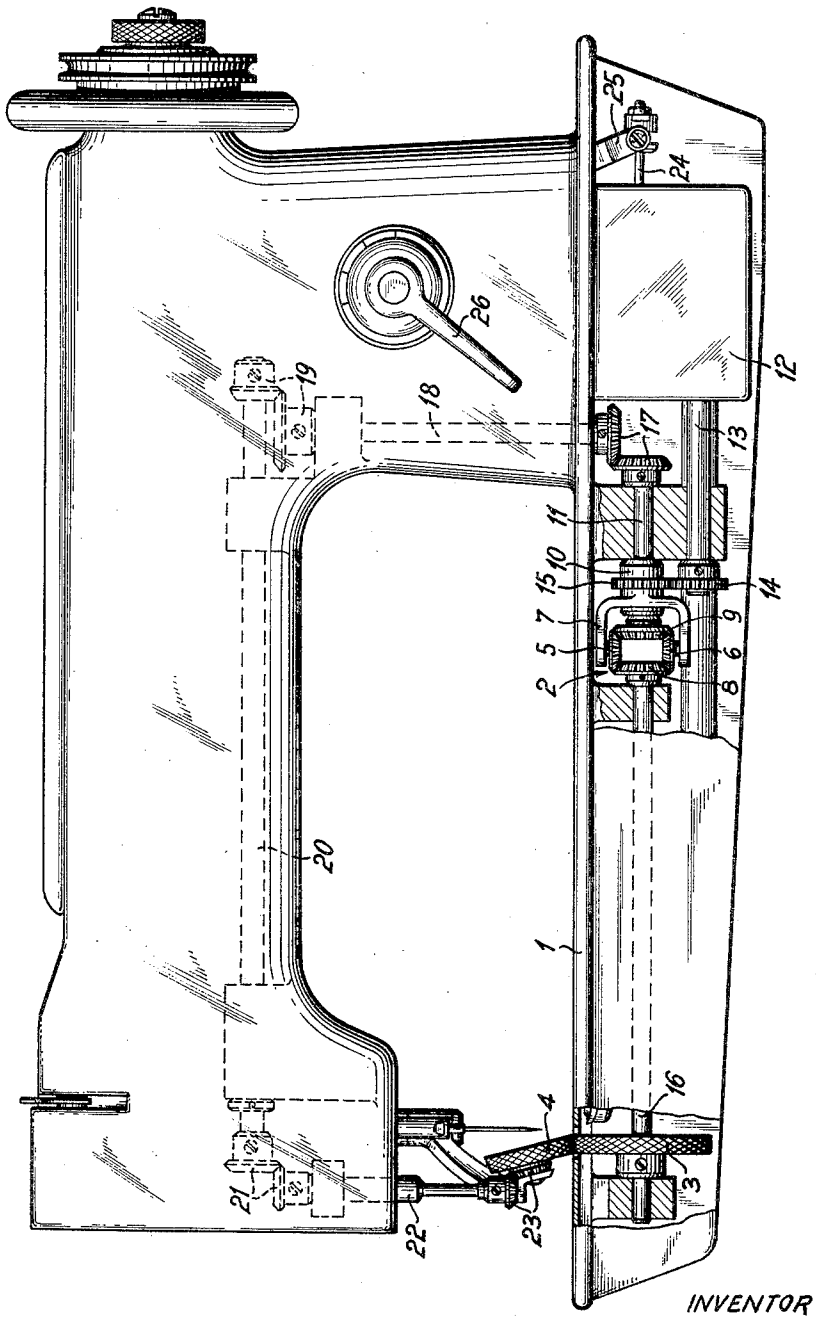
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SEWING MACHINE WITH FEED WHEEL FEEDING

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SEWING MACHINE WITH FEED WHEEL FEEDING

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The invention relates to a sewing machine provided with feed wheel feeding means and a driven roller foot.

For sewing together layers of material it is desirable that they are supplied to the sewing area at the same velocity without there being any movement of the individual layers of material relative to one another during the sewing operation. Furthermore, it is desirable to provide good supervision at the area of sewing as well as the possibility of sewing sharp curves and obtaining reliable guiding of the material. It has been attempted to attain these features with the aid of feeding mechanisms which feed the material along its bottom side by means of a feed wheel and along its top side by means of a roller foot which is driven in synchronism with the feed wheel.

If there are elevations in the material being sewn, over which it is necessary to sew or in changing over from one thickness of material to the other, there arise difficulties in that the roller foot and the feed wheel must cover paths of different length. This results in that the one layer of material is displaced with respect to the other layer.

It is an object of the invention to provide for the feed wheel and the roller foot being both driven in such a manner that differences between the circumferential paths of the two feed wheels during the sewing operation are automatically compensated.

In accordance with the invention, this object is achieved in that a differential gear of a type known per se is arranged between a common gear mechanism for the stitch length and the drive shafts for the feed wheel and for the roller foot.

It is particularly advantageous to arrange the differential gear coaxially with the shaft of the feed wheel, for in this manner additional transfer elements are eliminated.

Further objects of the invention and details of the advantages attained thereby will become apparent from the following description of an embodiment of the new drive means which is illustrated in the drawing.

The drawing shows an elevational view of the sewing machine partly in cross section to expose the parts which are essential for the operation.

A differential gear assembly 2 is provided below the work plate 1 of the sewing machine by way of which a feed wheel 3 and a spring biased roller foot 4, such as known per se, are driven.

The differential transmission 2 comprises two intermediate bevel gears 5, 6, a shackle member 7 and two drive pinions 8, 9. The shackle 7 has a hub 10 and rotatably supports the two bevel gears 5, 6 and is rotatably journalled on a shaft 11 which supports the pinion 9.

The differential 2 is driven from an adjustable transmission 12 of known construction by way of a shaft 13 carrying a toothed gear 14 which meshes with a toothed gear 15 provided around the hub 10 on the shackle 7.

The differential 2 transmits the driving forces to the feed wheel 3 by way of the pinion gear 8 and shaft 16 and the pinion gear 9 on shaft 11 transmits the driving forces to the roller foot 4 by way of a pair of bevel gears 17, a shaft 18 journalled in the standard of the machine, a pair of bevel gears 19, a shaft 20 journalled in the horizontal machine arm, a pair of bevel gears 21, a shaft 22 projecting downwardly out of the machine head and a

pair of bevel gears 23, one of which is on the roller foot 4.

The setting of the transmission 12 is effected by means of bars 24, 25 associated with the adjusting lever 26. By these means the speed of rotation of the shaft 13 is changed and thus the velocity of feed of the feed wheel 3 and of the roller foot 4 which determines the stitch length.

The feeding mechanism operates in the following manner:

The two feed wheels, i.e., the wheel 3 and the roller foot 4 engage the material at their rolling point and advance the material between them. If the material has elevations over which it is necessary to sew, for example, transversely disposed strips of material, pleats, hem seams, decorative trimming as on shoes or the like, then the circumference of the wheel which feeds on the side of the material on which the elevation exists must, in order to climb over the elevation, move over a longer path than the wheel or roller which engages on the side opposite to that where the elevation is located, i.e on. the flat side of the material. When an elevation encounters the circumference of a feed wheel, the wheel is engaged at one place along its circumference which has not as yet fully reached the normal rolling point so that the particular feed wheel on encountering an elevation contacts the material in two places, the rolling point being one, and the starting place of the elevation the other point of contact.

However, the feed wheel is not yet able at the starting point to transmit feeding force to the material because the location opposite the starting place likewise has not yet arrived at the rolling point, so that the material in this location is not yet subjected on both sides to the spring pressure acting on the roller foot. Therefore the advancing of the material continues to take place at the rolling point of the feed wheels in a manner that the material at the starting point is forced away in the direction of the feed wheel which engages the even side of the material until the place on the opposite side of the starting point comes in contact with the wheel which engages there. Now the material has located itself completely at its even side from the rolling point to the place opposite the starting point onto the circumference of the feed wheel which is effective there, while the feed wheel in engagement with the elevation engages only at the rolling point. To enable feeding the material having the elevation between the feed wheels the spring loaded roller foot 4 must be raised an amount equal to the thickness of the elevation. The raising of the roller foot requires an increased feeding force and that is transmitted or applied to the material by the two feed wheels in proportion to their engagement planes. Since the engagement plane of the material at the feed wheel on the even side of the material is always the greater, that wheel also takes over the greater part of the feeding forces. However, if a larger feeding force is taken away from this feed wheel, then the opposite force acting on it in the area of contact with the material is greater than that of the feed wheel engaging the elevation. As soon as the differential opposite force acts on the feed wheels, the differential 2 becomes effective in a known manner, decreasing the circumferential speed of the wheel acting on the even side of the material and increasing the circumferential velocity of the feed wheel which climbs over the elevation.

Together with the differing circumferential velocities thus developed the circumferential paths of the feed wheels change likewise, so that the feed wheel climbing the elevation can cover the greater feeding path at its location without compensating operations by the operator. However, the reducing of the circumferential velocity of the feed wheel acting on the even side of the material

effects a decrease in the material feed due to the decreased circumferential path, thus decreasing the stitch length while sewing over elevations. This decrease, however, is so negligible that the over-all picture of the seam has an even appearance.

As used in the claims the terms feed wheel drive shaft and roller foot drive shaft refer to shaft **16** to which the feed wheel is directly connected and to the shaft **11** which is connected to the roller foot by intermediary gears and shafts.

Having now described my invention with reference to the embodiment illustrated in the drawing, I do not wish to be limited thereto, but what I desire to protect by Letters Patent of the United States is set forth in the appended claims.

1. In a sewing machine of the type provided with a feed wheel and a driven roller foot and having a feed wheel drive shaft and a roller foot drive shaft, and an adjustable transmission for the stitch length including a common drive shaft, a differential gear means including a shackle member having a driving connection with said common drive shaft and rotatably supporting a pair of bevel gears, a pinion secured to said feed wheel drive shaft and a pinion secured to said roller foot drive shaft, said pair of bevel gears meshing with said pinions and being operative to permit differential movement of said feed wheel drive shaft and of said roller foot drive shaft.

2. In a sewing machine of the type provided with a feed wheel and a driven roller foot and having a feed wheel drive shaft and a roller foot drive shaft, and an adjustable transmission for the stitch length including a common drive shaft, a differential gear means including a shackle member having a driving connection with said common drive shaft and rotatably supporting a pair of bevel gears, a pinion secured to said feed wheel drive shaft and a pinion secured to said roller foot drive shaft, said pair of bevel gears meshing with said pinions and being operative to permit differential movement of said feed wheel drive shaft and of said roller foot drive shaft, said shackle member having a hub presenting a toothed gear and said common shaft having a gear meshing with said toothed gear.

3. In a sewing machine of the type provided with a feed wheel and a driven roller foot and having a feed wheel drive shaft and a roller foot drive shaft, and an adjustable transmission for the stitch length including a common drive shaft, a differential gear means including a shackle member having a driving connection with said common drive shaft and rotatably supporting a pair of bevel gears, a pinion secured to said feed wheel drive shaft and a pinion secured to said roller foot drive shaft, said pair of bevel gears meshing with said pinions and being operative to permit differential movement of said feed wheel drive shaft and of said roller foot drive shaft, said shackle member having a hub presenting a toothed gear and said common shaft having a gear meshing with said toothed gear, said feed wheel being disposed endwise of said feed wheel drive shaft below said machine head and in said base and said roller foot being supported below said machine head proximate said feed wheel above said base for cooperation with said feed wheel and being connected to said roller foot drive shaft by intermediate shafts and gears carried by said machine head, arm and standard.

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