Oct. 14, 1952 C. W. ROSE 2,613,865

SAFETY BELT

Filed June 13, 1947 2 SHEETS—SHEET 1

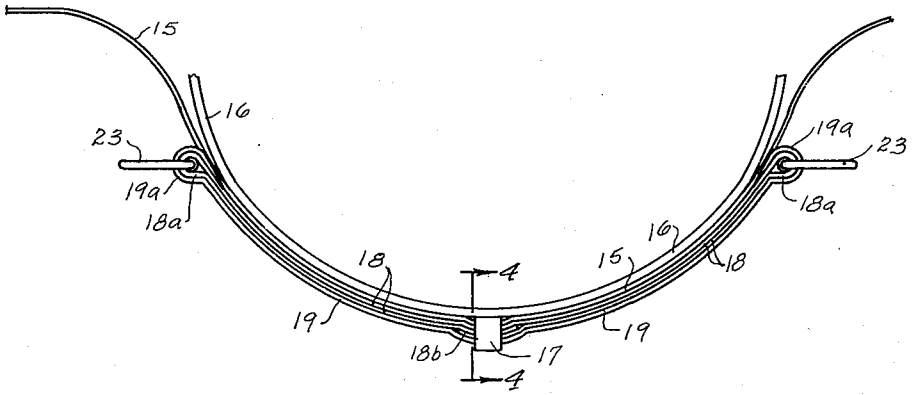

FIG. 1

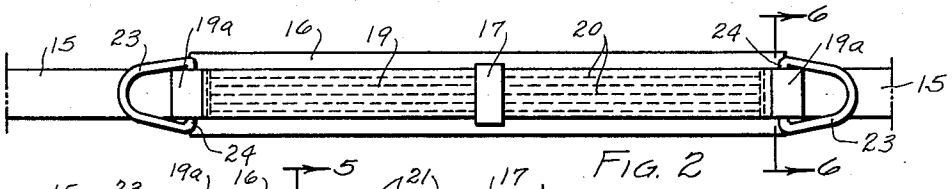

FIG. 2

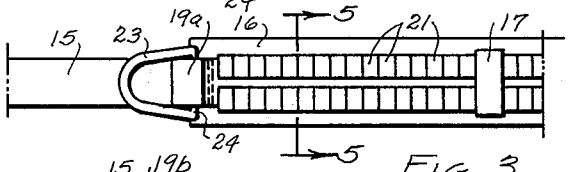

FIG. 3

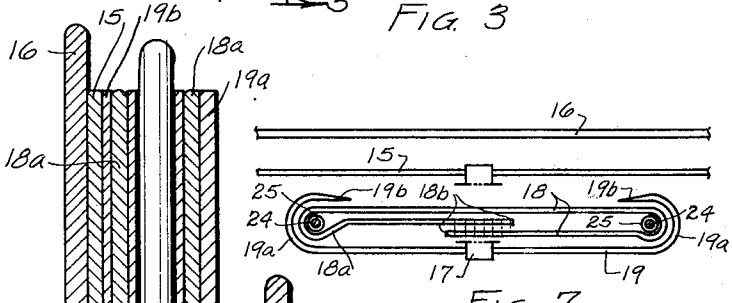

FIG. 7

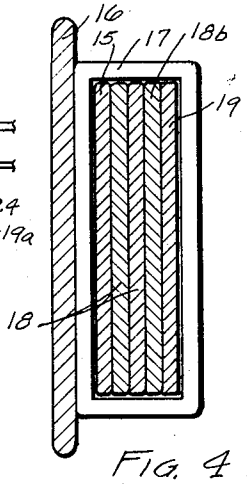

FIG. 4

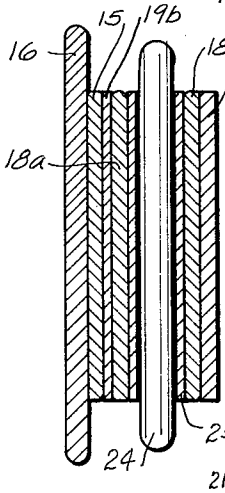

FIG. 6

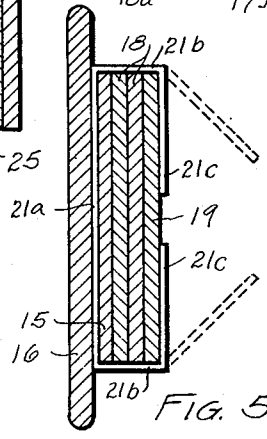

FIG. 5

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SAFETY BELT

Filed June 13, 1947 2 SHEETS—SHEET 2

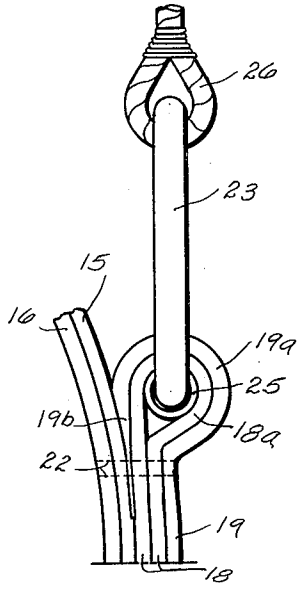

FIG. 8

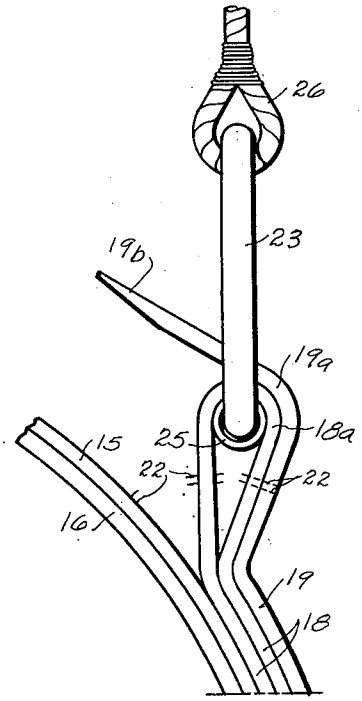

FIG. 9

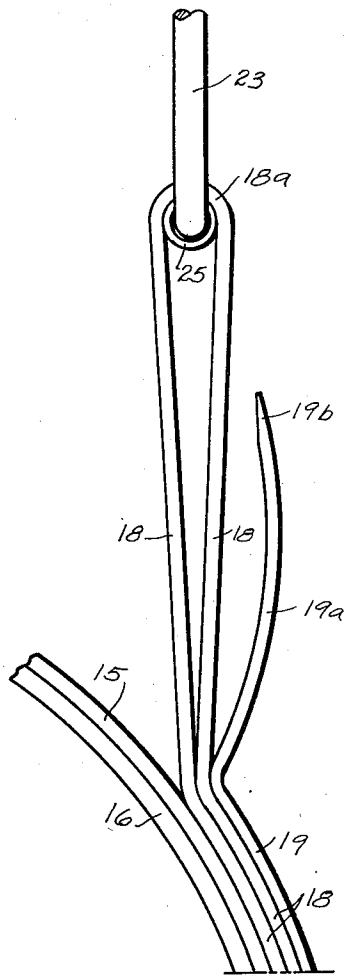

FIG. 10

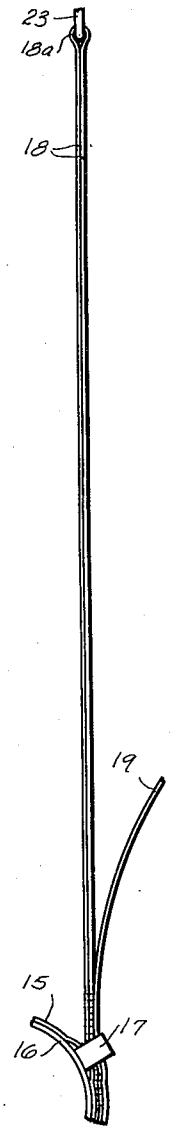

FIG. 11

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SAFETY BELT

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Application June 13, 1947, Serial No. 754,475

18 Claims. (Cl. 227—49)

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This invention relates to safety devices of the type used to check the accidental falling of workers or others wearing the device and especially to devices of such class which include a construction adapted to withstand the strains or pulls exerted thereon during the normal activities of the wearer but to break or sever under abnormal strain or pull and which also includes a safety element adapted to come into operation upon the breaking or severing of the said construction and to decelerate to a stop the fall of the body of the wearer whose fall has caused said breaking or severing of the normal construction.

This invention has certain features in common with that disclosed in my Patent No. 2,581,772, Jan. 8, 1952, but whereas the construction there disclosed was primarily designed for uses such as those of window washers, where anchorages are of varying and uncertain strengths, the present invention is primarily, though not exclusively, designed for use of structural workers who are provided with anchorages of ample strength.

An object of the present invention is to provide an improved normal-pull-withstanding element in a device or belt of the class described.

A further object is to provide, in such a belt or device, an improved safety or decelerating element.

A further object is to provide improved means for retarding the breaking or severing of the normal-pull-withstanding element.

A further object is to provide, in such a belt, an improved assembly of the normal-pull-withstanding element and the safety or decelerating element.

A further object is to provide a belt of the class described which, without lessening the highest attainable degree of efficiency in normal use or the highest attainable degree of safety in case of accident, shall be of extreme economy and simplicity in construction.

With these and other objects in view, all of which shall more fully hereinafter appear, the invention comprises certain novel constructions, combinations and arrangements of parts as will now be described and as defined in the appended claims and as illustrated, in preferred embodiment, in the accompanying drawing in which,

Fig. 1 is a plan, or top edge view, of my improved belt, complete except that the conventional terminal portions of the body-encircling strap and of the body pad are omitted.

Fig. 2 is an elevation of the structure shown at Fig. 1.

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Fig. 3 is a fragmentary view of the structure shown at Fig. 2, except that there is here illustrated a fastening means which may be used as an alternative to the linear stitching illustrated at Fig. 2.

Fig. 4 is a section taken on line 4—4 of Fig. 1.

Fig. 5 is a section taken on line 5—5 of Fig. 3.

Fig. 6 is a section taken on line 6—6 of Fig. 2.

Fig. 7 is a fragmentary view like Fig. 1, but foreshortened and exploded.

Fig. 8 is a fragmentary view on enlarged scale illustrating the normal interrelative positions and arrangement of the parts of the structure at the point of attachment of the D ring.

Fig. 9 is a view like Fig. 8 but illustrating the interrelative position of the parts just after the fall of the wearer has broken the transverse stitching shown at Fig. 8.

Fig. 10 is a view like Fig. 9 but illustrating the condition of the parts after the stretchable material has begun to stretch.

Fig. 11 is a view like Fig. 10 but illustrating the further stretching of the stretchable material, without exactness in detail.

My invention is primarily designed for wearing by a workman as a belt and will, therefore, be referred to generally as a safety belt and is provided with any suitable means for securing the safety belt to the wearer and such means are indicated by the strap 15, the buckle or other conventional fastening means being omitted from the drawing. Carried by and inside the strap 15 is the usual body pad 16. A link 17, preferably rectangular as shown, has one of its sides mounted between the strap and the pad at a point which will be at or near the middle of the back of the wearer when the belt is worn.

Normally secured to the strap, and along the back thereof as worn, are two reaches or layers of a band or strip 18 of stretchable material which are covered with a wear-guard 19, preferably of leather. The strip or band 18 is looped around the bases of the D rings (later described) as at 18a and its ends overlapped and suitably secured together, as by stitching, as at 18b. These layers of band 18, including the overlapped portions at 18b, and the wear-guard all lie within and are linked tightly together by link 17 and they are all interengaged to strap 15 by longitudinal stitching 20 (Fig. 2) or other suitable means such as decelerating clips 21 (Fig. 3), these methods of attachment and their requirements and functions being hereinafter described.

The ends of the wear-guard 19 are looped around the loops 18a of the band 18 as at 19a and their extreme ends are tapered as at 19b

and inserted between strap 15 and band 18 and there normally secured, as by cross stitching 22, all as clearly shown at Fig. 8.

Means are provided for attaching the Safety Belt to suitable anchorages, not shown, these means preferably comprising D rings 23 having bases 24 provided with sleeves or bushings 25, the sleeve-encased bases 24 lying within the loops 18*a* and 19*a*. Suitable anchor lines 26 (Figs. 8 and 9) are secured to the D rings and lead to and may be secured to any suitable anchorages, not shown.

The safety belt as thus far described, when worn by a worker and anchored as indicated, will withstand all the strains and pulls to which it will be subjected during and by the normal activities of the wearer, it being understood that the various parts are constructed of the dimensions and quality ordinarily employed for such purposes.

The safety elements and functions, designed to be brought into operation in case of the accidental fall of the wearer, will now be described.

It will be understood that the anchor ropes are sufficiently slack to permit the wearer to change position as required by his work so that in case of the accidental fall of the wearer, he will drop without hindrance until the slack in the anchor ropes is taken up and the ropes are taut by which time the falling wearer of the belt has gained a momentum which exerts a pull on the anchor ropes greatly in excess of the weight of the wearer, frequently several times that weight. The cross stitching 22 is made of such strength that when subjected to this excessive pull to a predetermined amount it will break or sever, freeing the end 19*b* of the wear-guard on which the excessive pull is first exerted and leaving only the longitudinal stitching 20 to hold the band 18 (and therethrough the D ring and anchor rope) to the strap 15. The stitching 20 is made of such strength that while it will not hold under the excessive pull to which it will, under such conditions, be subjected, it will, nevertheless, retard the tearing of the band 18 from the strap 15 and thus have a retarding effect upon the fall of the wearer of the belt.

At this point it should be understood that the band 18 is formed of stretchable material like the safety rope described in my said Patent No. 2,581,772, that is to say that while it is capable of being stretched it must have the quality of resisting the stretching force so that the stretching will be retarded from the beginning until the limit of stretching is reached. Also, preferably, it will not have a quick reacting elasticity which would result in a quick, or any substantial, rebound of the object causing the stretching when the stretching limit is reached. Certain nylon ropes and bands now on the market have these qualities and can be used for the band 18 in my safety belt.

It will be understood that one of the principal objects of safety devices of this class is to avoid the injury which is apt to be done to a falling worker, if brought to a sudden stop, by providing means to retard the fall and bring the worker gradually to a stop—ease him to a stop. This is accomplished most efficiently by my safety belt because as soon as the cross stitching 22 is broken and the end 19*a* of the wear-guard is released, the two reaches or layers of band 18 begin to stretch but at the same time exert their retarding influence and, coincidently, the longitudinal stitching begins to tear away but it, also, exerts its retarding influence and this continues until the stitching is torn away as far as the link 17 whereupon the link prevents further tearing of the stitching but by this time the combined retarding influence of the stitching and the band 18 has sufficiently decelerated the fall and reduced the pull so that the retarding influence of band 18 alone will be sufficient to decelerate the fall to a stop before the stretching limit of band 18 is reached.

The structure thus far described may be modified by slightly enlarging the link 17 so that while it will encase the strap, band and wear-guard it will not bind these elements tightly together (as hereinabove described) but will encase them sufficiently loosely so as to be capable of sliding along the encased elements. When a belt thus constructed is subjected to the excessive pull resulting from the fall of the wearer and the tearing of the longitudinal stitching has reached the centrally positioned link 17, instead of the link stopping the tearing, as above described, the link will be slid along the encased elements and the tearing of the longitudinal stitching will continue. In such case, however, there will be a considerable friction between the link and the strap and between the link and the wear-guard which lies between the link and the outer reach of band 18 and this friction will exert a further retarding influence on the falling of the wearer. This modified structure thus also permits the separation of the band 18 from the strap for the full length of the band and brings into play the stretchability of the band for its full length.

At Figs. 3 and 5 I have illustrated an alternative method of securing the band 18 and the wear-guard to the strap and accomplishing the retarding of the tearing away of the band from the strap. In this embodiment I eliminate the longitudinal stitching and, instead, provide a series of clips 21 which normally bind the band and guard to the strap but which, under excessive pull, will successively open or break and release the guard and the band in a manner similar to the breaking of the longitudinal stitching, at the same time exerting a similar retarding influence. These clips are made of any material suitable for the purpose and comprise a base 21*a* which lies between the strap and the pad, sides 21*b* which enclose the edges of band 18 and guard 19 and, conveniently, two front leaves 21 which normally press down against the guard as shown in full lines at Fig. 5 but which break outwardly to or beyond the dotted line position (Fig. 5) when subjected to excessive pull resulting from the accidental fall of a wearer of the belt. In this case the link 17 need not be slidable in order to utilize the stretchability of the full length of the band because while the band, in normal condition, is clamped tightly between the strap and the wear-guard by the clips 21, the band thins as it stretches so that even if the link should remain in its normal, central position after the tearing of the clips 21 reaches the link, the thinning of the band, between the strap and the wear-guard, resulting from its stretching, will leave the band free to stretch for its full length without opening the clips which lie beyond the link. However, the link may be made slidable with the clip construction as well as with the longitudinal stitch construction and, when slidable, it will exert a retarding friction along the series of clips in substantially the same manner as the above-described frictional retarding action of the link

when sliding along the longitudinally stitched elements.

I have hereinabove described the release of the stretchable band or strip as if the tearing or breaking out of the stitching or clips occurs at and continues from one end. It will be understood, however, that this tearing or breaking out might start at both ends and continue therefrom toward the middle of the strip, in which case it may continue from both directions until the link is reached. In such case, however, the action and retarding influence of the stitches or clips will be the same, in substance, as hereinabove described.

The guard 19 has been described as a separate member made, preferably, of material such as leather. It will, however, be understood that the principal function of the guard is protection of the stretchable band from wear, weather, etc. and this protection might be provided in various ways—even by covering the band with a suitable coating instead of providing a wholly separate guard.

I have illustrated and described many details of construction but I am not to be limited in my protection to the details thus illustrated and described, as alternative equivalent structures will occur to those skilled in the art and I have in mind, and desire protection broad enough to cover, such alternative and equivalent structures as well as the structures which I have specifically illustrated and described.

I claim:

1. For persons in elevated positions, a safety device including, in combination, substantially non-stretchable means for securing the device to the person's body, means for attaching the device to anchors and means for interconnecting the body-securing means and the anchor attaching means, including a stretchable element and serially separable means for interengaging said element with the body-securing means, said interengaging means being adapted to withstand stresses exerted thereon by the normal movements of the person and thereby hold said element in unstretched condition but being also adapted to serially separate responsive to abnormal stresses and thereby successively release portions of said element for stretching, and other means maintaining permanent engagement of a part of the element with the body-securing means.

2. In a device as defined in claim 1, the said interengaging means being arranged in a series substantially throughout the length of the element, and being adapted to release portions of said element responsive to abnormal stresses whereby the release of the stretchable element is successively retarded by the successive resistance of said interengaging means.

3. In a device as defined in claim 1, said interengaging means comprising stitching through said body securing means and said stretchable element.

4. In a device as defined in claim 1, said interengaging means comprising stitchings through and longitudinally of said securing means and said stretchable element.

5. In a device as defined in claim 1, said interengaging means including a series of clips encasing said body securing means and said stretchable element, said clips having parts adapted to release portions of said element responsive to abnormal stresses.

6. In a device as defined in claim 1, a guard member, the stretchable element being normally positioned between the body-securing means and the guard member, the interengaging means also securing the guard member to the body-securing means.

7. In a device as defined in claim 1, a guard member, the stretchable element being normally positioned between the body-securing means and the guard member, the stretchable element being permanently secured to the anchor-attaching means and the guard member being longer than the normal, unstretched, length of the stretchable element and being adapted to normally cover the stretchable member by the folding of the ends of the guard member over the ends of the stretchable element and stitching such folded ends between the stretchable element and the body-securing means.

8. A safety belt including, in combination, a body-securing strap, means for attaching the belt to anchors, a stretchable strip attached to the anchor-attaching means and permanently linked to the strap, and serially separable means normally connecting the stretchable strip, in unstretched condition, to the strap, said connecting means being adapted to withstand the stresses exerted on the belt by the normal movements of the wearer of the device but adapted to serially separate and thereby release, for stretching, successive portions of the strip.

9. In a safety belt as defined in claim 8, the connecting means including a series of stitches through the strap and the strip.

10. In a safety belt as defined in claim 8, the connecting means including a series of stitches through the strap and the strip and extending substantially throughout the length of the strip.

11. In a safety belt as defined in claim 8, said connecting means including a series of clips encasing said strap and said strip, each of said clips having a part which is adapted to release a portion of the strip responsive to abnormal stresses.

12. In a safety belt as defined in claim 8, the connecting means including a series of members normally connecting the strip to the strap substantially throughout the length of the strip, the means for permanently linking the strip to the strap comprising a link normally positioned centrally of the strip but being slidable along said strip and strap.

13. A safety belt including, in combination, a body-securing strap, means for attaching the belt to anchors, a stretchable strip secured to the anchor-attaching means, a link permanently connecting the strip to the strap, and other means including serially separable elements normally connecting the strip, in unstretched condition, to the strap, said other means being adapted to hold the strip to the strap under normal stresses but to successively release portions of the strip for stretching responsive to abnormal stresses.

14. In a safety belt as defined in claim 13, said other means including a series of elements extending substantially throughout the length of the unstretched strip.

15. In a safety belt as defined in claim 13, said link being normally positioned longitudinally centrally of the strip but being slidable along the strip and the strap upon separation of the serially separable elements.

16. In a safety belt as defined in claim 13, said other means including a series of clips normally encasing said strap and strip, a portion of each

of said clips being adapted to release a portion of the strip responsive to abnormal stresses.

17. In a safety belt as defined in claim 13, said other means including a series of stitches through the strip and strap.

18. In a safety belt as defined in claim 13, a guard member covering and being longer than the unstretched strip and having its ends folded over the ends of the strip and engaged to the strap by means adapted to release said engagement responsive to abnormal stresses.

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