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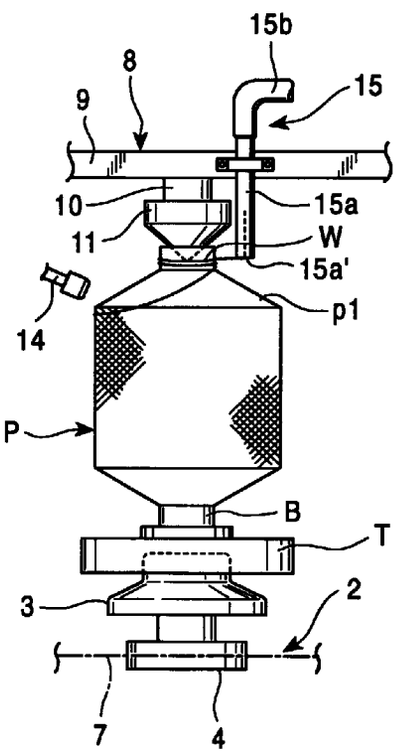
(54) Package inspection device

(57) An intake member 15 which sucks in the tip of a loosened bunch winding yarn W and removes it from the inspection area of package P is arranged in a package inspection device. Since the loosened bunch winding yarn W is removed from the inspection area by the intake member, the tip of the loosened bunch winding is prevented from unraveling from the package, entering the inspection area, and interfering with the inspection.

FIG. 2



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Description

Field of the Invention

[0001] The present invention relates to a package inspection device which examines package weight, diameter, shape, stitching, presence or absence of bunch winding, fluffs of the yarn, stains and the like.

Background of the Invention

[0002] A conventional package inspection device in which a plurality of inspection stations are arranged in the package transport line, and which automatically examines package weight, diameter, shape, stitching, the presence of a bunch winding yarn, fluffs, stains and the like, is known.

[0003] The present applicant has in a previous application (unexamined patent application No. HEI 10-153414) provided a package inspection device. Since the presence of loosened or slack bunch winding yarn would likely be damaged during inspection, the conventional package inspection device ejects air towards the package in a predetermined direction when it finds a loosened or slack bunch winding yarn during examination for fluffs or stains on the surface of a package, thus removing the loose bunch winding yarn from the inspection area.

Summary of the Invention

[0004] Although the conventional package inspection device is able to reduce operating errors and reliably inspect packages, it is a object of the present invention to provide a package inspection device which further reduces operating errors, enables greater package inspection reliability, and simplifies package processing after inspection.

[0005] In order to accomplish this object, the present invention is provided with an intake member for sucking in the loosened bunch winding yarn and holding it away from the package inspection area when inspecting a package. This intake member is arranged above a package either transported or inspected while placed atop a tray, and lowers toward the bunch winding on the bobbin. Moreover, the position at which the bunch winding yarn is taken up is outside of the inspection area. The intake member is arranged so as to move independently from a stand-by position above the package to an intake position in close proximity to the package's bunch winding. Additionally, an air ejection member is arranged to guide the tip of the loosened bunch winding towards the intake member. Further, the inspection device is arranged such that when the package is rotated and inspected, the package is rotated in the direction in which the bunch winding yarn has been wound.

Brief Description of the Drawings

[0006]

Figure 1 is a side view schematic drawing showing the entire package inspection device of the present invention.

Figure 2 is a side view drawing showing the essential elements of the package inspection device of the present invention.

Figure 3 is a side view schematic drawing showing the positional relationship between the intake member and the air ejection member in the package inspection device of the present invention.

Detailed Description of the Preferred Embodiments

[0007] An embodiment of the present invention is now explained in reference to the accompanying drawings. The following example is included merely to aid in the understanding of the present invention, and variations may be made by one skilled in the art without departing from the spirit and scope of the present invention.

[0008] First, the structure of the entire package inspection device will be explained using Figure 1.

[0009] 1 is a dark room. Inside the dark room 1, a plurality of inspection stations S2~S5 are arranged. A stand-by station S1 Is arranged in front of the inspection stations S2~S5, and a send-off station S6 is arranged immediately after. An inspected package P is set on a tray T, and transported via a transport device not shown in the drawing.

[0010] 2 is a tray rotating device arranged at a predetermined inspection station. Tray rotating device 2 is comprised of roughly conical rotating bodies 3 which come into contact with the bottom surface of the tray T, pulley 4 which is attached to the rotary shafts of the rotating bodies 3, motor 5, pulley 6 attached to the output shaft of a motor 5 and driving belt 7 which imparts rotary drive to pulley 4 which is attached the rotary shafts of each of the rotating bodies 3. Rotationally driving the motor 5 causes the pulley 6 to rotate the rotating bodies 3 via the driving belt 7 and the pulley 4. Rotation of the rotating bodies 3 enables the tray T to come into contact with the rotating bodies 3 and to be rotated.

[0011] 8 is a bobbin holding device which holds the top of a bobbin B of the package P riding on the tray T which is rotated by the tray rotating device 2. The bobbin holding device 8 is comprised of a independently elevating holding rod 9 which is raised and lowered via a suitable driving device such as a cylinder, and a holding member 11 which is held so as to be independently rotatable around a shaft 10 affixed to the holding rod 9. The tip of the bobbin B of package P carried on the tray T which is rotated by the tray rotating device 2 is held by the holding member 11, thus preventing the package P

from wobbling while it is being rotated.

[0012] Next, an example of the package inspection means which inspects the upper surface p1 of package P will be explained using Fig. 2 and Fig. 3.

[0013] 12 is a light source such as a halogen lamp which illuminates a predetermined region on the upper surface p1 of the package P being inspected. 13 is an image pick-up device for inspecting the upper surface p1 of the package P; in the present embodiment, an area sensor comprised of a CCD is employed. Image data obtained from the image pick-up device 13 is analyzed by a computer which enables detection of the amount of fluffs, stains, or the like on the upper surface p1 of the package P.

[0014] The above-described inspection is performed at a predetermined station. During inspection, as described below, the tray rotating device 2 causes the package P atop the tray T to rotate in the direction in which the bunch winding has been wound around the bobbin B. Additionally, the holding member 11 of the bobbin holding device 8 holds the tip of the bobbin B of the package P atop the rotating tray T, and prevents the rotating package P from wobbling.

[0015] 14 is an air ejection member which ejects air towards the tip of the bunch winding yarn W wrapped around the bobbin B, and is arranged at a location that does not interfere with the inspection performed by the image pick-up device 13. 15 is an intake member comprised of an intake pipe 15a and an intake orifice 15a' of the intake pipe 15a positioned in proximity to the tip of the bunch winding yarn W of the package P being inspected, and is arranged at a location that will not interfere with the inspection performed by the image pick-up device 13. In the present embodiment, the intake pipe 15a is affixed to the independently elevating holding rod 9 comprising the above-described bobbin holding device 8. The Intake pipe 15a is connected via a suction pipe 15b to an air suction supply source not shown in the drawing. The holding rod 9 is lowered from the elevated stand-by position, and when the holding member 11 of the bobbin holding device 8 holds the tip of the bobbin B of the package P atop the tray T, the intake orifice 15a' of the intake pipe 15a is positioned in close proximity to the bunch winding of the package P.

[0016] When the package P on the tray T is positioned at the predetermined station, the rotating body 3 of the tray rotating device 2 comes into contact with the bottom of the tray T, the holding rod 9 is lowered, and the tip of the bobbin B of the package P is held by the holding member 11 of the bobbin holding device 8. Next, the motor 5 is driven, and the tray T upon which the package P is carried is rotated in the direction in which the bunch winding yarn W has been wound around the bobbin B. Thus, before and after rotation in the direction in which the bunch winding yarn W has been wound, or alternatively, during this time, air from the air ejection member 14 is discharged, generating an intake current in close proximity to the intake orifice 15a' of the intake pipe 15a. Thus loose bunch winding yarn W on the surface p1 of the package P is removed from the inspection area by the air ejected from the air discharge member 14, and sucked into the intake orifice 15a' of intake pipe 15a which is sucking in air.

[0017] As described above, the tip of the loosened bunch winding yarn W on the surface p1 of the package P is removed from the inspection area by the air ejected from the air discharge member 14 In a way that does not interfere with inspection. Although there is suction in the intake orifice 15a' of the intake pipe 15a which sucks in air, since the package P atop the tray T is rotated in the direction in which the bunch winding yarn W is wound around the bobbin B, the tip of the bunch winding yarn W is rewound around the bobbin B once again as a bunch winding.

[0018] Since, as described above, the tip of the loosened bunch winding yarn W which has been removed from the inspection area by the air ejected from the air discharge member 14 is sucked in and held in the intake pipe 15a of the intake member 15, unlike in the case of the conventional package inspection device, the tip of the bunch winding yarn W is not loosened from the top of the package, and it is reliably prevented from entering the inspection area and hampering the inspection.

[0019] As described above, in addition to the tip of the bunch winding yarn W, which is removed from the inspection area by the air ejected from the air discharge member 14, being sucked in and held in the intake pipe 15a of the intake member 15, the package P on the tray T is rotated in the direction in which the bunch winding yarn W has been wound around the bobbin B. Thus, by using the rotation of the package P being inspected, the bunch winding yarn W can be rewound around the bobbin B into a new bunch winding. Hence, after inspection of the package P, loosened tips of the bunch winding yarns can be prevented from becoming entangled with machinery during the transport process, with other packages, or with the tips of bunch winding yarns of other packages.

[0020] Depending upon the inspection location and the type of yarn wound into package P, only a intake member 15 need be provided to remove the tip of a loosened bunch winding yarn W from the inspection area, and hold it in suction. Thus, in this case, the air ejection member 14 can be eliminated, and by using only the intake member 15 to remove the loosened bunch winding yarn W from the inspection area, unlike in the case of the conventional device where air discharge is used and the bunch winding yarn W is not loosened, and the bunch winding yarn tip is prevented from entering the inspection area and interfering with the inspection.

[0021] Alternatively, by providing the air discharge member 14 and arranging the device such that air ejected from the air discharge member 14 is discharged in the direction of the air intake pipe 15a, the loosened bunch winding yarn W is guided in the direction of the

intake pipe 15a of the intake member 15, and can be reliably sucked into the intake pipe 15a. Normally, two types of bunch winding yarns are present, from the start and end of the winding; the present invention may operate using either of these ends.

[0022] Since the present invention is arranged as described above, it achieves the following results.

[0023] Since the tip of the bunch winding yarn is removed and held outside of the inspection area by means of the intake member, entry of the bunch winding yarn into the inspection area and interference with the inspection can be prevented. The intake member is attached in proximity to and facing towards the bunch winding in the direction in which the bunch winding yarn is wrapped around the bobbin. Further, it is arranged at a position that is outside the inspection area. Thus, the yarn tip sucked into the intake member can be reliably held outside of the inspection area.

[0024] The intake member is arranged above the upper surface of the package such that it moves independently from the standby position until the bunch winding of the package nears the intake position. Thus, when at the stand-by position, It does not interfere with the flow of the package, and when at the bunch winding yarn intake position, it can reliably suck in the bunch winding yarn.

[0025] By providing an air discharge member for guiding the tip of the loosened bunch winding yarn towards the intake member, the loosened bunch winding yarn can be reliably sucked into the intake member.

[0026] Since the package is rotated in the direction in which the bunch winding yarn is wound, a loosened bunch winding yarn can be rewound around the bobbin into a new bunch winding, and after inspection, entanglement of a package's loosened bunch winding yarn with machinery, other packages, or the bunch winding yarns of other packages in the package transportation process can be reliably prevented.

Claims

1. A package inspection device comprising an intake member for sucking-in the tip of a bunch winding yarn and holding it outside of the package inspection area when a package is inspected.

2. A package inspection device as in claim 1 wherein the intake member is attached in close proximity above a package that is either transported or inspected on a tray, and which faces a bunch winding in the direction in which the bunch winding yarn is wrapped around the bobbin.

3. A package inspection device as in claim 1 or claim 2 wherein the intake member is arranged such that it moves independently from a stand-by position above a package to the intake position in close proximity to the bunch winding.

4. A package inspection device as in any one of claims 1~3 further comprising an air ejection member for guiding the tip of the loosened bunch winding yarn towards the intake member.

5. A package inspection device as in any one of claims 1~4 wherein a package is rotated in the direction in which the bunch winding is wound when the package is rotated and inspected.

FIG. 1

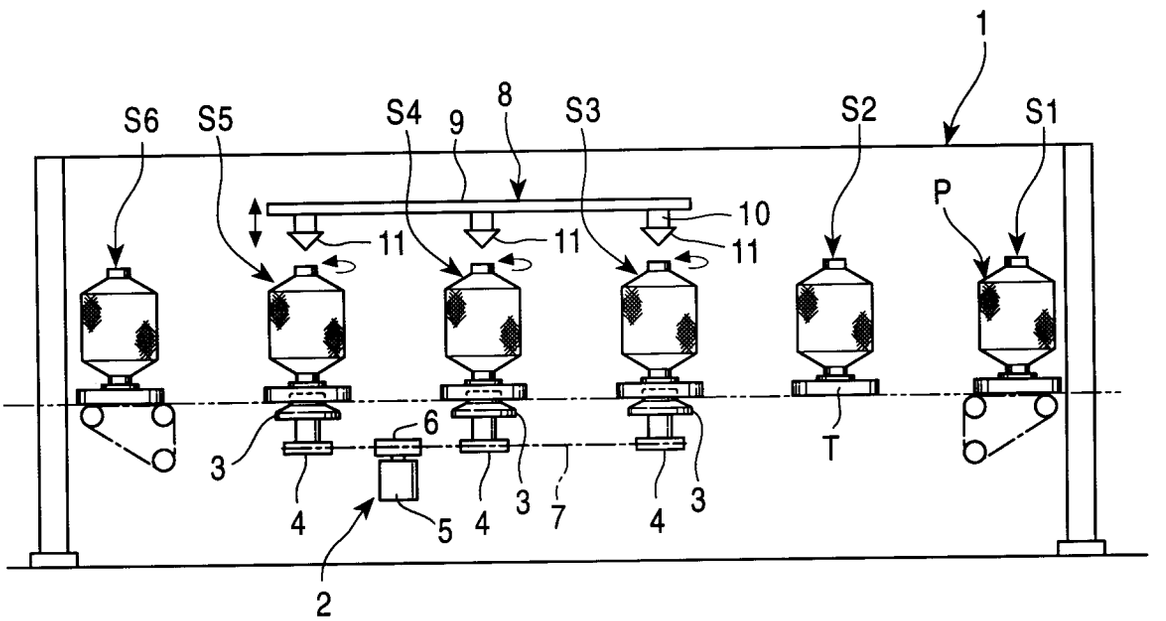

FIG. 2

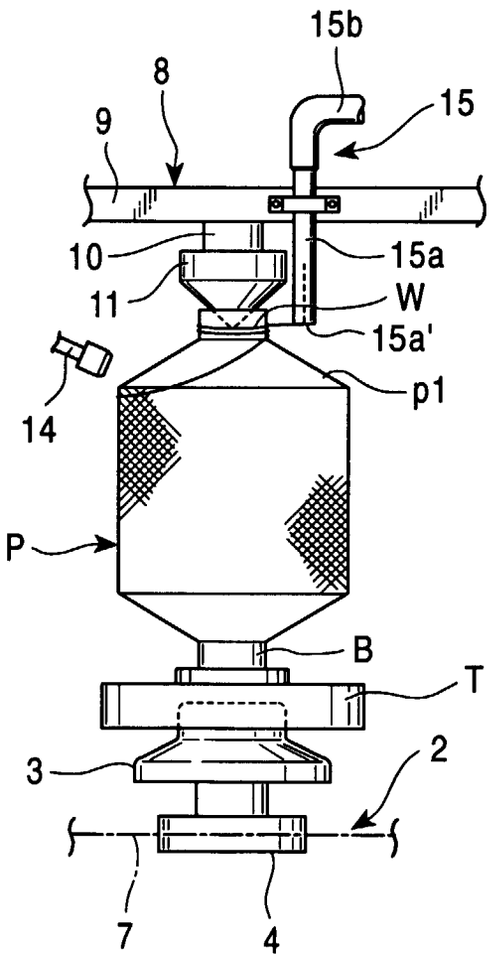

FIG. 3