

"APPARATUS FOR STACKING PRINTED PRODUCTS ARRIVING
IN AN IMBRICATED PRODUCT STREAM"

This invention relates to a new and improved construction of apparatus for stacking
5 printed products arriving in an imbricated product formation or stream, such as newspapers, periodicals and the like. The invention further concerns apparatus for de-stacking a stack which has been formed with the aid of the aforementioned stacking
10 apparatus.

Generally speaking, the stacking apparatus of the present invention is of the type comprising a rotatably driven winding mandrel for winding-up the imbricated product formation and a separation
15 layer operatively associated or connected with the winding mandrel.

In German Patent No. 1,244,658 there is disclosed an apparatus for storing veneer sheets, wherein the veneer sheets reposing upon a pressure
20 band are fed from below to a drum. The revolvably driven pressure band extends almost along the entire circumference of the drum and therefore serves both for the infeed and also for the support of the loose veneer sheets before and during the
25 winding operation. The individual wound

layers or package plies are separated from one another by a separation or partition band connected with the drum. This separation band is placed over the veneer sheets at the region of a winding gap and is wound up along with the veneer sheets. Since the outermost ply or layer of the thus formed package must be supported by the pressure band, the package cannot be readily removed from the stacking apparatus. As a rule, the package remains in the stacker apparatus until such time as it is de-stacked, this stacker apparatus being convertible into the de-stacking apparatus by performing appropriate equipment conversion manipulations, so that the de-stacking apparatus cannot be employed during the storage time of the stack for the formation of a new stack.

Also, in German Patent No. 2,207,556 there is disclosed stacking apparatus of the previously mentioned type, wherein the printed products arriving in an imbricated product formation are brought together by means of winder or winding bands both at its top surface and also at its bottom surface. The imbricated product formation is retained between the winding bands.

These winding bands together with the intermediately reposing printed products are fed in from above, i.e. overhead, to the winder drum and wound upon it. After
5 the winder drum has been filled, the ends of both winding bands are firmly lashed together in order to retain the finished package. The need to provide two winding bands is associated with a corresponding complication in the
10 equipment design and the expenditure in materials. Additionally, notwithstanding the presence of two winding bands, in many instances it is necessary to provide side or cheek plates at the winder drum, in order to prevent any disintegration of the stack
15 or a positional change of the printed products within the imbricated product formation during manipulation of the finished stack.

Therefore, with the foregoing in mind it is the general or primary object of the present
20 invention to provide a new and improved construction of apparatus of the kind referred to which is free from the aforementioned drawbacks and limitations of the prior art constructions.

Another and more specific object of the
25 present invention is to provide a new and improved

construction of apparatus of the character described which, with extremely modest equipment and material expenditure, permits the positive formation of a wound stack, in which the products maintain their position
5 within the imbricated product formation even during the handling of the wound stack, for instance during its transportation.

Yet a further significant object of the present invention aims is the provision of a new and improved
10 construction of de-stacking apparatus for the de-stacking of printed products which have been stacked by means of the stacking apparatus of the invention.

A further significant object of the present invention is the provision of novel material handling
15 apparatus, namely a stacker and a de-stacker, respectively, which in each case are of relatively simple construction and design, extremely reliable in operation, quite economical to manufacture, not readily subject to breakdown or malfunction, and which require a
20 minimum of maintenance and servicing.

In accordance with the present invention, apparatus for the intermediate storage of newspapers, journals and like printed products, arriving thereto in an imbricated product formation, with each leading end of the product
25 resting upon the trailing end of the preceding product,

comprises a rotatably mounted winding mandrel which is rotatably driven for winding-up the imbricated product formation. Also provided is a conveying device for guiding the said imbricated formation tangentially on to the winding mandrel and a winding band connectable to the winding mandrel which is wound between the layers of the wound product formation during winding up of the product formation. The characteristic feature of the invention is that the conveying device and a single winding band are arranged in underfeed relation to the winding mandrel, with the winding band at the outer side of the product formation relative to the winding^{mandrel} and that means are provided, additional to the mandrel, for producing a tension in the winding band.

15 The underfeed of the imbricated product stream to the winding mandrel permits the use of only the single winding band. Since this winding band is wound up under tension there is obtained a taut or tightly wound package in which the printed products maintain their mutual position, without the need to provide the winding mandrel with side or cheek plates or other similar additional aids.

Preferably, the side of the winding band which confronts the imbricated product is adhesive to the printed products so that these are more securely fixed thereto.

If there is adhesion between the surfaces of the winding band, then the finished stack can be retained in a most simple manner in that, at the end of the winding operation or product stacking process, the empty winding

5 band _____

is wound under tension one or more times over the previously wound winding band layer or ply.

As already indicated, the invention also proposes apparatus for de-stacking a printed product stack which has been formed by use of the previously mentioned stacking apparatus. According to the invention this de-stacking apparatus withdraws the single winding band forming the separation layer together with the printed products reposing on the winding band in an imbricated product formation, from below off the rotatably mounted package.

Due to the withdrawal of the winding band from below the printed products are likewise conjointly unwound and after separation from the winding band can be delivered in imbricated formation. Since each printed product bears upon the next following printed products a faultless detachment of the printed products from the product package or wound structure is ensured.

It is advantageous to provide a regulation device for maintaining constant the tension force applied to the winding band, in order thus to favour a faultless de-stacking operation.

The invention should be better understood from a consideration of the following detailed

description by reference to the accompanying drawings wherein:

5 Figures 1 and 2 illustrate by way of example an embodiment of stacking apparatus for forming a printed product stack in the form of a wound package and respectively illustrate such stacking apparatus during different working phases or steps; and

10 Figure 3 illustrates by way of example an embodiment of de-stacking apparatus for de-stacking the stack formed with the stacking apparatus illustrated in Figures 1 and 2.

15 Referring now to the drawings, in Figures 1 and 2 there is shown a stacking apparatus for stacking products such as printed products, typically newspapers, periodicals or the like. To simplify the illustration only enough of the construction of the stacking apparatus has been shown in order to enable those skilled in the art to readily understand the underlying principles and concepts of the present development.

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25 Thus in Figure 1 there is shown the stacking apparatus at the start of the winding operation, whereas in Figure 2 the stacking apparatus has been illustrated at a later moment

during which the package of stacked products is being formed. A substantially drum-shaped winding mandrel 1 is rotatably mounted in any suitable fashion so that it can rotate about its longitudinal axis 1a. To the winding mandrel 1 there is attached one end of a winding band 2 or equivalent winding structure. The winding band 2 is unwound from a supply roller 3. This supply roller 3 is freely rotatably mounted for rotational movement about its axis of rotation 3a. Engaging this supply roller 3 is a lever or equivalent brake 4. This brake 4 has a brake pad 5 which bears against the supply roller 3. The pad 5 is secured to a lever 6 which is pivotally mounted at one end. Engaging this lever 6 at its free end is a compression spring 7 which causes the brake pad 5 to contact the supply roller 3.

The winding band 2 is guided from the supply roller 3 over a conveyor roller 8 which is operatively associated, by means of a suitable drive connection 9, with a drive motor 10. By means of winder gearing 11 this drive motor 10 drives the winding mandrel 1 in the direction of the arrow A. The winder gearing 11 regulates the drive of the winding mandrel 1 so that its speed remains

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essentially constant independent of the diameter of the wound package. The winder gearing 11 is of

conventional design and commercially available, for instance, from the West German Company known as Firma P.I.V. Antrieb Werner Reimers KG.

Operatively associated with the drive motor 10 is a tachogenerator 12 which is driven by a guide roller 13 of a belt conveyor 14. This belt conveyor 14 or equivalent conveying device is rotatably driven in any suitable manner, as is well known in this art, in the direction of the arrow B. By means of the control connection between the belt conveyor 14 and the drive motor 10 it is possible to accommodate the rotational speed of the winding mandrel 1 to the supply speed of the belt conveyor 14.

Between the belt conveyor 14 and the winding mandrel 1 there is a balance arm 15 or equivalent structure serving as a slide or chute.

This balance arm 15 is pivotable about an axis 16 which is essentially parallel to the axis of rotation 1a of the winding mandrel 1 and coincides with the axis of rotation of the conveyor roller 8. At the balance arm 15 there engages a contact or pressure mechanism 17. This contact or pressure

mechanism 17 contains a pressure rod 18 which is hingedly connected with the balance arm 15. This pressure rod 18 or equivalent structure is mounted in a stationary housing 19 in which there is accommodated a compression spring 20 acting upon the pressure rod 18, as best seen by referring to Figure 2. By virtue of this contact or press mechanism 17 the rocker or balance arm 15 is pressed upwardly towards the winding mandrel 1 and against the package which is forming upon it.

The belt conveyor 14 feeds in the printed products 21 which repose one upon another in the manner of tiles of a roof and thus form an imbricated product stream or formation S. As best seen by referring to Figures 1 and 2, each printed product 21 bears, within the imbricated product formation S, in an imbricated manner upon the preceding or downstream located printed product. The imbricated printed product formation S can be fed in, for instance, by the belt conveyor 14 from the output of a rotary printing press. As also will be seen by referring to Figures 1 and 2, the winding band 2 travels from the supply roller 3 over the conveyor roller 8 and while bearing upon the balance arm or rocker 15 is fed to the

winding mandrel 1. The imbricated product formation S is moved by the belt or band conveyor 14 onto the balance arm or rocker 15 and upon the winding band 2 reposing upon it. The side 2a of the winding band 2, which confronts the imbricated product formation or stream S, is structured so that there is adhesion between the winding band 2 and the printed products 21. For this purpose the winding band 2 can be formed of an adhesive material, for instance a suitable plastics material. However, it is also possible to render the surface 2a of the winding band 2 adhesive or to apply an adhesive layer to such surface 2a.

By means of the driven winding mandrel 1 the winding band 2 together with the printed products 21 reposing thereon, are moved in the direction of the arrow C along the balance arm 15 and wound up upon the mandrel 1. The co-wound winding band 2 functions as a separation or partition layer between the package layers or plies. The winding roller 3 is braked by the brake pad 4 during the winding operation, so that the winding and 2 is wound-up while in a tensioned state upon the winding mandrel 1. It should be readily understood and as mentioned

heretofore that instead of using the brake
pad 4 other devices also can be employed
for generating a tension in the winding band 2
during the winding operation. Thus, for
instance, there could be utilised a suitable
band tensioning device of known design.

During the winding operation the
balance arm 15 is downwardly rocked about its
pivot axis 16 by the weight of the formed package
22 and against the force of the compression
spring 20. This has been clearly shown by a
comparison of Figures 1 and 2. Under the
action of this compression or pressure spring 20 the
balance arm 15 is pressed against the package 22,
so that there is caused a compression or pressing
of the printed products 21 which are fed in
to the winding gap W.

It would also be conceivable to design
the balance arrangement, i.e. the balance arm
15 so as to be stationary and to construct the
winding mandrel 1 so as to be elevationally dis-
placeable in order to compensate for the package
diameter and to generate a compressive force or
pressing action. The balance arrangement 15,
under certain circumstances, could also be

dispensed with, and in that instance the winding band 2 receives the imbricated product formation S from the belt conveyor 14 and feeds it to the winding gap W. With this design the winding band 2, apart from having a
5 conveying function, also assumes a support function.

By virtue of the fact that the winding band 2 and the printed products 21 which are reposing thereon are fed in from below to the winding mandrel 1, only a single winding band 2 is needed. By virtue of the
10 winding-up of the winding band 2 under tension there is obtained a compact and densely wound package 22 in which the printed products 21 are faultlessly maintained in their position within the imbricated product formation S without the need to resort to additional aids or
15 expedients, and specifically also when handling the wound product package 22, such as during transport and the like. The already described pressing of the printed products 21 at _____

the region of the winding gap W further contributes to increasing the strength of the finished wound package 22.

At the completion of the winding operation the empty winding band 2 is wrapped once or a number of times about the finished wound package 22, so that each new winding band layer or ply bears upon the previously wound winding band layer or ply. The adhesion prevailing between the winding band plies is sufficient for retaining together the wound package 22. No additional measures are needed for attachment of the free end of the winding band 2.

The finished wound package 22 can now be removed from the described stacking apparatus and intermediately stacked. If the stacked printed products 21 are again needed for further processing, then for de-stacking the wound stack the package 22 is delivered to the de-stacking apparatus shown in Figure 3.

This de-stacker apparatus corresponds in its design to the stacking apparatus shown and described above with reference to Figures 1 and 2. It will be seen to comprise a wind-up roll 23 for the winding band 2 and which is mounted to

be rotatable about its lengthwise axis 23a.

This wind-up or winding roll 23 is operatively drivingly associated by means of a winding gearing 24 with a suitable drive motor 25.

5 The winding gearing 24, corresponding to the winding gearing 11 of the stacking apparatus of Figures 1 and 2, ensures that the wind-up speed of the winding band 2 remains essentially constant independent of the varying
10 diameter of the package 22. By means of the merely schematically illustrated drive connection 26, the drive motor 25 drives a conveyor roller 27 over which there travels the winding band 2. By means of a suitable drive element 28, for
15 instance a chain or a belt, the drive motor 25 also drives a deflection roller 29 of a belt conveyor 30. This belt conveyor 30 or equivalent conveying structure serves to move and dispense the unwound imbricated product stream or
20 formation S' in the direction of the arrow F.

Between the outfeed conveyor 30 and the package 22 there is likewise arranged a balance arm 31 which, as to its design, can correspond to that of the balance arm 15 described with
25 reference to Figures 1 and 2. The balance arm 31

is pivotably mounted for movement upwardly and downwardly about its pivot axis 32 which coincides with the longitudinal axis of the conveyor roller 27. Likewise engaging at the balance arm 31 is a contact or press mechanism 33. Here also the contact or press mechanism 33 will be seen to comprise, by way of example, a press rod 35 guided within a housing 34 and bearing against a suitable compression spring, (not shown), but like the compression spring 20 of the arrangement of Figure 2. The contact mechanism 33, which is designed like the contact or press mechanism 17 of the arrangement of Figures 1 and 2, serves to press the balance arm 31 against the wound package 22.

A lever brake 36, which may be designed like the lever brake 4 of the arrangement of Figures 1. and 2, engages the winding mandrel 1 which is mounted to be freely rotatable about its rotational axis 1a. A brake pad 37 which is pressed against the winding mandrel 1 is secured to a rotatably mounted lever 38 which is engaged by a compression spring 39. This compression spring 39 or equivalent structure biases the brake pad 37 against the winding mandrel 1. Owing

to the braking force exerted by the brake pad 37 upon the winding mandrel 1, the winding band 2 is under a tensional force during the unwinding operation. The tension exerted at the winding band 2 should remain constant in order to ensure faultless detachment of the individual wound product layers during the unwinding operation. It should be understood that instead of using the lever brake 36 it would be possible to employ other suitable band tension regulation devices of known construction, in order to apply the aforementioned essentially constant tension.

The winding-up of the winding band 2 upon the winding roll 23 results in a rotation of the package 22 in the direction of the arrow D and unwinding of the printed products 21. The imbricated product formation S' which is removed from the package 22 is moved by the winding band 22 along the balance arm or rocker 31 in the direction of the arrow E and finally transferred to the belt or band conveyor 30 for the outfeed of the thus handled products. The mutual position of the printed products 21 within the outfed imbricated product stream S' is thus

essentially the same as that within the imbricated product stream S into the winding or stacking apparatus of Figures 1 and 2.

Since, as is shown in Figure 3, in the unwound imbricated product stream S' each printed product 21 bears in each case upon the next following printed product, it is possible to detach without any problem the printed products from the package 22 at the region of the unwinding or wind-off gap W'. By the action of the weight of the preceding printed product the printed products are pressed away from the wound package 22 towards the rocker or balance arm 31, so that any possibly prevailing adhesion force between the printed product and the outermost package layer or ply can be overcome without the need to resort to any additional aids for this purpose.

As with the stacking apparatus described above by reference to Figures 1 and 2, here also it is possible, in certain circumstances, to dispense with the use of the rocker 31. The winding band 2, in this case, serves as a support for the detached printed products 21.

After having accomplished the complete de-stacking or unwinding of the package 22 the winding band 22, wound up upon the wind-up roll 23, can be re-used for forming a new package.

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While there have been shown and described preferred embodimetns of the invention, it is to be understood that the invention may be variously embodied and practised within the scope of the appended claims.

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CLAIMS

1. Apparatus for the intermediate storage of newspapers, journals and the like printed products, arriving thereto in an imbricated product formation, with the leading end of each product resting upon the
5 trailing end of the preceding product comprising a rotatably mounted winding mandrel which is rotatably driven for winding-up the imbricated product formation, a conveying device for guiding the said imbricated formation tangentially on to the winding mandrel, and a
10 winding band connectable to the winding mandrel, which is wound between the layers of the wound product formation during winding-up of said product formation, characterised in that the conveying device and a single winding band are arranged in underfeed relation to the
15 winding mandrel, with the winding band at the outer side of the product formation relative to the winding mandrel, and in that means are provided additional to the mandrel, for producing a tension in the winding band.

2. Apparatus according to Claim 1, wherein the surface
20 of the winding band which faces the imbricated formation is adhesive with respect to the printed products.



3. Apparatus according to Claim 1 or Claim 2, wherein both the surfaces of the winding band are adhesive.
4. Apparatus according to Claim 2 or Claim 3, wherein the side of the winding band facing the imbricated
5 formation adheres by frictional contact.
5. Apparatus according to Claim 2 or Claim 3, wherein the side of the winding band facing the imbricated formation has an adhesive coating.
6. Apparatus according to Claim 2 or Claim 3, wherein
10 the winding band consists of adhesive material.
7. Apparatus according to Claim 6, wherein the winding band is a plastics material foil.
8. Apparatus according to Claim 1; wherein the additional tensioning means is a braking device which
15 affects the forward movement of the winding band.
9. Apparatus according to Claim 8, wherein during a winding operation the braking device engages a roller which is freely rotatable with the winding band.



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10. Apparatus according to Claim 8, wherein during an unwinding procedure the braking device engages the freely rotatable winding mandrel.

11. Apparatus according to any of the preceding Claims,
5 and comprising a regulating device for keeping constant the tensioning of the winding band.

12. Apparatus according to any of the preceding Claims,
wherein the winding band drawn off from an unwinding roller is guided over a conveying roller which is
10 connected to a drive motor which drives the winding mandrel by way of winder gearing at a winding speed independent of the respective winding diameter.

13. Apparatus according to Claim 12, wherein in order to adapt the rotational speed of the winding mandrel to the
15 delivery speed of the imbricated formation, the drive motor is connected to a tachogenerator which detects the delivery speed of the imbricated formation.

14. Apparatus according to any of the preceding claims,
wherein during an unwinding operation the winding band
20 is guided by way of a conveying roller driven by a motor to a winding-up roller which is driven by the same motor by way of winder gearing at a speed independent of the changing diameter of the winding package.



15. Apparatus according to any of the preceding claims, wherein upstream of the winding mandrel there is a bearing member over which the winding band and the imbricated formation resting thereon run and which in accordance with a change in the diameter of the winding package disposed on the winding mandrel is displaceable relative to the winding mandrel in such manner that the bearing member bears on the winding package with a constant force.
- 10 16. Apparatus according to Claim 15, wherein the bearing member is a rocker which is pivotable about an axis extending substantially parallel to the axis of the winding mandrel and is pressed against the winding package by means of a spring biased pressing device.
- 15 17. Apparatus for stacking products such as newspapers, periodicals and the like arriving in an imbricated product formation and constructed substantially as hereinbefore described with reference to, and as shown in Figs. 1 and 2 of the accompanying drawings.
- 20 18. Apparatus for de-stacking a stack of printed products, such as newspapers, periodicals and the like and which is constructed substantially as hereinbefore described with reference to, and as shown in, Fig. 3 of the accompanying drawings.
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