The present invention relates to a two-speed drive for sewing machines. More particularly, the present invention is directed to a two-speed planetary drive such as forms the subject matter of the United States patent application of Hayes, Serial No. 768,311, filed October 20, 1958, now Patent No. 2,956,810.

The primary object of the invention is to provide an improved control mechanism for a two-speed planetary drive of the type disclosed in the above-named Hayes patent application, wherein the control mechanism is simple and economical, dependable, durable and easy to operate. A further object of the invention is to provide such a drive which can be operated in both directions with a minimum of friction and in engagement with the planets 8. The peripheries of the planets 8 are provided with a friction-enhancing resilient material such as rubber to ensure against slipping of the planets 8 relatively to the surfaces 13 and 20. The planet carrier 7 is adapted to be released and clamped on the sleeve 5 for unitary rotation therewith and thus for unitary rotation with the main shaft 4 by means of a conventional mechanism including a clamp nut 21 having a shank 22 threaded into the internally threaded end of the sleeve 5 below the end of the main shaft 4 and having an enlarged head 23 that is adapted to be grasped and turned in the usual manner. A clamp was interposed between the head 23 of the clamp nut and the end of the hub of the planet carrier 7. The washer 24 is keyed to the sleeve 5 by ears 25 engaging in grooves 26 and in the end of the sleeve 5. When the nut 21 is turned down, the hub of the planet carrier 7 is clamped between the washer 24 and a shoulder 27 formed by the enlarged diameter portion 10 of the sleeve.

There is also illustrated in the drawings a conventional belt cover 28 mounted as by screws 29 on the end of the bracket arm 2 and having a hook 30 that overlies the inner portion of the driving member 14 in which the belt groove 16 is formed. In the usual fashion the belt cover 28 carries a bobbin winder 31 which includes a bobbin receiving spindle 32 having a driving wheel 33 that is adapted to be swung into engagement with the periphery of the portion 16 of the driving element 14 for rotating the spindle 32 and to be swung away from and out of engagement with the portion 16.

For selectively locking the reaction element 9 to the frame of the machine, thus holding it stationary and to the driving element 14, thus securing the elements 14 and 9 together for unitary rotation, there is provided a locking means comprising a locking element 34 preferably formed of sheet metal and having a bifurcated end defining tines 35 straddling the shaft 4 and pivotally mounted at the ends thereof on the reaction element 9. The pivotal mounting of the locking element 34 in the reaction element 9 comprises lugs 36 into which are threaded shoulder screws 37 upon the enlarged diameter portion of which are pivotally mounted the ends of the tines 35. The locking element 34 is made relatively tight on the screws 37 so that it will frictionally remain in set position. The pivot axis of the locking element is disposed in a plane normal to the axis of the main shaft 4 and specifically, in the preferred embodiment of the invention, it is made normal to the axis of the reaction element 9.

The locking element 34 also includes a laterally extending arm 38 that is adapted upon pivotal movement of the locking element to enter a notch or groove 39 in the belt cover 28 or a similar groove 40 on the belt pulley portion 16 of the driving element 14. To hold the locking element 34 with the arm 38 in the groove 40, there is provided an aperture 41 in the rear wall of the reaction element 9, which aperture is partially closed by a spring wire 42 secured to the rear wall of the reaction element 9 by screws 43. The locking element 34 carries a stud 44 that is adapted to be projected into the aperture 41 upon pivotal movement of the arm 38 toward the reaction element 9 and away from the notch 39. The stud 44 is of a diameter such that the spring wire 42 must be deflected in order for it to enter the aperture 41 and it is provided with a peripheral groove 45 into which the spring wire 42 seats to hold the locking element 34.

With the mechanism as described, it will be seen that, with the clamp nut 21 backed-off, the planet carrier 7 is free to rotate relatively to the sleeve 5 so that no rotation is imparted to the shaft 4 when the driving element 14 is rotated. This condition is for bobbin winding. When clamp nut 21 is turned down, the planet carrier 7 is clamped to the sleeve 5 and thus locked to the shaft 4 for unitary rotation. In this condition, with
the reaction element 9 locked to the driving element 14 by seating the arm 38 in the groove 40, that is, in the full line position of FIG. 3, rotation imparted to the driving element 14 by the belt 19 will be transmitted directly to the shaft 4 since, with the reaction element 9 and driving element 14 locked together for unitary rotation, the planets 8 are held against turning and are therefore merely carried around with the elements 9 and 14, thereby rotating the planet carrier 7 and thus the shaft in unison with the driving element 14. This is the normal drive arrangement. When the locking arm 38 is moved from the groove 40 to the groove 39, the reaction element is locked to the frame and thus held stationary so that, when rotation is imparted to the surface 20 by rotation of the driving element, the planets 8 must roll relatively to the surface 13. The planet carrier is thus advanced in the same direction of rotation as the driving element but at a reduced speed which is determined by the difference in the length of the surfaces 13 and 20. In the illustrated device, this reduction in speed is approximately three and one-half to one.

Numerous alterations of the structure herein disclosed will suggest themselves to those skilled in the art. However, it is to be understood that the present disclosure relates to a preferred embodiment of my invention which is for the purposes of illustration only and not to be construed as a limitation of the invention. All such modifications which do not depart from the spirit of the invention are intended to be included within the scope of the appended claims.

Having thus described the nature of this invention, what I claim herein is:

1. In a sewing machine having a frame, a main drive shaft journaled for rotation in said frame, and a planetary drive unit for said shaft comprising a planet carrier mounted on said shaft, means for securing said planet carrier to said shaft for unitary rotation, a driving element and a reaction element mounted on said shaft for independent rotation relatively to said shaft, said driving element and said reaction element having coaxial planet engaging surfaces, a plurality of planets carried by said planet carrier and disposed between and in operative engagement with said planet engaging surfaces, and a locking element having a laterally extending arm, means for pivotally mounting said locking element for unitary rotation about an axis in a plane normal to the axis of said shaft and for movement of said arm between a locking position relative to said driving element and a locking position relatively to said frame, and means on said frame and on said driving element for engaging with said arm when in said locking position relatively thereto for securing said reaction element respectively against rotation relatively to said frame and for unitary rotation with said driving element.

2. In a sewing machine in accordance with claim 1 in which said last mentioned means comprises notches on said frame and said driving element for receiving said arm when in locking position relative thereto.

3. In a sewing machine in accordance with claim 1 in which said means for pivotally mounting said locking element on said reaction element defines a pivot axis for said locking element that is normal to the axis of said shaft, said locking element having a bifurcated end opposite to said locking arm defining tines straddling said shaft and pivotally connected at the ends thereof to said reaction element.

4. In a sewing machine in accordance with claim 1 having a belt cover secured to said frame and overhanging a portion of said driving element, and in which said last mentioned means comprises means on said belt cover and on said driving element for cooperating with said arm.

5. In a sewing machine having a frame, a main shaft journaled for rotation in said frame, a sleeve secured on the end of said shaft, a planetary drive unit for said shaft comprising a planet carrier mounted upon said sleeve, means for securing said planet carrier to said sleeve for unitary rotation, a driving element and a reaction element mounted on said sleeve for independent rotation relatively to said sleeve, said driving element and said reaction element having coaxial planet engaging surfaces, a plurality of planets carried by said planet carrier and disposed between and in operative engagement with said planet engaging surfaces, a locking element having a laterally extending arm, means for pivotally mounting said locking element on said reaction element for movement about an axis in a plane normal to the axis of said shaft and for movement of said arm between a locking position relative to said driving element and a locking position relatively to said frame, and means on said frame and on said driving element for cooperating with said arm when in said locking position relatively thereto for securing said reaction element respectively against rotation relatively to said frame and for unitary rotation with said driving element.

6. In a sewing machine in accordance with claim 5 in which said means for securing said planet carrier to said sleeve comprises a shoulder on said sleeve and engaged by and preventing axial movement of the hub of said planet carrier, a clamp nut having a shank threaded into the end of said sleeve, and a clamp washer keyed to said sleeve for unitary rotation, said clamp nut being opposed to said shoulder for clamping and thereby frictionally connecting said washer to the hub of said planet carrier for unitary rotation.

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