Automatic apparatus for loading cones on a creel

An automatic apparatus for loading cones on a creel comprises accumulating means (2) for accumulating cones on pallets, depalletizing means (3) for removing the cones, and means (6) for determining the position of the cones and means (4) for loading the cones on the creel (5).

The system (1) allows to perform the steps of accumulating, depalletizing, determining the position and loading the cones on the creel (5), through an anthropomorph robot (3) which, by other electropneumatic and electronic devices, takes the pieces or cones (9) arranged in an ordered manner on pallets.
Description

BACKGROUND OF THE INVENTION

[0001] The present invention relates to an automatic apparatus for loading cones on a creel.
[0002] As in known, a creel is a primary apparatus necessary for weaving a fabric or cloth material.
[0003] The yarn, either of a natural or synthetic type, must be prepared for the loom provided for weaving it.
[0004] Depending on the height or width of the fabric material and the type of fabric material to be made, it is necessary to use a different number of thread or yarn ends.
[0005] All the above threads inside the warping mills, are directly prepared on a single large reel or spindle, called "beam", to be fed to the loom or weaving apparatus and unwound.
[0006] The preparation of the beam is made by the creel, which can have different configurations and arrangements; on the other hand, all prior creels have common characteristics, comprising a cone accumulating system, a thread control system and a beam winding system.
[0007] The cone accumulating system essentially comprises one or more racks, on the pins or spindles of which the cones are arranged.
[0008] In particular, the thread is manually taken and conveyed through a suitable pulling and control sensor system to the motor driven beam.
[0009] On systems for which a high yield is required, the racks are arranged in a duplicated arrangement, and they are made movable to allow the cones to be loaded at the same time at which the beam is made.
[0010] The so-called "V" creel constitutes an apparatus for allowing the racks to be easily moved or driven.
[0011] In such an arrangement, the rack is made by a double closed loop chain (of triangle configuration), in which the operating side is arranged outside, whereas the loading side is arranged along a central passageway.
[0012] In prior apparatus, the cones are manually loaded by an operator.
[0013] This operation is a comparatively simple one, since the cones have a cylindric configuration with a maximum diameter of 300 mm and a height of about 200 mm and a weight or mass less than 4 Kg.
[0014] However, the operator must necessarily perform the loading operations in a very small space, and in the presence of dust and fluff, generated by the rubbing-sliding of the thread or yarn through the puller elements and for a comparatively high number of times.
[0015] The above mentioned repetitive loading requires a limitation of the personal operating hours and, consequently, requires or the presence of a lot of operator staffs or a reduction of the system yield.
[0016] Also known is the fact that the cones are palletized in a multiple layer arrangements on benches having a size of about 1200 x 1200 mm.
[0017] The cone layers, in particular, are separated by separating element which can be made either of a plastic or a paperboard material.
[0018] The height of the operating benches can be up to 2 meters and this characteristics, jointly with the limited bearing surface of the cones on the bottom plane, causes the cones to be inaccurately distributed through each cone layer.
[0019] While the operations related to fabric material weaving operations are very advanced, from an automatic standpoint, it is anyhow known that the first automatized machines were the weaving apparatus or looms.
[0020] Up to now, small efforts have been made to design an automatic system for automatically loading cones on creel apparatus, and, at present, and as stated, this loading operation is performed by human operators.

SUMMARY OF THE INVENTION

[0021] Accordingly, the aim of the present invention is to provide such an apparatus adapted to automatically load cones to be fed to a creel.
[0022] Within the scope of the above mentioned aim, a main object of the invention is to provide such an apparatus which has a very high production yield.
[0023] According to one aspect of the present invention, the above mentioned aim and objects, as well as yet other objects, which will become more apparent hereinafter, are achieved by an automatic apparatus for loading cones to be fed to a creel, characterized in that said apparatus comprises accumulating means for accumulating cones on pallets, depalletizing means for removing said cones from said pallets, and means for determining the position and loading said cones on said creel.

BRIEF DESCRIPTION OF THE DRAWINGS

[0024] Further characteristics and advantages of the present invention will become more apparent hereinafter from the following detailed disclosure of a preferred, though not exclusive, embodiment of the invention, which is illustrated, by way of an indicative, but not limiting, example in the accompanying drawings, where:

Figure 1 is a top plan view of the automatic apparatus according to the present invention, applied to a V-shape creel;
Figure 2 is a top plan view of a roller assembly;
Figure 3 is a further top plan view of the V-shape creel and of the warping equipment;
Figure 4 is an elevation view of the robot assembly;
Figure 5 is a further elevation view illustrating an interlap pallet to be loaded, a cone supporting magazine and a cone handler;
Figure 6 is a top plan view of the robot assembly; Figure 7 is a further elevation view of the robot assembly; Figure 8 is a front elevation view of the cone handler and of the portal assembly; and Figure 9 is an elevation view illustrating the cone magazine or store.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0025] With reference to the number references of the above mentioned figures, the automatic apparatus according to the present invention, which has been generally indicated by the reference number 1, will be disclosed and illustrated with reference to an embodiment thereof provided for application to a V-shape creel, generally indicated by the reference number 100.

[0026] However, it should be apparent that said automatic apparatus can also be applied, as suitably modified, to other creel arrangements or configurations.

[0027] The application to a V-shape creel of the apparatus according to the present invention is advantageous, since such an apparatus requires a great production performance and, accordingly, the size designing of the system according to the present invention for a V-shape creel will be sufficient also for other creel arrangements.

[0028] The subject apparatus essentially comprises accumulating roller assemblies 2, robotized means and display means 3, a cone handler arranged inside a V-shape creel 5, for supplying a warping equipment 7.

[0029] Between the robotized means 3 and handler device 4 a cone store or magazine 6 is arranged.

[0030] More specifically, the handler 4 comprises a carriage, adapted to slide on a longitudinal beam 18, supported by portal elements 19 and bridging the two loading zones 20.

[0031] Bench assemblies 8, holding full cones 10 therein, are arranged at the start of the accumulating roller assembly 2 and are transferred to a depalletizing point and, as emptied, are transferred to an outlet stacking point.

[0032] The length of the roller assemblies 2 can be changed depending on the number of the bench element required for filling the creel 5 or depending on the feeding speed of the bench elements.

[0033] In particular, the bench element or assembly 8, filled-in with cones, is arranged under the detection region of the TV camera, to detect or sense the proper positions X and Y of each hole of the cones 9.

[0034] To detect or determine the remaining coordinate z, a battery of optic sensors is arranged at the inlet of the roller assembly path, at the depalletizing region thereof.

[0035] The z dimension will be a multiple of the height of each cone.

[0036] The determination of the taking coordinates will allow to properly take the cones 10, by directly operating on their inner cores, thereby preventing any contact with the thread or yarn wound thereon.

[0037] Thus, any possible damages related to a possible contact with outside elements, would be prevented from occurring.

[0038] In operation, the robot 3 takes the cones 10 directly from the bench assembly 8 and arranges them on the parking or accumulating assembly 6.

[0039] As the bench assembly layer has been fully emptied, the monitoring and displaying system verifies the position of the inter-lap, and the robot will remove it with a subsequent depositing on a dedicated bench assembly.

[0040] The assembly for accumulating or parking the cones 6 comprises two units, generally indicated by the reference numbers 61 and 62, arranged one in the front of the other at the inlet of the creel 5 and comprising two pin or spindle rows 11, spaced from one another as the creel pins or spindles.

[0041] Such a parking or accumulation is necessary to make the operation of the robot 3 independent from that of the carriage 4 and to prevent the robot from being undesirably stopped during the carriage translation and as the cones are arranged on the creel pins.

[0042] The cones 10, in particular, are supported on their inner core and on each supporting pin are arranged ejecting ring elements, to push and drive the piece or cone on the carriage, upon completing the loading operation.

[0043] The cone carriage 4 is arranged in a bridging relationship with respect to the two loading zones of the creel 5 and comprises a portal handler 14, of metal construction, having a length equal to that of the creel plus the stroke necessary for arrangement between the two parking positions.

[0044] The longitudinal axis is driven by an electric motor, pinion and rack assembly.

[0045] The cone supporting assembly is directly mounted on the driving carriage 16 and comprises a number of pins 15 equal to the number of the parking pins, in turn mounted on a telescopic expanding device 17, to facilitate the cone transfer operations.

[0046] On each carriage pin is finally arranged a cone ejecting ring element, to finally transfer the cones onto the creel pins.

[0047] The full cones 10 are accordingly driven from the pallets to the store or parking device 6, by the robot 3, advantageously including a gripping gripper 33 and, accordingly, through the carriage 4, to the loading regions 20 from which, in a per se known manner, they pass to the unwinding zone 21, through driving chains 22.

[0048] Depending on the use requirements, the portal handler size and roller assembly length can be suitably changed.

[0049] It has been practically shown that the invention fully achieves the intended aim and objects.
In fact, the invention has provided an apparatus allowing to perform the steps of accumulating, depalletizing, determining the position and loading the cones on the creel, by using an anthropomorth robot which, as aided by other electropneumatic and electronic devices, takes the cones arranged in an ordered arrangement on the pallets.

In the disclosed embodiment, the apparatus allows to load onto the creel single color cones.

However, it should be apparent that it would be also possible to load cones of different colors, with a composition of the proper color sequence on the creel, by using a bench accumulating and transfer system, and a cone depalletizing system, as suitably designed.

In practicing the invention, the used materials, as well as the contingent size and shapes, can be any, depending on requirements.

**Claims**

1. An automatic apparatus for loading cones to be fed to a creel, characterized in that said apparatus comprises accumulating means for accumulating cones on pallets, depalletizing means for removing said accumulated cones, and means for determining the position and loading the cones on the creel.

2. An automatic apparatus, according to claim 1, characterized in that said apparatus comprises pallet accumulating roller assemblies, display means and robotized means, and a cone handler arranged in the V-shape creel, said creel being designed for supplying a warping assembly.

3. An automatic apparatus, according to claims 1 and 2, characterized in that between said robotized means and handler a parking or storing region for parking or storing said cones is provided.

4. An automatic apparatus, according to one or more of the preceding claims, characterized in that said handler comprises a carriage adapted to slide along a longitudinal beam supported by portal elements and bridging the two cone loading zones.

5. An automatic apparatus, according to one or more of the preceding claims, characterized in that the bench assemblies holding full cones therein are deposited at a start of the accumulating roller assembly and then driven to a depalletizing point as they are empty; said bench assemblies being driven to an outlet stacking point.

6. An automatic apparatus, according to one or more of the preceding claims, characterized in that said roller assemblies have a length varying depending on the number of bench assemblies necessary for filling-in the creel, or depending on the bench assembly supplying speed.

7. An automatic apparatus, according to one or more of the preceding claims, characterized in that said bench assembly, full of cones, is arranged under the TV camera detecting region, to determine an accurate X and Y position of each hole of said cones.

8. An automatic apparatus, according to the preceding claim, characterized in that, to determine the lacking coordinate z, an optic sensor battery is arranged at the inlet of the roller assembly path at the depalletizing point.

9. An automatic apparatus, according to the preceding claim, characterized in that the z dimension is a multiple of the height of each cone.

10. An automatic apparatus, according to one or more of the preceding claims, characterized in that a determining of the cone taking coordinates allows to pick up the cones, by directly operating on the inner cores of said cones and preventing any contacts with the thread or yarn wound on said cones.

11. An automatic apparatus, according to one or more of the preceding claims, characterized in that said robot picks up said cones directly from the bench assembly and arranges said taken cones on the parking assembly.

12. An automatic apparatus, according to one or more of the preceding claims, characterized in that, as the bench layer has been fully emptied, the display system verifies a position of the interlap and said robot removes said interlap and then deposit it on a dedicated bench assembly.

13. An automatic apparatus, according to one or more of the preceding claims, characterized in that said cone parking assembly comprises two units, arranged one in the front of the other, at an inlet of said creel and comprising two pin rows, the pins of which are spaced as the creel pins.

14. An automatic apparatus, according to one or more of the preceding claims, characterized in that said parking is designed for making the operation of said robot independent from that of said carriage and to prevent said robot from being undesirably stopped, as said carriage is driven and said cones are deposited on said creel pins.

15. An automatic apparatus, according to one or more of the preceding claims, characterized in that said cones are supported on their inner cores and on each said pin are arranged ejecting ring elements.
to push and transfer said cones onto said carriage
upon completing the loading operation.

16. An automatic apparatus, according to one or more
of the preceding claims, characterized in that said
cone carriage is arranged in a bridging relationship
with the two loading zones of said creel and com-
prising a portal handle having a length equal to that
of said creel plus the stroke necessary for arranging
it between two parking positions.

17. An automatic apparatus, according to one or more
of the preceding claims, characterized in that the
longitudinal axis is driven by an electric motor, pin-
ion and rack assembly.

18. An automatic apparatus, according to one or more
of the preceding claims, characterized in that said
cone supporting assembly is directly amounted on
said carriage and comprises a number of pins equal
to the number of pins of said parking arrangement,
in turn mounted on a telescopic expanding device
to facilitate the cone transfer operations.

19. An automatic apparatus, according to one or more
of the preceding claims, characterized in that on
each pin of said carriage is arranged a cone ejecting
ring element to finally transfer said cones on said
creel pins.

20. An automatic apparatus, according to one or more
of the preceding claims, characterized in that the
full cones are driven from the pallets to said maga-
zine or parking zone through said robot, including
gripper means and then, through said carriage, to
the loading zones, from which they pass to the wind-
ing zone by chains.
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