April 19, 1927. 1,625,072

M. B. BEHRMAN

PILE WIRE CUTTER AND METHOD OF MAKING IT

Filed Nov. 25, 1924

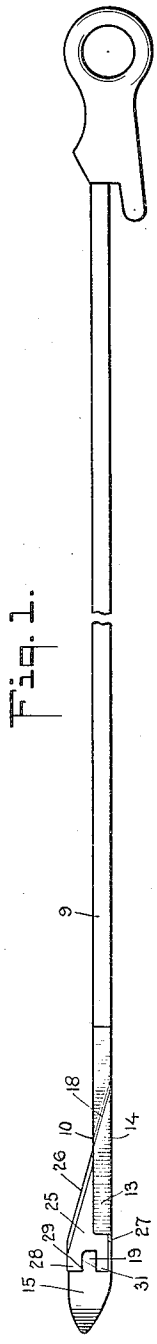


Fig. 1.

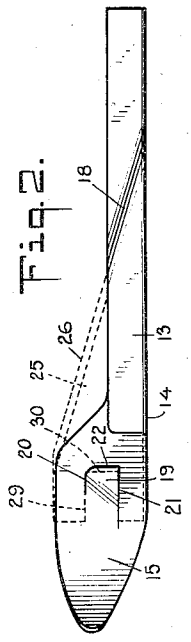


Fig. 2.

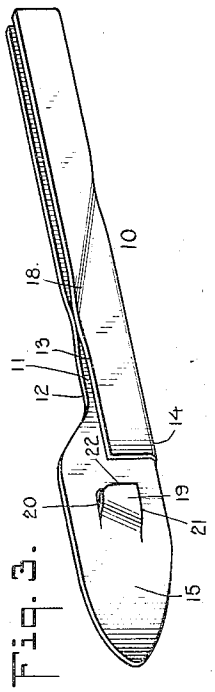


Fig. 3.

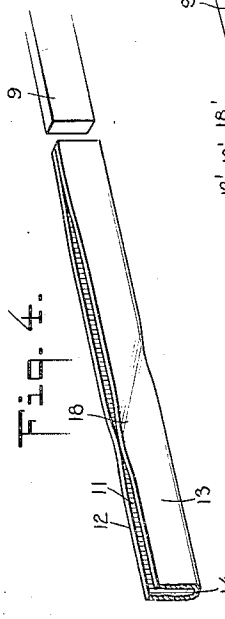


Fig. 4.

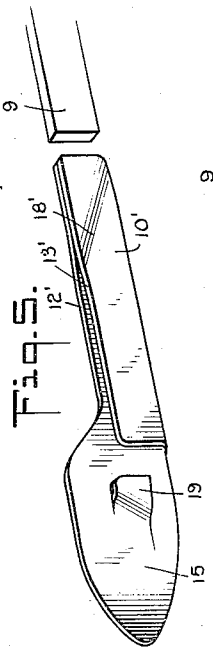


Fig. 5.

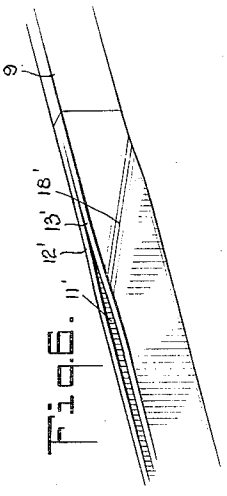


Fig. 6.

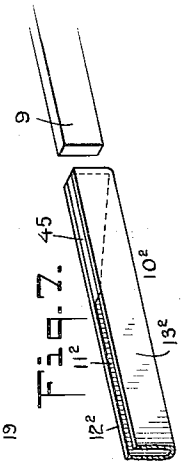


Fig. 7.

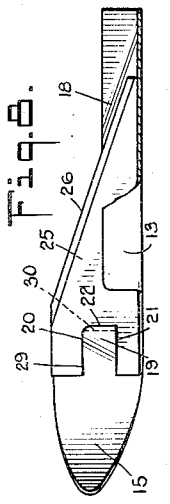


Fig. 8.

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UNITED STATES PATENT OFFICE.

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PILE-WIRE CUTTER AND METHOD OF MAKING IT.

Application filed November 25, 1924. Serial No. 752,146.

My present invention relates generally to a pile cutting means for the type of looms which weave pile fabrics and more particularly to an association with the pile wire employed for such purposes of a blade holder which can be attached thereto, and also to the manner of attachment.

In looms which I employ pile wires, the warp threads are generally looped over these wires and when it is desired to produce a cut pile fabric, cutters are so associated with the pile wires that upon withdrawal of the wires from the fabric, the cutters will cut through the loops. Due to the rapidity with which these pile wires are thrown in and withdrawn and the number of threads to be cut upon each withdrawal, each cutting edge is subject to a great number of cutting operations in a short time and therefore dulls quickly and such edges must obviously therefore be either frequently resharpened or frequently repaced.

The use of a cutter which is separable from the pile wire for permitting replacement of the blade is attended with a number of problems, amongst which is that arising from the fact that the arrangement for securing the blade in position on the one hand must serve to hold the blade in such fixed association with the pile wire that it will not shift therein nor will it be accidentally separated therefrom and, on the other hand, will so secure the blade as not to render its removal difficult or time consuming.

One of the important objects of my invention, therefore, is the provision of an arrangement whereby a cutting blade is so associated with the pile wire that while it is fixedly held in position thereon and against accidental removal, its quick and effective removal is permitted.

Looms of this type referred to are already provided with pile wires and it is one of the important objects of my invention to so devise the cutter holder and its manner of association with a pile wire that the holder can be formed as a separable unit for attachment to a pile wire and can be associated with the conventional form of pile wire without requiring a replacement of the pile wires or any substantial change of reconstruction therein.

I have found however that making the blade holder as an attachment to the pile wire carries with it the difficulties that arise from the fact that the point at which the blade holder is attached to the pile wire is subject to bending and turning stresses, to which the pile wire as a whole is subjected in the general operation of the loom.

One of the objects of my invention, therefore, is the provision of a holder and of a manner of its association with the pile wire whereby the point at which the holder is joined on to the pile wire is not weakened by the fact that it is so attached.

For purposes of holding blade, I have found that a holder formed of sheet material and bent intermediate its ends to give it a substantial U shape, with the walls of the U spaced so as to receive a blade therewithin, possesses many advantages. On the other hand, such a U-shaped holder always presents the possibility that when it is subject to turning or bending stresses, there will be a tendency for the walls of the U to spread and to become misshapen.

Another object of my invention, therefore, is the provision of an arrangement whereby a U-shaped holder of this type can be so secured to a pile wire so that not only is the point of attachment no weaker than any other portion of the pile wire, but that by such manner of attachment the tendency of the walls to spread will, to some extent, be overcome.

Another object of my invention is such an association of the manner of securing the holder to the pile wire with the arrangement on the holder for holding the blade thereon, that not only is a stronger attachment secured between the holder and the pile wire but the spreading and distorting tendencies incident to the stresses upon a pile wire as the loom operates are still further reduced.

My invention furthermore involves the provision of a simple, inexpensive and efficient blade holding attachment for a pile wire and a new and improved method for associating such holder with the pile wire.

For the attainment of these objects and such other objects as may hereinafter appear or be pointed out, I have illustrated

embodiments of my invention in the drawings wherein—

Fig. 1 is an elevational view of one embodiment showing the blade holder attached to the pile wire and a blade held in the holder;

Fig. 2 is an enlarged view of the blade holder with the blade shown in dotted lines in its position;

Fig. 3 shows the holder before it is attached to the pile wire;

Fig. 4 illustrates a step in my method of attachment with the walls of the inner end of the holder pinched together preparatory to the welding operation;

Fig. 5 is a view showing the step of Fig. 4, in which I employ a modified form of holder;

Fig. 6 is an enlarged view of a fragment of the pile wire made according to Fig. 5;

Fig. 7 is a view corresponding to Fig. 4 showing the employment of still another form of holder;

Fig. 8 is a side elevational view partly broken away of a still further embodiment.

Upon viewing Fig. 1 of the drawing, it will be observed that I here employ a blade holder 10 which is in the form of a thin strip of sheet material bent so as to provide a channelled construction which is preferably, though not necessarily, U-shaped in cross-section, the channel 11 being defined by the walls 12 and 13 upstanding from the bottom 14. Extending forwardly from the wall 12 is the enlarged spoon-like member 15, preferably curved at its outer end, for purposes well understood to those skilled in the art.

The channel 11 is provided in any preferred or desired manner with the inclined end abutment wall 18, the illustrated embodiment (see Fig. 2) showing this wall as formed by forcing together the walls 12 and 13 along a line which is inclined as shown in the drawing, and which is to form an overhanging wall for the front end of the blade.

The spoon-like member 15 is provided with a punched up projection or finger 19, cut away along three sides 20, 21 and 22 and positioned angularly part way across the channel 11. It will be observed that in this illustrated embodiment that the finger is formed by a lower cut to form the wall 21, by a much shallower cut to form the shorter side 20, and by a cut 22 connecting the two, and that the free end of the finger 19 is deflected into the path of the knife sufficient to permit the blade to partly pass therebeneath, all for purposes that will shortly appear.

Upon viewing Fig. 1 of the drawing, it will be observed that the knife or cutter 25 which I employ is preferably of the flexible wafer type, the cutting edge 26 of which inclines upwardly with reference to the bottom edge 27 and at an angle substantially equal to that of the end wall 18 in the channel 11, and that the butt end of the blade is provided with the cutout or slot 29, the position and dimensions of which are preferably determined by the character and dimensions of the member 19 to serve the purposes intended, the slot 29 thus providing the fingers 28 and 31 upon the butt end of the cutter.

In the insertion of this type of blade in the holder, the front or pointed end of the blade is first worked at an angle into the channel 11 to bring the front or pointed end of the blade into position beneath the inclined end wall 18 of the channel and the blade is then moved angularly downwardly, so as to cause the butt end to move over the inclined surface of the finger 19, which surface inclines from its free end to the inner surface of the spoon 15 into which it merges. In this movement of the blade over the surface of the finger 19 a relative lateral movement between a part of the blade and the finger will take place, and in the embodiment of the application, it will be the blade which will flex as the holder 10 is made of relatively stiff material.

It will be understood that the dimensions of the parts are such that as the blade reaches its final predetermined position in the holder with the front or pointed end of the blade beneath the wall 18 and with the lower edge 27 of the blade seated on the bottom of the channel 11, that the end wall 30 of the slot 29 will be positioned beneath the finger 19 as shown in dotted lines in Fig. 2 due to the fact that the distance between the inclined overhanging wall 18 and the vertical wall 22 of the finger 19 is such that the blade must be slightly buckled to have the end wall 30 of the blade pass inwardly and beyond the end wall 22 of the finger and as the blade resumes its normal flat position, this end wall 30 will automatically position itself beneath the finger 19 to lock the blade in position as shown in Fig. 2.

By making the cut which forms the wall 20 of the finger 19 materially shorter than the cut which forms the lower wall 21 I not only provide an arrangement whereby the blade can be inserted more readily, due to the inclination given to the finger which not only inclines longitudinally of the blade, but also downwardly, but that the end of the slot or cut which forms the wall 20 forms a stop for the blade to prevent a reverse movement of the blade.

In Fig. 3 of the drawing, I have shown the holder 10 before it is attached to the pile wire proper 9, and I have found that by employing a U-shaped holder 10, as set forth, I obtain a very efficient blade holding means which is economical to manufacture and permits of the ready insertion and re-

moval of the blade. I have found, however, that a U-shaped holder of this character, when attached to the pile wire 9, which is generally in the form of a solid bar, presents difficulties arising from the fact that in the operation of the loom the pile wires are subject to stresses and strains and twisting and bending forces, with the tendency always present not only to cause the walls 11 and 12 of the pile wire to spread and become misshapen, but these forces are also applied to the point at which the holder 10 is affixed to the pile wire 9, with the consequent liability of breakage at this point.

I have found that by affixing the holder 10 to the pile wire 9 by a welding operation, in the manner to be pointed out, I not only secure an attachment which is no weaker than if the holder 10 were made integral with the pile wire 9, but in addition brace the walls 11 and 12 of the holder against spreading and also against permanent distortion.

In my preferred practice, I first pinch together the inner ends of these two adjacent walls 12 and 13 of the member 10, as shown in Fig. 4, and then weld these ends directly to the adjacent end of the pile wire 9. For this welding operation I preferably employ the jump gap method in which an alternating current of high amperage is passed through both the holder 10 and the pile wire 9, with the two spaced a predetermined distance. In this manner I obtain a weld not only between the holder and the pile wire, but a weld will also be effected between the portions of the walls 12 and 13 of the holder which are pinched together, particularly where the walls of the holder 10 are thinner than the pile wire 9, as in the illustrated embodiment, as the adjacent end of the holder 10 will heat up to a greater extent and the flow of the metal will occur mainly at the said adjacent end of the holder. In this manner I obtain an attachment between the channeled holder 10 and the pile wire 9 which not only is no weaker than if the holder 10 had been a solid bar, but in addition strengthens the end of the holder.

It will be understood of course that a welding operation of this character results in an extrusion of metal and this extrusion is ground off so as to give the pile wire and the holder attached thereto a thickness at the point of attachment which is the same as that of the pile wire.

The wire which I employ is preferably of spring steel and in the welding operation that portion of both the holder and the pile wire which is adjacent the point of weld is tempered so highly as to become brittle, and in order to restore the temper of these parts, it is re-annealed so that the desired spring character of this portion of the wire is restored and the temper thereof made the same as that of the original pile wire. This increased temper to glass hardness is due to the rapid cooling of the heated metal in the open air and also the small mass of metal and re-annealing restores the malleability of the metal to its original condition.

Upon viewing Fig. 1 of the drawing, it will be observed that the length of the holder is such that the line 10, which indicates the place at which holder 10 and pile wire 9 have been welded together, is positioned at a substantial distance from the free or outer end of the pile wire cutter. Pile wires are subject to the bending and twisting stresses and strains already referred to, and it will be understood that in a structure made in channel form, as is the holder 10, where the two spaced walls therein are subject separately to such bending strains, there will be a tendency not only for the walls to spread, but also for these walls to be distorted and bent out of their parallel positions, and that the extent of this action will depend among other things upon the leverage with which these forces are applied; in other words, upon the length of the holder 10. In Fig. 5 of the drawing I illustrate a modification of this invention in which I not only reduce the length of the holder and thus the amount of leverage with which these bending forces can be applied, but also so associate the weld between the pile wire and the holder with the knife holding means, that the cutting edge of the knife is held as close to the point of the weld as is possible and at the same time is held in position by such weld.

Upon viewing this figure of the drawing, it will be observed that the holder 10′ is materially shorter than is the holder 10 of Fig. 3 and that this shortening is attained by pinching together the ends of the walls 12′ and 13′ so as to provide not only the contacting ends for the purposes of the weld, as in Fig. 4, but also the inclined overhanging wall 18′ which functions as does the corresponding wall 18 in Fig. 3. When, therefore, the holder, treated as described and as shown in Fig. 5, is welded to the pile wire 9 in a manner already described, the welding operation will not only fixedly associate the holder 10′ with the pile wire 9, but it will also weld together the pinched together portions of the walls 12′ and 13′ and at the same time produce the overhanging wall 18′ beneath which the knife is to be received, as shown in Figures 1 and 2. In this way, I not only simultaneously produce the weld and the overhanging walls with increased effectiveness, but due to such construction also shorten the holder itself and bring the knife immediately adjacent to the weld, so that the leverage of the turning forces applied to the free end of the holder is not only reduced but the force is applied so close to

the weld that the tendency of these twisting forces to disrupt the weld is reduced to a minimum.

In Fig. 6 of the drawings, I show a still further modification in which instead of pinching the walls of the holder together so as to produce the contacting triangular portions, I insert in the holder shortened, as in Fig. 5, the filler block 45 which may be of any preferred or desired shape, but which is shown in the drawing of a triangular shape and which is positioned in the channel 11^2 at the inner end of the holder 10^2 so that when the holder with this filler block therein is welded to the pile wire 9, the filler block 45 will also be welded to the walls 12^2 and 13^2 of the holder and also to the wire 9 so that a construction will be attained which functions generally as does that made by the method of Fig. 5.

By my invention I thus not only attain a holder which can be made separate and apart from the pile wire and which can be made to serve as an attachment to any conventional type of pile wire already in use, but which holder can be constructed so as to serve its purposes for holding a blade without considering the character of the pile wire to which it is to be attached. By the manner of attachment which I employ, I am enabled to eliminate almost wholly any undesirable features which are incident to the character of the holder which I employ. In addition, I have provided on the holder an arrangement which not only permits of the ready insertion and removal of the blade but also effectively holds the blade in the holder.

It will be understood that when the blade is in operative position in the holder as in Fig. 2, that movement of the blade in one direction will be prevented by the overhanging wall 18 and movement of the blade in the opposite direction prevented by the engagement of the wall 30 defining one end of the slot 29 in the blade, with the end of the slit or cut which forms the upper end 20 of the finger 19 and that upward movement of the blade or an upward tilting of either end of the blade will be prevented by the overhanging wall 18 and by the engagement with the lower edge 21 of the finger 19, of the finger or projection 31 of the blade formed by and below the slot 29.

In Fig. 8 of the drawing, I show a form of the invention in which the distance between the end 22 of the finger 19 and the overhanging wall 18 is no greater than the corresponding distance between the end wall 30 of the slot 29 of the blade and the inclined edge 26 and in this form of the invention no buckling of the blade is necessary to cause said wall 30 to pass inwardly of the end 22, such as described in connection with the form of Fig. 2, and in this form of the invention when the blade is inserted as described, the finger 31 thereof will flex as the blade is moved angularly over the inclined surface of the finger 19 of the holder, as in Fig. 2, and the blade will assume its normal flat position when fully inserted with the wall 30 however immediately adjacent and to the front of the end 22 of the finger 19.

It will be understood that in this form of the invention, as well as in the form of the invention shown in Fig. 2, that the finger 19 is pushed up sufficiently to provide a space large enough to permit the wall 30 of the blade to move to a slight extent into the space between said finger and the wall 15 of the pile wire and beneath said finger 19. This arrangement of Fig. 8 will permit a slight movement of the blade in the channel from its initial position of insertion to a position to which, either purposefully, or automatically as the pile wire is moved forward on its cutting operation, the blade is moved to force the wall 30 of the blade beneath the finger 19 until said wall contacts with the end of the cut which forms the side 20 of the finger 19 to lock the blade beneath said finger. It will be understood that this movement of the blade is just sufficient to permit of the securing of the blade as desired, and will not be for the full length of the cut which forms the side 20 of the finger 19 and will be limited by the thickness of the blade.

Having thus described my invention and illustrated its use, what I claim as new and desire to secure by Letters Patent is:

1. The method of forming a pile wire with a U-shaped blade holder attached thereto, which comprises the step or steps of simultaneously welding the ends of the walls of the U-shaped holder to each other, and such welded end to the pile wire.

2. The process of attaching a U-shaped blade holder to a pile wire which comprises the step or steps of simultaneously forming in the channel of the holder an end abutment for the blade and a weld between the holder and the pile wire.

3. The method of forming a pile wire with a U-shaped blade holder attached thereto, which comprises the step or steps of pinching together the portions of the walls of the U-shaped holder and then welding such pinched together portions to the pile wire.

4. For use in looms for weaving pile fabrics, a pile wire and a U-shaped blade holder welded thereto, the walls of the U-shaped member adjacent to point of weld being pinched together.

5. The process of attaching a U-shaped blade holder to a pile wire which comprises the step or steps of pinching together end portion of the walls of the holder so as to produce an overhanging end wall intermedi-

ate the ends of the holders and then welding such pinched-together portion of the holder to a pile wire.

6. A pile wire cutter comprising a pile wire and a U-shaped holder welded thereto, the walls of the holder adjacent the point of weld being pinched together so as to provide an overhanging wall in the channel intermediate the ends thereof and beneath which a blade is adapted to be received.

7. For use in looms for weaving pile fabrics, a holder adapted to form part of a pile wire and having a channel to receive a cutting implement or blade with one edge of the implement seated on the bottom of the channel, and means on said holder for holding the blade against movement in said channel, including a member formed on the holder and projecting inwardly into the path of movement of a cutting implement in the channel and spaced a substantial distance below the top of the holder, said member presenting a surface which inclines toward and merges into the inner surface of one of the walls forming the channel, in a direction which extends both longitudinally and upwardly whereby the blade can be moved angularly over said inclined surface into position in the channel of the holder to bring a portion of the blade in abutting relation to said member.

8. For use in looms for weaving pile fabrics, a holder adapted to form part of a pile wire and having a channel to receive a cutting implement or blade with one edge of the implement seated on the bottom of the channel, and means on said holder for holding a blade against movement in said channel, said means including a member punched up from one of the walls of the channel along three sides and forced angularly inwardly into the path of movement of an implement in the channel, said member presenting a surface which inclines toward and merges into the inner surface of one of the walls forming the channel, in a direction which extends both longitudinally and upwardly whereby the blade can be moved angularly over said inclined surface into position in the holder to bring a portion of the blade in abutting relation to said member.

9. For use in looms for weaving pile fabrics, a holder adapted to form part of a pile wire and having a channel to receive a cutting implement or blade with one edge of the implement seated on the bottom of the channel, and means on said holder for holding a blade against movement in said channel, said means including a member punched up from one of the walls of the channel along three sides and forced angularly inwardly into the channel, the cut along one side being shorter than the cut along the opposite side.

10. For use in looms for weaving pile fabrics, a holder adapted to form part of a pile wire and having a channel to receive a cutting implement or blade with one edge of the implement seated on the bottom of the channel, and means on said holder for holding the blade against movement in said channel, including a member punched up from the holder and projecting inwardly into the path of movement of a cutting implement in the channel, said member presenting a surface which inclines toward and merges into the inner surface of one of the walls forming the channel, in a direction which extends both longitudinally and upwardly whereby the blade can be moved angularly over said inclined surface into position in the holder to bring a portion of the blade in abutting relation to said member.

11. For use in looms for weaving pile fabrics, a holder adapted to form part of a pile wire and having a channel to receive a cutting implement or blade with one edge of the implement seated on the bottom of the channel, means in said channel for preventing the movement of the blade in one direction beyond a predetermined point, and means for preventing movement of the blade beyond a predetermined point in the opposite direction, said last mentioned means including a member carried by one wall of the holder and spaced a sufficient distance from said wall to permit a part of the blade to move into such space.

12. For use in looms for weaving pile fabrics, a holder adapted to form part of a pile wire and having a channel to receive a cutting implement or blade with one edge of the implement seated on the bottom of the channel, one of the walls of the channel being extended beyond the other whereby the channel is open laterally opposite such extended portion, means in said channel for preventing the movement of the blade in one direction beyond a predetermined point, and means for preventing movement of the blade beyond a predetermined point in the opposite direction, said last mentioned means including a member positioned in the plane of the channel and spaced a sufficient distance from said extended part of the aforementioned wall to permit a part of the blade to be positioned therebeneath.

13. For use in looms for weaving pile fabrics, a holder adapted to form part of a pile wire and having a channel to receive a cutting implement or blade with one edge of the implement seated on the bottom of the channel, and means on said holder for holding the blade against movement in said channel, including a member punched from the holder and projecting inwardly into the path of movement of an implement in the channel and having its free end spaced from a wall of the holder a sufficient distance to

permit a portion of the blade to pass therebeneath, said member presenting a surface which inclines toward and merges into the inner surface of one of the walls forming the channel in a direction which extends both longitudinally and upwardly whereby the blade can be moved angularly over said inclined surface into position in the channel of the holder to bring a portion of the blade beneath the holder.

In witness whereof, I have signed this specification.

MARCUS B. BEHRMAN.