LET-OFF DEVICE
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ABSTRACT OF THE DISCLOSURE
The bobbin support of a let-off device is blocked by a gravity operated clamping roller located in a wedge-
shaped gap, when the bobbin support with an unbalanced silver package undesirably tends to rotate rearward in a direction of rotation opposite to the normal forward unwinding direction of rotation of the sliver package.

The present invention relates to a let-off device for a bobbin having a yarn package, and more particularly to a device of this type in which a rotary bobbin support is mounted on a stationary shaft. The unwinding of cross-
wind packages, such as sliver packages in roving frames or in spinning machines, is either effected by mounting the bobbin loosely on a pair of driven rollers, or by attaching the bobbin with the package to a support mounted on the stationary shaft. In the first-mentioned construction, undesirable stretching of the unwound sliver is prevented by a transmission which controls the circumferential speed of the bobbin. However, the transmission is comparatively complicated, expensive, and requires space which is not always available in spinning machines. In the second con-
struction, the bobbin rotates with the bobbin support due to the pulling effect exerted by the unwound sliver on the package and bobbin. This arrangement, is unsuitable for large and heavy yarn packages, since the inertia and un-
balanced masses of the package present difficulties. A uniform speed of rotation of the bobbin must be obtained by braking the same, which results in an undesirable ten-
sioning of the sliver unwound from the bobbin.

It is one object of the invention to overcome the above-
described disadvantages of known let-off devices for bob-
bin, and to provide a let-off device by which trouble-
free unwinding of the bobbin is effected and the sliver is unwound from the package.

Another object of the invention is to provide a let-off device for a bobbin and yarn package in which rearward rotation of the bobbin opposite to the unwinding direction is prevented.

Another object of the invention is to provide a let-off device for a bobbin and yarn package in which inertia movements of the bobbin, and movements of the bobbin due to unbalanced masses of the package, are limited.

With these objects in view, the present invention relates to a let-off device for a bobbin having a yarn package. One embodiment of the invention comprises stationary means, such as a shaft; bobbin support means mounted on the stationary means for rotation about a substantially horizontal axis; and a round clamping element such as a cylindrical roller or a spherical ball, located in a down-
wardly slanted gap formed between the support means and the stationary means.

The gap has a higher gap portion and a lower gap por-
tion which is narrower than the higher gap portion. In the preferred embodiment of the invention, the gap is formed between a circular wall of the rotary support means and a clamping member which is secured to the end portion of the stationary shaft. If the clamping sur-
face of the clamping member is straight, the upper gap end portion and the lower gap end portion are narrower than the intermediate gap portion.

Due to the fact that the gap is slanted to a horizontal plane, the round clamping element is urged by gravity toward and into the lower gap end portion which is nar-
ower than the diameter of the round element so that the rotary bobbin support is clamped to the stationary shaft means in a position of rest of the rotary support means, and also when the same have a tendency to rotate in rear-
ward direction so that rearward turning of the package is prevented. When the yarn package is unwound and ro-
tates in forward direction, the round element moves into the wider gap portion so that the rotary support means of the bobbin is not clamped to the stationary shaft means, and unwinding of the package can proceed in for-
ward direction.

The mass and position of the round clamping element, and the dimensions and position of the gap must be se-
lected so that the kinetic energy of the round clamping element falling from the higher wider gap portion into the lower narrower gap portion is sufficient to produce the required clamping force in the lower narrower gap end portion.

Due to the fact that the rotary bobbin support rotates freely on the stationary shaft means in the free position of the round clamping element, and that braking of the bobbin support is not required, the sliver is unwound at a minimum tension.

The let-off device according to the invention is of sim-
ple design, inexpensively manufactured, and extremely reliable in operation.

The novel features which are considered as character-
istic 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 spec-
cific embodiments when read in connection with the ac-
companying drawings, in which:

FIG. 1 is a side elevation, partially in axial section, illustrating an embodiment of the invention; and

FIG. 2 is an end view of the embodiment of FIG. 1, as viewed in the direction of the arrow in FIG. 1, an end cover being omitted for the sake of clarity.

Referring now to the drawing, a stationary shaft 1 is fixedly secured to a frame wall 2 in a horizontal position and carries a pair of ball bearings 4, of which only one is visible in FIG. 1. Rotary support means for a bobbin 14 and package 14', include a sleeve 3 mounted on bearings 4 for rotation about the axis of shaft 1, and an end cover 16 closing a circular recess 5 in the end portion of sleeve 3 bounded by a circular wall 3a.

A flange 6 is secured to the free end of shaft 1 and

located in recess 5. A clamping member 7 is secured to the front face of flange 6 so as to form a gap 8 with the circular inner surface 9 of wall 3a. Clamping member 7 may be perma-
nently secured to flange 6, or attached to the same by a pair of screws 7, permitting an adjustment of the position of clamping member 7. In the preferred embodiment illustrated in FIG. 2 in solid lines, the lower end portion 11 of clamping member 7 is located in the region of the lowest point 13 of the inner surface 9 of circular wall 3a. Due to the fact that the clamping surface 7a extends along a chord of the circular surface 9, the gap end por-
tions are narrower than the intermediate central portion of gap 8.

A round clamping element, shown to be a cylindrical roller 10, is located in the gap between the straight clamping surface 7a and an arcuate portion of the inner surface 9.
the ends 11 and 12 of clamping member 7, but smaller than the width of the central portion of the gap. Consequently, the clamping roller 10 has two end positions in which it clamps annular wall 3c to clamping member 7 and stationary shaft means 1, 6, and an intermediate position in which clamping engagement is released and slippage of bobbin 14 and package 14' can freely rotate on shaft 1 and bearings 4. The slant of surface 7a must be directed upward in the direction of rotation of bobbin support 3, 3a, 16 which is assumed to be clockwise when the yarn 15 is unwound in the direction of the arrow 15u from the yarn package 14. and the lower end 11 of clamping member 7 is located above the lowest portion of the inner surface 9, and acts on roller 10 at a point in which the latter has a certain kinetic and potential energy with respect to the lowest point 13 of the inner circular surface 9. In this manner, a sufficient clamping of roller 10 in the region of the clamping portion 11 is assured. The position of the rear clamping portion 11 must be selected in such a way as to assure that roller 10 is located above the lowest point 13 of the circular surface 9 when roller 10 is clamped in its lower position.

In the illustrated embodiment, the position of clamping member 7 has been selected to obtain a minimum utilization of the kinetic energy of roller 10. However, clamping member 7 may be secured to flange 6 in other positions, one of which is shown in phantom lines in FIG. 2. In this embodiment, the kinetic energy of roller 10 is substantially greater than in the position shown in solid lines, so that roller 10 more firmly clamps the rotary bobbin support to the stationary shaft means. The position of clamping member 7 with clamping portions 11, 12 can be selected to position gap 8 to obtain the desired clamping action.

A bobbin 14 is mounted on sleeve 3 with a yarn package 14'. When yarn 15 is unwound in the direction of the arrow 15u, sleeve 3 rotates with bobbin 14 in clockwise direction as viewed in FIG. 2. When yarn 15 is not unwound, and the device is in a position of rest, the unbalanced mass and the inertia of yarn package 14' acts against the direction 15u of the pull of yarn or sliver 15. Clamping roller 10 is wedged due to the action of gravity between the lower clamping portion 11 and the circular surface 9 in the illustration position, so that rearward rotation of bobbin support means 3, 3a, 16 in counterclockwise direction is prevented since such rotation would force clamping roller 10 more deeply into the narrow end of gap 8.

When slaver or sliver 15 is pulled in the direction of the arrow 15u and unwound from package 14', the same rotator with bobbin 14 and rotary bobbin support 3, 3a, 16 in clockwise direction, and clamping roller 10 is carried from its illustrated lower clamping position to a higher position located in the wider central portion of the gap where the central portion of the clamping surface 7a is spaced a greater distance from the circular inner surface 9 of wall 3c, so that the ball does not simultaneously engage surfaces 7a and 9, permitting free rotation of the bobbin support means on bearings 4 and stationary shaft 1 in clockwise direction. Since the bobbin support is mounted on antifriction bearings, a negligible force is required for pulling slaver or yarn 15 which does not stress or strain the slaver. Only the rolling friction of ball bearings 4 and to a certain extent the resistance of the unbalanced mass of package 14' against rotation has to be overcome.

When the unwinding of slaver or yarn 15 is stopped, clamping roller 10 is no longer driven upward by the rotating circular surface 9, and drops into the lower gap portion where it is wedged between the lower end portion 11 of clamping member 7 and the confronting portion of circular surface 9. In this manner, rearward rotation of bobbin support means 3, 3a, 16 is immediately prevented.

If due to the unbalanced mass of package 14', the momentum and inertia of package 14' act in the forward unwinding direction of bobbin 14 and rotary bobbin support 3, 3a, 16, bobbin 14 and the rotary bobbin support turn into a position in which the unbalanced mass of package 14' begins to act rearward in counterclockwise direction and opposite to the unwinding direction until roller 10 stops and further rearward movement of the bobbin support with bobbin 14 and prevents further rearward rotation when wedged in the lower end of gap 8.

In the illustrated embodiment, the clamping surface 7a of clamping member 7 is straight. However, it will be understood that the surface 7a may also be curved, but the curvature must be designed and selected so that the curved surface 7a forms a gap with the circular surface 9 which has two narrow end portions for limiting the movements of clamping roller 10. In any event, in view of the purpose of clamping roller 10, the position of clamping surface 7a must permit clamping roller 10 to reach the lower clamping portion of gap 8 always by its own weight.

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 let-off devices for bobbins differing from the types described above.

While the invention has been illustrated and described as embodied in a let-off device for a bobbin including a gravity operated clamping means for blocking rearward rotation of a bobbin and package, it is not intended to be limited to the details shown, since various modifications 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 equivalents of the following claims.

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

1. Let-off device for a bobbin having a package, comprising, in combination, stationary means having a first clamping surface; bobbin support means mounted on said stationary means for rotation about a substantially horizontal axis and having a second endless clamping surface, said first clamping surface being formed with a cam-like edge extending at an angle to a horizontal plane and having a higher gap portion and a lower gap portion, said lower gap portion being narrower than said higher gap portion and being substantially greater than said higher gap portion, said clamping element being urged by gravity into a clamping position located in said lower gap portion in engagement with said first and second clamping surfaces for blocking rotation of said bobbin support means in a direction opposite to said one direction, said clamping element being adapted to be moved by said endless second clamping surface during rotation of said bobbin support means in said one direction to a loose position located in said wider higher gap portion and releasing said second clamping surface so that said bobbin support means rotates freely in said one direction during the unwinding of the bobbin, and being adapted to move to said clamping position when said bobbin support means starts to rotate in said opposite direction.

2. Let-off device as claimed in claim 1 wherein said clamping element has a circular rolling face whose diameter is greater than the width of said lower gap portion.
and smaller than the width of said higher gap portion.
3. Let-off device as claimed in claim 1 wherein said endless clamping surface is circular and has a center coinciding with said horizontal axis.
4. Let-off device as claimed in claim 1 wherein the ends of said first clamping surface are spaced from said second clamping surface a distance smaller than the width of said clamping element, and wherein the center portion of said first clamping surface is spaced from said second clamping surface a distance greater than the width of said clamping element, said center portion of said first clamping surface bounding said higher gap portion, and one of said ends of said first clamping surface bounding said lower gap portion.
5. Let-off device for a bobbin, comprising, in combination, stationary means having a straight clamping surface; bobbin support means mounted on said stationary means for rotation about a substantially horizontal axis and having a circular clamping surface coaxial with said axis, said straight clamping surface extending substantially along a chord of said circular clamping face, said straight and circular clamping surfaces forming together a gap slanted to a horizontal plane and having a higher gap portion and a lower gap portion, said lower gap portion being narrower than said higher gap portion; and a round clamping roller located in said gap and having a diameter greater than the width of said lower gap portion and smaller than the width of said higher gap portion and being urged by gravity into a clamping position located in said lower gap portion for clamping said support means to said stationary means whereby rearward rotation of said support means is blocked, said round clamping roller being adapted to be moved by said bobbin support means to a free position located in said wider gap portion when said support means is forwardly rotated during the unwinding of a bobbin mounted thereon.
6. Let-off device for a bobbin having a yarn package, comprising, in combination, stationary shaft means having a horizontal axis; bobbin support means including a sleeve mounted on said shaft means for rotation about said axis and having a recess bounded by a circular wall having a circular inner surface surrounding an end portion of said shaft means and being coaxial with the same; a clamping member secured to said end portion of said shaft means and having aplanar straight clamping surface extending substantially along a chord of said circular inner surface and forming with the same a gap slanted to a horizontal plane and having two narrow gap end portions and an intermediate wider gap portion; and a round clamping element located in said gap and having a circular face adapted to contact said clamping surface and said circular inner surface, said circular face of said clamping element having a diameter greater than the width of said gap end portions and smaller than the width of said intermediate gap portion, said clamping element being urged by gravity into a clamping position located in the lower gap end portion for clamping said sleeve to said stationary shaft means whereby rearward rotation of said bobbin support means is blocked, said clamping element being adapted to be rolled by said circular wall to a free position located in said intermediate gap portion when said bobbin support means is rotated forwardly during the unwinding of a bobbin mounted thereon.
7. A device according to claim 5 wherein the lower end of said gap is located in the region of the lowest point of said circular clamping surface.
8. A device according to claim 6 wherein said shaft means include a stationary shaft and a circular flange constituting said end portion and being located in said recess; and wherein said clamping member is secured to said flange, and adapted to be secured to the same in different angular positions at different heights above the lowest point of the inner surface of said circular wall.
9. A device according to claim 6 wherein said clamping member is secured to said end portion of said shaft means in a position in which the lower end of said clamping surface is located above the lowest point of said circular inner surface so that said round clamping element in its lowest position is located above said lowest point.
10. A device according to claim 6 and including anti-friction bearing means mounted on said shaft means and supporting said sleeve of said bobbin support means for rotation about said axis.
11. A device according to claim 6 wherein said sleeve is cylindrical and has said recess in one end thereof so as to form said circular wall; and a circular cover abutting the annular end of said circular wall and closing said recess.

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