June 23, 1942. P. B. REEVES ET AL 2,287,326

PRELOADED SAFETY SPRING UNIT

Filed April 5, 1940

Fig. 1.

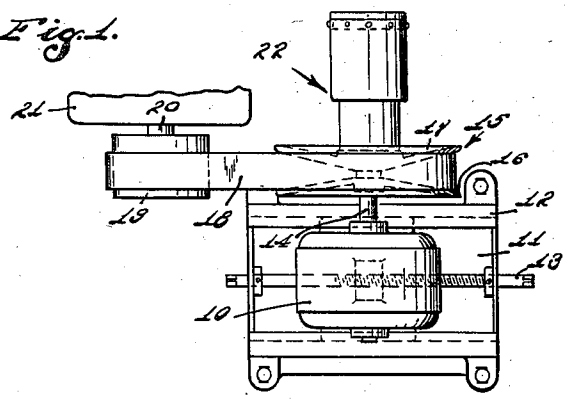


Fig. 2.

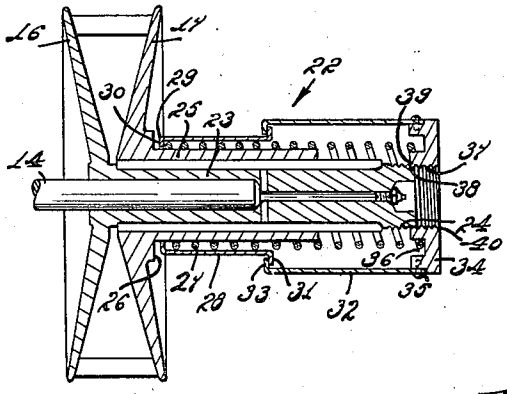


Fig. 4.

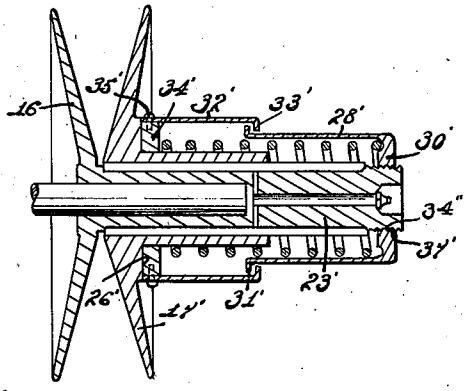
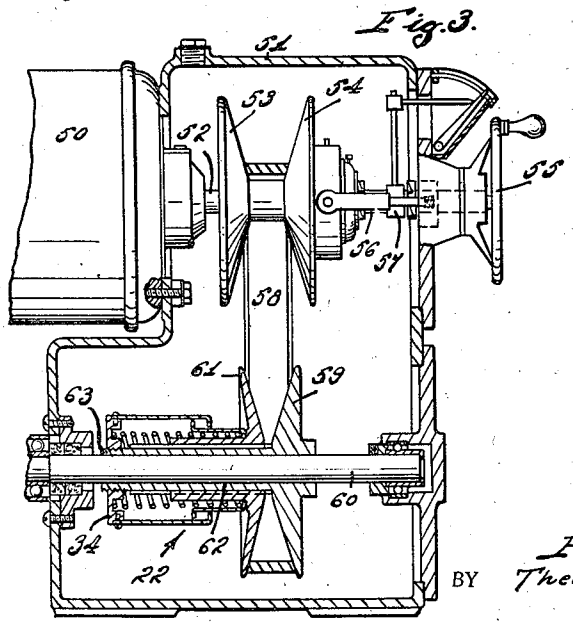


Fig. 3.



INVENTOR.
Paul B. Reeves 2nd
Theodore P. Knoedler,
BY Hood & Waters
ATTORNEYS

Patented June 23, 1942

2,287,326

UNITED STATES PATENT OFFICE

2,287,326

PRELOADED SAFETY SPRING UNIT

Paul B. Reeves and Theodore P. Knoedler, Columbus, Ind., assignors to Reeves Pulley Company, Columbus, Ind., a corporation of Indiana

Application April 5, 1940, Serial No. 328,012

8 Claims. (Cl. 74—230.17)

The present invention relates to a pre-loaded spring unit, and to the combination of that unit with a particular kind of variable speed drive mechanism.

Within the past few years, the type of variable speed drive illustrated in Patent No. 1,822,935, and the type of drive illustrated in Patent No. 2,189,711, have gained wide popularity. Such drives incorporate what has come to be known as a resiliently expansible V-pulley, which consists of a coned disc fixed to a rotatable element, a mating coned disc axially slidable with respect to the fixed disc, and a spring urging the slidable disc toward the fixed disc. As the slidable disc moves outwardly against the effect of the spring, the degree of force exerted by the spring, of course, increases. It is desirable that relatively heavy spring pressure be applied to the shiftable disc; but that the degree of that pressure shall vary only slightly between the extreme positions of the disc. The force exerted by a short, stiff spring would vary rather widely within the limits of movement of the shiftable disc; and therefore, it has been customary to use a long, relatively soft spring, pre-compressed to desired length and effective pressure. When such a spring is used, the degree of pressure exerted thereby upon the disc varies only slightly within the limits of movement of the disc.

Rather heavy spring pressures are used in units of this character, and particularly in the larger sizes thereof; and, since there is nothing about the appearance of a spring to indicate to the observer whether or not that spring is partially collapsed from its relaxed position, a spring such as that illustrated in either of the patents above mentioned is potentially dangerous to operators of the machine. If an operator, unacquainted with the fact that the spring of the unit under consideration is loaded, incautiously removes the abutment nut, that nut will fly away from the unit, when it is backed off of the final thread, with an enormous velocity; and industrial accidents have occurred as a result of this situation.

It is the primary object of the present invention to overcome the possibility of such accidents, and to render a pre-loaded spring entirely safe in the hands of the user of the equipment. As an incidental advantage of the present invention, the spring is housed, thereby preventing clothing, ropes, the hair of an operator, and the like from being caught in the rapidly rotating coiled spring.

To the accomplishment of the above and related objects, our invention may be embodied in the forms illustrated in the accompanying drawing, attention being called to the fact, however, that the drawing is illustrative only, and that change may be made in the specific constructions illustrated and described, so long as the scope of the appended claims is not violated.

Fig. 1 is a plan view of a variable speed drive of the character illustrated in Patent No. 1,822,935, but embodying the spring unit of the present invention;

Fig. 2 is an enlarged longitudinal section through the said spring unit;

Fig. 3 is a section through a unit of the character illustrated in Patent No. 2,089,711, embodying the spring unit of the present invention; and

Fig. 4 is a fragmental illustration of a modified form of spring unit.

Referring more particularly to the drawing and to the embodiment of the invention illustrated in Figs. 1 and 2 thereof, it will be seen that we have shown a motor 10 mounted upon a carriage 11 slidably supported upon bed 12, and movable with relation to the bed by means of a lead screw 13. On the spindle 14 of the motor 10 is mounted a pulley unit 15 comprising a coned disc 16 fixed to the spindle 14 and a mating coned disc 17 axially movable with respect to the disc 16. A belt 18 drives from the pulley 15 to a flat faced pulley 19 mounted on the shaft 20 of a driven machine 21. The spring unit of the present invention is illustrated generally by the reference number 22.

As is clearly shown in Fig. 2, the disc 16 is preferably provided with an elongated hub 23 projecting from the coned face thereof, the outer end of said hub being formed with screw threads as at 24. The disc 17 is likewise formed with an elongated hub 25 projecting from its outer face, and said disc 17 with its hub 25 is slidably mounted upon the hub 23, being preferably held against rotation with respect to said disc 16. The outer face of the disc 17 is preferably formed to provide an abutment surface 26.

A spring 27 is provided for constantly urging the disc 17 toward the disc 16. One end of said spring 27 is received in a housing unit 28 which, at one end, is formed with an inturned lip 29 providing an abutment surface 30 adapted to engage the surface 26. The opposite end of said unit 28 is formed with an outturned lip 31. The unit 28 is telescopically mounted within a second housing unit 32 which is formed at one end with an inturned lip 33 cooperating with the lip 31 to limit relative movement of the housing units 28 and 32 in one direction. The opposite end

of the housing unit 32 is closed by a head 34 secured in said housing unit by rivets 35, or the like, and preferably provided in its inner surface with a groove 36 for the reception of the adjacent end of the spring 27. As is clearly shown in Fig. 2, one end of the spring 27 bears against the lip 29, while the other end of said spring bears against the head 34.

In assembling the spring unit 22, the housing unit 28 is introduced through the right-hand end of the unit 32 into telescopic association therewith. Thereafter, the spring 27 is entered in the composite housing, one end being brought to bear against the lip 29. By suitable means, the spring 27 is now heavily pre-loaded by compressing the same, from its normal length which greatly exceeds the expanded length of the housing 28—32, to the length illustrated in Fig. 2; whereupon the head 34 is entered in the housing 32 and is secured in place by its rivets 35, or the like.

When the head 34 has been firmly secured in position, the unit 22 comprises a heavily preloaded spring unit which, however, is entirely safe in the hands of the user, since the spring is firmly and rigidly held against expansion beyond the length illustrated in Fig. 2.

The head 34 is formed with an axial bore which is internally threaded as at 37. It is to be noted that, as shown in Fig. 2, the overall length of the unit 22 is such that the threads 37 may be engaged with the outermost threads 38 of the threaded portion 24 of the hub 23 before bringing the abutment surface 30 into contact with the surface 26. In other words, the distance from the inner end 39 of the threaded section 37 to the remote end 30 of the housing unit 28 is less than the distance from the outer end 38 of the threaded portion 24 of the hub 23 to the adjacent surface 26 of the disc 17. But, as the unit 22 is rotated to carry the threads 37 farther onto the threads 24, the surface 30 comes into contact with the surface 26 before the head 34 has been turned down to its ultimate position. In other words, the distance from the outermost end 40 of the threaded portion 37 to the remote end 30 of the housing unit 28 is greater than the distance from the outermost portion 38 of the threads 24 to the adjacent surface 26 of the disc 17.

Thus, no resilient force need be overcome to start the unit 22 into threaded association with the hub 23. But, as the unit 22 is threaded home, the surface 30 comes into contact with the surface 26 and the lip 33 is moved, against the tendency of the spring 27, out of contact with the lip 31. Thus the resilient force of the spring 27 is applied to the disc 17 at all times after the unit 22 is threaded home. But, in removing the unit 22 from the hub 23, the threaded engagement between the unit and the hub continues until after the surface 30 has been moved away from the surface 26, so that the unit 22 is in its limit condition of expansion before that unit is disconnected from the threads 24 of the hub 23.

In Fig. 3, we have shown a variable speed drive like that illustrated in Patent No. 2,089,711, incorporating a motor 50, suitably mounted upon the external wall of a casing 51, with its spindle 52 located within said casing. A disc 53 is fixed to the spindle 52, while a disc 54 is axially movable with respect thereto through the medium of a hand wheel 55, screw 56, and nut 57, all as is clearly disclosed in the said Patent No. 2,089,711. A belt 58 forms a driving connection between the discs 53 and 54 and a pulley consisting of a disc 59 fixed to a shaft 60 and a disc 61 axially shiftable with respect thereto. A spring unit 22, identical in all respects with the unit illustrated in Fig. 2, has its head 34 threadedly mounted upon the threaded portion 63 of the hub 62 of the disc 59.

In Fig. 4, we have illustrated an obvious modification of the spring unit 22. According to this modification, the housing unit 32' is closed at one end by a head 34' suitably secured in place by rivets 35' or the like, while the other end thereof is formed with an inturned lip 33'. The head 34' is adapted to bear against the surface 26' of the pulley disc 17'; and a housing unit 28' is telescopically mounted within the unit 32', being formed with an outturned lip 31' cooperating with the lip 33'. The unit 28' is provided with an inturned lip 30' of sufficient axial thickness to permit the formation therein of threads 37' cooperable with the threads 24' of the hub 23' of pulley disc 16'.

We claim:

1. In a variable speed device, a shaft, a pulley mounted on said shaft and comprising a coned disc fixed to said shaft and having an elongated hub projecting from its coned face, a mating coned disc slidably mounted on said hub, a tubular casing fixedly secured on said hub and spaced from the coned face of said first disc by said second disc, a second tubular casing telescopically associated with said first-named casing and bearing on said second-named disc, a coiled spring received within said telescoping casings and urging separation thereof, and means limiting the degree of separation of said casings, the abutment for one end of said spring being axially removably associated with one of said casings.

2. In a variable speed device, a shaft, a pulley mounted on said shaft and comprising a coned disc fixed to said shaft and having an elongated hub projecting from its coned face, a mating coned disc slidably mounted on said hub, a tubular casing fixedly secured on said hub and spaced from the coned face of said first disc by said second disc, a second tubular casing telescopically associated with said first-named casing and bearing on said second-named disc, a coiled spring received within said telescoping casings and urging separation thereof, and means limiting the degree of relative movement of said casings under the influence of said spring to hold said spring always under distorting compression, the abutment for one end of said spring being axially removably associated with one of said casings.

3. A preloaded spring unit comprising a pair of telescoping casing elements, spring abutments at the remote ends of said elements, and said elements being formed at their telescoping ends to provide cooperating means preventing complete separation of said elements in one direction, and a coiled spring received and held in said unit, bearing against said abutments and urging said casing elements to move relatively in said one direction, one of said abutments being axially removably associated with its casing elements.

4. A preloaded spring unit comprising a pair of telescoping casing elements, spring abutments at the remote ends of said elements, and said elements being formed at their telescoping ends to provide cooperating means preventing complete separation of said elements in one direction, and a coiled spring received and held in said unit, bearing against said abutments and urging said casing elements to move relatively in said one

direction, the normal length of said spring being greater than the extreme distance between said abutments, one of said abutments being axially removably associated with its casing elements.

5. A preloaded spring unit comprising a can having an inturned lip at one end and an outturned lip at its opposite end, a second can having an inturned lip at one end, the internal dimensions of said last-named lip corresponding substantially with the external dimensions of said first-named can excluding said outturned lip, said first can being telescoped within said second can, a coiled spring received within said telescoped cans, one end of said spring bearing on said first-named inturned lip, and a head secured in place adjacent the end of said second can remote from its inturned lip and forming an abutment for the opposite end of said spring.

6. A preloaded spring unit comprising a can having an inturned lip at one end and an outturned lip at its opposite end, a second can having an inturned lip at one end, the internal dimensions of said last-named lip corresponding substantially with the external dimensions of said first-named can excluding said outturned lip, said first can being telescoped within said second can, a coiled spring having one end received in said telescoped cans and bearing on said first-named inturned lip, the normal length of said spring being greater than the expanded length of said telescoped cans, and a head fixed in the end of said second can remote from said first-named inturned lip and forming an abutment for the opposite end of said spring, holding said spring always under distorting compression.

7. The combination with an expansible pulley comprising a pair of mating, relatively axially movable coned discs, of means for resiliently urging one of said discs toward the other comprising a preloaded spring unit including a spring and two elements respectively engaging separate portions of said spring, means limiting the degree of separation of said elements, and cooperative means on one of said discs and one of said elements, mutually engageable and operative to connect said element with said disc and to adjust the relative axial positions thereof, a portion of said means on said one disc being spaced from the other of said discs a distance greater than the maximum degree of separations of said elements.

8. In combination, a rotatable element, a coned disc fixed thereto, a mating coned disc axially slidable toward and away from said first disc, the end of said element spaced from said first disc by said second disc being threaded, a spring unit comprising a first housing unit and a second housing unit telescopically axially aligned but relatively axially movable, means limiting relative movement of said units in one direction, spring abutments adjacent the remote ends of said respective units, one of said abutments being removably associated with its housing unit, and a spring bearing against said abutments and constantly resiliently urging said units to move relatively in said one direction, the abutment of one of said units being provided with an axial threaded portion cooperable with the threaded portion of said rotatable element, the distance from the adjacent end of said abutment threaded portion to the remote end of the other of said units being less than the distance from the remote end of said threaded portion of said rotatable element to the adjacent surface of said slidable coned disc, but the distance from the remote end of said abutment threaded portion to the remote end of the other of said units being greater than the distance from the remote end of said threaded portion of said rotatable element to the adjacent surface of said slidable coned disc.

PAUL B. REEVES.
THEODORE P. KNOEDLER.