Aug. 25, 1964 W. BENNETT 3,145,550

LATCH NEEDLE

Filed Jan. 25, 1962

FIG. 1

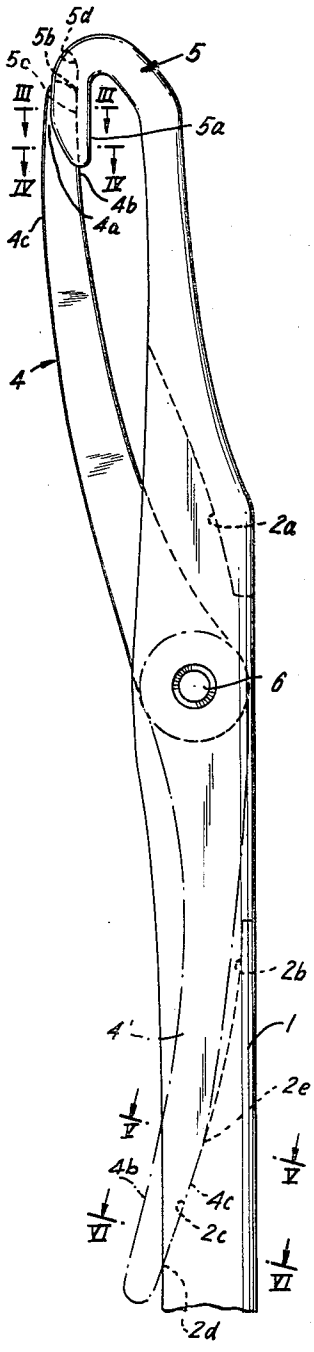


FIG. 2

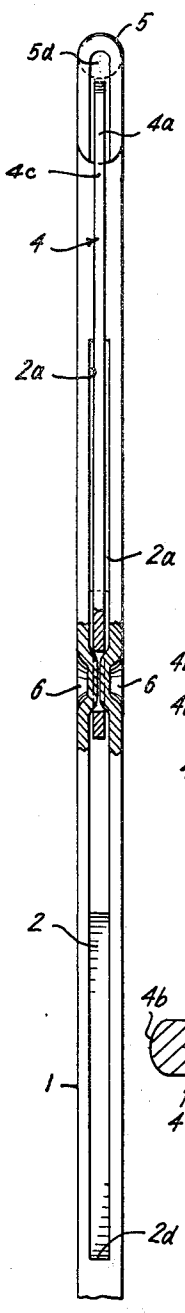


FIG. 3

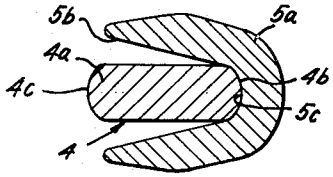


FIG. 4

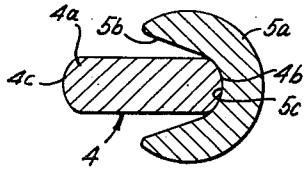


FIG. 5

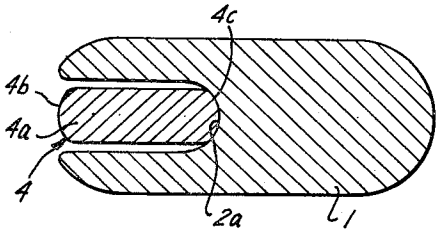
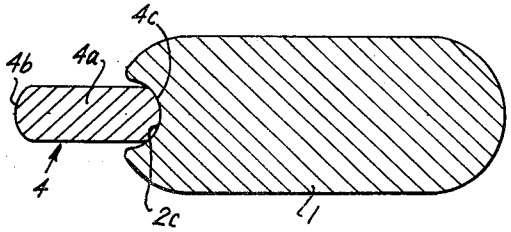


FIG. 6



INVENTOR.
William Bennett

BY
Richard S. Striker
Atty

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LATCH NEEDLE

William Bennett, Aalen, Wurttemberg, Germany, assignor to Haase & Kühn KG, Leinzell, Wurttemberg, Germany

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The present invention relates to a latch needle, and more particularly to latch needles for circular knitting machines.

Latch needles have a hook and a latch movable between a position closing the hook for confining a thread, and an open position permitting the hook to catch a thread. The latch is mounted on the stem of the needle for turning movement, and is partly located in a slot of the stem. In a circular knitting machine for making hose, 300 to 400 latch needles are used which, assuming 250 revolutions of the needle cylinder per minute and four feeding stations, results in 1,000 latch movements per minute. Consequently, the latch performs in each minute 1,000 closing motions and 1,000 opening motions.

In order to permit such rapid movement of the latch, it is necessary to mount the latch with sufficient play to reduce friction, but such play permits a slight lateral movement of the latches which is further aided by the action of the centrifugal force. Furthermore, in modern circular knitting machines, pneumatic devices are provided for removing the finished article, and the air current produced by the pneumatic devices also acts to laterally displace the latch so that lateral vibrations of the latch occur in closed and opened positions of the latch, as well as during movement of the latch from the closed position to the open position.

The cylinder latch needles of a circular knitting machine move between sinkers in vertical direction, while the sinkers move in horizontal direction. Consequently, the sides of the cylinder needles are in frictional engagement with the sinkers. The spoon-shaped end of the latch of a conventional latch needle engages the sinkers frictionally, particularly due to the lateral motions of the latch, and is ground off so that sharp edges are formed along the latch spoon. Such sharp edges contact the thread when an old loop passes over the closed latch onto the new loop, and also when a new loop slides downwardly over the open latch during the upward movement of the cylinder latch needle.

The thread is always under a certain tension, and worn off sharp edges of the latch spoon have a knife-like action on the thread.

However, the thread is not cut through entirely, but only one or two filaments of the multi-filament thread are cut, so that the damage to the thread cannot be determined by inspection of the finished stocking. Only when the stocking is worn and subjected to longitudinal tension by a garter, the damaged thread tears and causes a run. Even the pull exerted by putting on a stocking damaged in this manner, is sometimes sufficient to cause a run.

Damage to a finished stocking of this type is even worse than as if the stocking would be completely torn in the machine, since many thousands of stockings may be manufactured, delivered, and sold as first class stockings, and tear when they are first worn. Even the most careful checking at the factory cannot always discover the hidden damage to the thread caused by worn latches, and in any event a great number of inspectors is required which increase the cost of manufacture.

It is one object of the present invention to overcome this disadvantage of conventional latch needles and to provide a latch needle whose latch will not be damaged or worn by frictional engagement with the sinkers or other parts of the machine.

A related object of the present invention is to provide a latch needle which, even after long use, will not damage a thread.

With these objects in view, the present invention provides a latch needle which has a latch narrower than the hook of the needle so that the sinkers do not engage the latch, but rather the hook of the needle, and consequently cannot wear off the sides of the latch.

When a latch needle of this type moves to a hook closing position, the latch strikes the hook end portion, which may take place one thousand times per minute, as explained above. The frequently repeated impacts cause a notch to form on the latch, if there is a point engagement between the latch and the hook. When the cylinder needle moves upward in the open latch position, the thread slides over the inner face of the open latch, and when a notch has formed on such inner face, the thread is again damaged by the sharp edges of the notch. It is another object of the present invention to overcome this disadvantage and to provide a latch needle in which the latch and the hook abut each other along contacting abutment faces so that the force of the impact is distributed over a great surface whereby the formation of a notch in the latch is prevented.

Latch needles of this type are known in which the abutment faces between the latch and the hook extend transverse to the direction of the hook end portion on which the latch abuts. If in a latch needle of this type, the pivot means on which the latch is mounted, develops play, or if the latch is too long or too short, the outer surface along which the thread loop slides when the hook is closed, is not smooth since the transverse end face of the latch projects from the outer surface of the hook.

It is another object of the present invention to overcome this disadvantage of known latch needles, and to provide a latch needle in which the surfaces of the latch and of the hook remain flush, even if the pivot means becomes loose, or if the pivot means is inaccurately placed during the manufacture of the needle.

When the latch of a conventional latch needle moves to its open position, it strikes a portion of the stem of the main part of the latch needle. The frequent impact caused a notch to form on the outer surface of the latch, and the sharp edges of this notch damaged the thread when a loop slides over the latch in the closed position of the latch.

It is another object of the present invention to overcome this disadvantage of latch needles, and to provide a latch needle in which the latch and the stem of the needle abut each other on elongated curved abutment faces in the open position of the latch.

Due to the distribution of the impact force over a greater surface of the latch, no notch can form on the outer surface of the latch, which remains smooth and cannot damage a thread.

With thse objects in view, a latch needle according to one embodiment of the invention comprises a main part including a hook having an elongated abutment face extending spaced from the sides of the hook, and a latch mounted by a pivot means on the main part for turning movement to and from a hook closing position and being narrower than the hook. Consequently, the latch is laterally spaced from the sides of the hook in the hook closing position so that contact between the latch and sinkers adjacent the hook is prevented. The latch has an elongated abutment face extending in said hook closing position parallel to and abutting the abutment face of the hook so that the latch is not worn by frequent contact with the hook in said hook closing position.

The stem portion of the latch neele has an elongated curved abutment surface, which preferably bounds the slot in which the latch is mounted. The latch has a corre-

sponding curved abutment surface on the outside thereof and extending parallel to and abutting the abutment surface of the stem portion in the open position so that the latch is not worn by frequent contact with the stem portion in open position even if the latch is slightly displaced.

In the preferred embodiment of the invention, the hook has a free hook end portion formed with an elongated groove whose bottom constitutes the abutment surface on which the corresponding abutment surface of a latch end portion abuts fully in the hook-closing position. The abutting abutment surfaces of the latch and hook extend in longitudinal direction of the hook end portion, and the outer surface of the latch end portion is flush with the outer surface of the hook end portion, so that if the latch end portion is displaced due to play of the pivot means, it moves parallel to the outer surface of the hook end portion and remains flush with the same so that the transverse end portion and remains flush with the same so that the transverse end face of the latch end portion cannot project out of the groove and from the outer surface of the hook end portion. Also, if the pivot means is not exactly placed on the stem of the needle during manufacture, or if the latch is longer than standard, the position of the latch end portion in the groove will be somewhat different, but the outer surfaces of the latch end portion and of the hook end portion remain flush and the transverse end face of the latch end portion cannot project from the outer surface of the hook end portion, or be retracted so far from the same that the groove surface forms a step between the outer surface of the hook end portion and the outer surfaces of the latch end portion, which is possible in constructions according to the prior art where the bottom face of the groove extends transverse to the outer surfaces of the latch end portion and of the hook end portion.

The novel features which are considered as characteristic for the invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation together with additional objects and advantages thereof, will be best understood from the following description of specific embodiments when read in connection with the accompanying drawing, in which:

FIG. 1 is a fragmentary side view illustrating a latch needle according to the present invention on an enlarged scale;

FIG. 2 is a fragmentary front view of the latch needle shown in FIG. 1;

FIG. 3 is a cross sectional view taken on line III—III in FIG. 1;

FIG. 4 is a cross sectional view taken on line IV—IV in FIG. 1;

FIG. 5 is a cross sectional view taken on line V—V in FIG. 1; and

FIG. 6 is a cross sectional view taken on line VI—VI in FIG. 1.

Referring now to the drawings, the stem portion 1 of a latch needle has a longitudinal slot 2 which is bounded by an end face 2*a*, and by another end face 2*b*. The main portion of the needle terminates in a hook 5 which has a straight hook end portion 5*a*. Hook end portion 5*a* has an elongated straight groove 5*b* of U-shaped cross section extending in the longitudinal direction of hook portion 5*a* and parallel to the straight outer surface of the same, as best seen FIGS. 3 and 4. A latch 4 is mounted on a pivot means 6 in slot 2 and is turnable between an open position 4' shown in chain lines and a closed position in which the straight end portion 4*a* of latch abuts the end portion 5*a* of hook 5. As best seen in FIGS. 3 and 4, the latch end portion 4*a* has a substantially rectangular cross section, a straight convex abutment face 4*b* which fully abuts the straight concave abutment face 5*c* at the bottom of the groove 5*b*, and a straight outer surface parallel to the abutment face 4*b*, and being substantially flush with the outer surface of the straight hook end portion 5*a*. The abutment surfaces 4*b* and 5*c* are elongated and abut each other along the length thereof, as best seen in FIGS. 1, 3 and 4.

The end of the latch end portion 4*a* has a transverse, rounded-off end face located in groove 5*b*, and slightly spaced from the end face 5*d* of groove 5*b*.

The latch end portion 4*a* is thinner than the mounting portion of the latch 4 which is supported on the pivot means 6 and located on the slot 2, so that the end portion 5*a* of the hook can be made thinner than the slotted stem portion 1.

It is evident that the lateral faces of the end portion 4*a* of the latch are laterally spaced from the sides of the hook end portion 5*a* and are protected from any frictional engagement with the sinkers between which the latch needle passes. When the latch 4 moves from the open position 4' to the hook-closing position, engagement between the latch end portion 4*a* and the hook end portion 5*a* takes place along the elongated abutment surfaces 5*c* and 4*b*, so that no notch can form on the latch end portion 4*a* even after a very great number of strikes of the latch end portion against the hook end portion. The straight outer surface of latch end portion 4*a* and the straight outer surface of hook end portion 5*a* together form a smooth outer surface which can easily slide within a loop. If the latch end portion 4*a* is displaced from its intended illustrated position, which may occur when the pivot means 6 develops play after considerable use, or if the pivot means 6 is placed during manufacture so that the latch 4 is too long or too short, the latch end portion 4*a* will be displaced relative to the hook end portion 5*a*, but since the abutment faces 5*b* and 5*c* extend in longitudinal direction of the hook end portion 5*a*, the latch end portion 4*a* will move parallel to itself and in the direction of the straight hook end portion 5*a*, so that the flush outer surfaces of the latch end portion 4*a* and of the hook end portion 5*a* remain parallel to each other and flush so that a loop passing over the hook and the closed latch end portion cannot be damaged by the transverse end face of the latch end portion 4*a*. The end face 2*b* which bounds the lower end of slot 2 has an elongated curved convex abutment surface 2*c* which extends from the point 2*d* to the point 2*e*. The latch 4 has a corresponding outer curved convex abutment surface 4*c* which is shaped in such a manner as to extend parallel to, and to fully abut, the abutment surface 2*c* in the open position of the latch. Consequently, even after innumerable strikes of the outer surface of the latch 4 against the stem portion of the needle, no notch will form on the outer surface of the latch 4, since the force of the impact is distributed over the elongated abutment surfaces 4*c* and 2*c* even if the latch is displaced from its intended position. Consequently, a loop cannot be damaged by a notch on the outside of the latch when passing over the hook in the closed position of the latch.

It will be understood that each of the elements described above or two or more together, may also find a useful application in other types of latch needles differing from the types described above.

While the invention has been illustrated and described as embodied in a latch needle having abutment faces for preventing damage to the latch when the latch strikes the hook or the stem of the needle, it is not intended to be limited to the details shown, since various modifications and structural changes may be made without departing in any way from the spirit of the present invention.

Without further analysis the foregoing will so fully reveal the gist of the present invention that others can by applying current knowledge readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention and, therefore such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claims.

What is claimed and desired to be secured by Letters Patent is:

1. A latch needle comprising a stem; a hook connected with said stem and having an elongated hook end portion spaced from said stem, said hook end portion having an outer surface facing away from said stem, and being formed with an elongated groove extending in the longitudinal direction of said hook end portion and having an elongated longitudinally extending bottom face parallel to said outer surface; a pivot means mounted on said stem; and a latch mounted on said pivot means for turning movement to and from a hook-closing position, said latch having an inner abutment face abutting said bottom face of said groove, and an outer surface extending in said hook-closing position in the direction of, and substantially flush with said outer surface of said hook end portion, said latch having a transverse latch end face between said outer surface thereof and said inner abutment surface, said latch end face being located in said groove in said hook-closing position so that when said latch abuts said hook end portion in a displaced hook-closing position in which said abutment face is longitudinally displaced along said bottom face, said outer surface of said latch remains flush with said outer surface of said hook end portion while said latch end face remains in said groove and cannot engage and damage a thread passing over said hook and over said flush outer surfaces of said hook end portion and of said latch.

2. A latch needle comprising a stem; a hook connected with said stem and having an elongated hook end portion spaced from said stem, said hook end portion having an outer surface facing away from said stem, and being formed with an elongated groove extending in the longitudinal direction of said hook end portion and having an elongated longitudinally extending bottom face, said bottom face being parallel to said outer surface; a pivot means mounted on said stem; and a latch mounted on said pivot means for turning movement to and from a hook-closing position, said latch having an inner elongated abutment face extending in said hook-closing position parallel to and abutting said bottom face of said groove, and an outer surface parallel to said elongated abutment face and extending in said hook-closing position parallel to, and substantially flush with said outer surface of said hook end portion, said latch having a transverse latch end face between said outer surface thereof and said inner abutment surface, said latch end face being located in said groove in said hook-closing position so that when said latch abuts said hook end portion in a displaced hook-closing position in which said abutment face is longitudinally displaced along said bottom face, said outer surface of said latch remains parallel and flush with said outer surface of said hook end portion while said latch end face remains in said groove and cannot engage and damage a thread passing over said hook and over said flush outer surfaces of said hook end portion and of said latch.

3. A latch needle, comprising a stem; a hook connected with said stem and having an elongated straight hook end portion spaced from said stem, said hook end portion having an outer straight surface facing away from said stem, and being formed with an elongated straight groove extending in the longitudinal direction of said hook end portion and having an elongated longitudinally extending straight bottom face; a pivot means mounted on said stem; and a latch mounted on said pivot means for turning movement to and from a hook-closing position, said latch having an inner elongated straight abutment face extending in said hook-closing position parallel to and abutting said straight bottom face of said groove, and an outer straight surface extending in said hook-closing position parallel to, and substantially flush with said straight outer surface of said hook end portion, said latch having a transverse latch end face between said outer surface thereof and said inner abutment surface, said latch end face being located in said groove in said hook-closing position so that when said latch abuts said hook end portion in a displaced hook-closing position in which said straight abutment face is longitudinally displaced along said straight bottom face, said straight outer surface of said latch remains parallel and flush with said outer surface of said hook end portion while said latch end face remains in said groove and cannot engage and damage a thread passing over said hook and over said flush outer surfaces of said hook end portion and of said latch.

4. A latch needle comprising a stem; a hook connected with said stem and having an elongated straight hook end portion spaced from said stem, said hook end portion having an outer straight surface facing away from said stem, and being formed with an elongated straight groove extending in the longitudinal direction of said hook end portion and having an elongated longitudinally extending straight bottom face, said bottom face being parallel to said outer surface; a pivot means mounted on said stem; and a latch mounted on said pivot means for turning movement to and from a hook-closing position, said latch having an inner elongated straight abutment face extending in said hook-closing position parallel to and abutting said straight bottom face of said groove, and an outer straight surface parallel to said elongated abutment face and extending in said hook-closing position parallel to, and substantially flush with said straight outer surface of said hook end portion, said latch having a transverse latch end face between said outer surface thereof and said inner abutment surface, said latch end face being located in said groove in said hook-closing position so that when said latch abuts said hook end portion in a displaced hook-closing position in which said straight abutment face is longitudinally displaced along said straight bottom face, said straight outer surface of said latch remains parallel and flush with said outer surface of said hook end portion while said latch end face remains in said groove and cannot engage and damage a thread passing over said hook and over said flush outer surfaces of said hook end portion and of said latch.

5. A latch needle comprising a stem having a straight stem portion; a hook connected with said stem portion and having an elongated straight hook end portion spaced from said stem and extending substantially parallel to the same, said hook end portion having an outer straight surface facing away from said stem portion, and being formed with an elongated straight groove extending in the longitudinal direction of said hook end portion and having an elongated longitudinally extending straight bottom face; a pivot means mounted on said stem; and a latch mounted on said pivot means for turning movement to and from a hook-closing position, said latch having an inner elongated straight abutment face extending in said hook-closing position parallel to and abutting said straight bottom face of said groove, and an outer straight surface extending in said hook-closing position parallel to, and substantially flush with said straight outer surface of said hook end portion, said latch having a transverse latch end face between said outer surface thereof and said inner abutment surface, said latch end face being located in said groove in said hook-closing position so that when said latch abuts said hook end portion in a displaced hook-closing position in which said straight abutment face is longitudinally displaced along said straight bottom face, said straight outer surface of said latch remains parallel and flush with said outer surface of said hook end portion while said latch end face remains in said groove and cannot engage and damage a thread passing over said hook and over said flush outer surfaces of said hook end portion and of said latch.

6. A latch needle comprising a stem; a hook connected with said stem and having a curved connecting portion and an elongated hook end portion spaced from said stem, said hook end portion having an outer surface facing away from said stem, and being formed with an elongated groove extending in the longitudinal direction of said hook end portion and having an elongated

longitudinally extending bottom face, said groove having a transverse end face extending to the outer surface of said curved connecting portion; a pivot means mounted on said stem; and a latch mounted on said pivot means for turning movement to and from a hook-closing position, said latch having an inner elongated abutment face extending in said hook closing position parallel to and abutting said bottom face of said groove, and an outer surface extending in said hook-closing position parallel to, and substantially flush with said outer surface of said hook end portion, said latch having a transverse latch end face between said outer surface thereof and said inner abutment surface, said latch end face being located in said groove in said hook-closing position spaced from said transverse end face of said groove so that when said latch abuts said hook end portion in a displaced hook-closing position in which said abutment face is longitudinally displaced along said bottom face, said outer surface of said latch remains parallel and flush with said outer surface of said hook end portion while said latch end face remains in said groove and cannot engage and damage a thread passing over said hook and over said flush outer surfaces of said hook end portion and of said latch.

7. A latch needle comprising a stem having a straight stem portion; a hook connected with said stem portion and having an elongated straight hook end portion spaced from said stem and extending substantially parallel to the same, said hook end portion having an outer straight surface facing away from said stem portion, and being formed with an elongated straight groove extending in the longitudinal direction of said hook end portion and having an elongated longitudinally extending straight bottom face, said bottom face being parallel to said outer surface; a pivot means mounted on said stem; and a latch mounted on said pivot means for turning movement to and from a hook closing position, said latch having an inner elongated straight abutment face extending in said hook-closing position parallel to and abutting said straight bottom face of said groove, and an outer straight surface parallel to said elongated abutment face and extending in said hook-closing position parallel to, and substantially flush with said straight outer surface of said hook end portion, said latch having a transverse latch end face between said outer surface thereof and said inner abutment surface, said latch end face being located in said groove in said hook-closing position so that when said latch abuts said hook end portion in a displaced hook-closing position in which said straight abutment face is longitudinally displaced along said straight bottom face, said straight outer surface of said latch remains parallel and flush with said outer surface of said hook end portion while said latch end face remains in said groove and cannot engage and damage a thread passing over said hook and over said flush outer surfaces of said hook end portion and of said latch.

8. A latch needle comprising a stem having a longitudinal slot bounded at one end by an elongated curved concave abutment surface; a hook connected with said stem and having an elongated hook end portion spaced from said stem; said hook end portion having an outer surface facing away from said stem, and being formed with an elongated groove extending in the longitudinal direction of said hook end portion and having an elongated longitudinally extending bottom face; a pivot means mounted on said stem; and a latch mounted on said pivot means for turning movement between a hook-closing position and an open position, said latch having spaced from its end an outer curved convex elongated abutment surface extending parallel to and abutting said elongated curved concave abutment surface in said open position so that said latch is not damaged by frequent contact with said stem, and so that when said latch engages said stem in a displaced open position, said curved convex abutment surface remains parallel to said curved concave abutment surface and fully abuts the same, said latch having at its end an inner elongated abutment face extending in said hook-closing position parallel to and abutting said bottom face of said groove, and an outer surface extending in said hook-closing position parallel to, and substantially flush with said outer surface of said hook end portion, said latch having a transverse latch end face between said outer surface thereof and said inner abutment surface, said latch end face being located in said groove in said hook-closing position so that when said latch abuts said hook end portion in a displaced hook-closing position in which said abutment face is longitudinally displaced along said bottom face, said outer surface of said latch remains parallel and flush with said outer surface of said hook end portion while said latch end face remains in said groove and cannot engage and damage a thread passing over said hook and over said flush outer surfaces of said hook end portion and of said latch.

9. A latch needle comprising a stem having a longitudinal slot bounded at one end by an elongated curved concave abutment surface; a hook connected with said stem and having an elongated straight hook end portion spaced from said stem, said hook end portion having an outer straight surface facing away from said stem, and being formed with an elongated straight groove extending in the longitudinal direction of said hook end portion and having an elongated longitudinally extending straight bottom face, said bottom face being parallel to said outer surface; a pivot means mounted on said stem; and a latch mounted on said pivot means for turning movement between a hook-closing position and an open position, said latch having spaced from its end an outer curved convex elongated abutment surface extending parallel to and abutting said elongated curved concave abutment surface in said open position so that said latch is not damaged by frequent contact with said stem, and so that when said latch engages said stem in a displaced open position, said curved convex abutment surface remains parallel to said curved concave abutment surface and fully abuts the same, said latch having at its end an inner elongated straight abutment face extending in said hook-closing position parallel to and abutting said straight bottom face of said groove, and an outer straight surface parallel to said elongated abutment face and extending in said hook-closing position parallel to, and substantially flush with said straight outer surface of said hook end portion, said latch having a transverse latch end face between said outer surface thereof and said inner abutment surface, said latch end face being located in said groove in said hook-closing position so that when said latch abuts said hook end portion in a displaced hook-closing position in which said straight abutment face is longitudinally displaced along said straight bottom face, said straight outer surface of said latch remains parallel and flush with said outer surface of said hook end portion while said latch end face remains in said groove and cannot engage and damage a thread passing over said hook and over said flush outer surfaces of said hook end portion and of said latch.

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