

18

METHOD AND DEVICE FOR INTERMEDIATE STORAGE OF PRINTED
PRODUCTS RECEIVED IN AN IMBRICATED FORMATION

1 The present invention relates to a method and apparatus
for intermediate storage of printed products such as news
papers or magazines received in staggered or imbricated
formation, in which the printed products are wound onto
5 a roll on a rotarily entrainable winding core.

It is known that printed products received in imbricated
formation may be wound for intermediate storage on to a
driven winding core together with a winding tape as described
in Swiss patent 559 691, German patent 31 23 688 or the
10 corresponding US patent 4,438,618. To this end, the printed
products are fed with their flat sides resting on a belt
conveyor to the winding core which is arranged with its
axis extending horizontally. The feed of the imbricated
formation may to this end be performed above or below the
15 winding core.

To obtain a compact printed product roll of high
storage capacity, meaning a roll of large diameter amongst
other things, it is now required to feed the printed products
to the winding core or to the roll, in such manner that
20 the leading edge of the printed products faces towards
the winding core or towards the outermost turn of the roll.
Furthermore, the winding tape should be wound up whilst
being placed under a particular tensile stress, so that
a contraction of the roll turns is caused during the winding
25 operation, which is essential to produce a compact roll.
Despite all these measures, the storage capacity of such
rolls formed in the conventional manner is restricted.

From a first aspect of the present invention consists
in a method for intermediate storage of printed products
30 received in staggered or imbricated formation, in which

- 19
- 1 the printed products are wound into a roll around a rotarily driven spindle which is vertical or slightly inclined with respect to the vertical , whilst the printed products have their bottom edges extending transversely to the
- 5 winding spindle placed on a support which rotates together with the winding core.

From a further aspect the invention consists in a device for intermediate storage of printed products received in staggered or imbricated formation, comprising a rotarily

10 driven winding core and a feed mechanism for infeed of the imbricated formation to the winding core or to the roll being formed thereon wherein the winding core is positioned with the pivot spindle extending vertically or slightly inclined with respect to the vertical, and wherein beneath

15 the winding core is situated a support co-rotating with the former and intended for the printed products wound on, on which the printed products are arranged to rest with their edges situated at the bottom and extending transversely to the pivot spindle of the winding core.

20 The method and apparatus of the invention allow the forming of rolls which are of greater diameter and commensurately greater storage capacity than hitherto and which can be handled in an uncomplicated manner.

In contrast to prior art arrangements it is unnecessary

25 to make special arrangements for preventing the disintegration of the roll during the winding operation, since the printed products wound on to the winding core are supported on edge on the support. In particular, the printed products may be fed to the winding core or to the roll in any appropriate

30 attitude within the imbricated formation. Furthermore, it is unnecessary to wind-in a winding tape, placed under substantial tensile stress, to hold the roll together.

6

- 1 On the contrary, it is sufficient to support the printed products of the outermost turn. To this end, it is possible for example to utilise a winding tape wound up together with the scale formation, which need only be kept under
5 very low tensile stress.

It is possible to produce rolls of very large diameter with a commensurately great storage capacity, thanks to the printed products being borne on the support. This also allows utilisation of winding cores of comparatively
10 large diameter without for this reason having to accept an appreciable reduction of the storage capacity. Winding cores of greater diameter have the advantage that the printed products of the innermost turns of the roll need not be wound as tightly and consequently need not be bent so far
15 out of shape.

Preferred embodiments of the invention will now be described in detail with reference to the accompanying drawings wherein:

Figure 1 is a schematic side view of a winding station
20 for winding printed products received in staggered or imbricated formation;

Figure 2 is a schematic plan view of the winding station of Figure 1;

Figure 3 is a schematic plan view of a winding station
25 comprising a displaceable winding core;

Figure 4 is a partial plan view of a winding station comprising a pivotable feed,

Figure 5 is a plan view of a winding station comprising a displaceable winding core in accordance with another
30 embodiment of the invention;

Figure 6 is a partial side view of the winding station of Figure 5;

1 Figure 7 is a plan view of a winding station comprises a fixed winding core, in accordance with a further embodiment of the invention; and

5 Figures 8 to 13 show different methods of feeding the printed products to the winding core or to the roll in accordance with the invention.

Referring first to Figures 1 and 2, a winding station 1 comprises a carrying frame 2 wherein a supporting disc 3 and a hollow cylindrical winding core 4 firmly joined thereto are rotatably mounted. The supporting disc 3 and the winding core 4 are driven in rotation in the direction of the arrow A (Figure 2) around the vertical pivot axis 4a coinciding with the longitudinal axis of the winding core 4, by means of a driving assembly 5. To this end, the driving assembly 15 5 is provided in the embodiment shown with a driving pinion 6 which meshes with internal gear teeth 7 of the supporting disc 3. It is understood that the drive of the supporting disc 3 and of the winding core 4 may also be effected in another appropriate manner.

20 Printed products 9 which lie flat in the embodiment according to Figures 1 and 2, that is to say which are fed in with horizontally extending flat sides in the direction of the arrow B (Figure 2) said printed products being received in staggered or imbricated formation 8, are wound on to 25 the winding core 4. The leading edge of the printed products 9 which may be situated on the upper or lower side of the staggered formation 8 and may be either the folded edge or the open lateral edge oppositely situated with respect to the former, is denoted by 9a. The edges of the 30 printed products 9 extending at right angles to this leading edge 9a, are denoted by 9b and 9c. The formation 8 is

1 placed on the winding core 4 or on the roll 1 being formed
thereon, at a transfer point 10. As is apparent from the
two Figures 1 and 2, the formation 8 is turned through 90°
around its longitudinal axis 8a in an area situated in front
5 of the transfer point 10 as seen in its conveying direction
B, so that the printed products 9 are placed on edge on
the winding core 4 or on the roll 11, that is to say whilst
extending vertically. The infeed and turning of the printed
products 9 are performed by means of a feed mechanism of
10 appropriate construction, which is not illustrated in Figures
1 and 2. For example, this feed mechanism may be formed
by conveyor belts.

A support tape 13 unwound from a storage reel 14,
which is slightly braked in a manner not specifically shown,
15 and extending on the underside 12 of the formation 8, is
wound up together with the latter. After the formation
8 is turned its underside 12, and the support tape 13, are
situated on the outer side of the roll 11. The support
tape 13 then serves the purpose of supporting the printed
20 products 9 in the turn 11a of the roll 11 which is the outermost
turn in each case, thereby preventing the upstanding printed
products 9 from being turned over.

As illustrated dash-dotted in Figure 1, the imbricated
formation 8 may also complementarily have wound up with
25 it a separator tape 15 which may be unwound from a storage
reel 16 which is also slightly braked, and is placed on
the upper side 17 of the formation 8 fed in. This upper
side 17 is transformed into the inwardly situated side of
the formation 8 facing towards the winding core 4, after
30 the formation 8 has been turned. The separator tape 15
situated on this inner side 17 in the roll serves the purpose
of facilitating the subsequent unwinding of the staggered
formation 8 from the roll 11.

23
1 The printed products 9 wound on edge have their lower edges 9c resting on the supporting disc 3 which carries the weight of the roll 11.

In an analogous form of illustration, in even more diagrammatic manner than in Figure 2, Figure 3 shows a winding station 1 in which the transfer point 10 remains fixed whereas the winding core 7 is arranged to be displaceable in the direction of the arrow C, together with the roll 11 and the supporting disc 3. This displacement occurs in step with the increase of the diameter of the roll 10 occurring during the winding operation. The position of the supporting disc 3 and of the winding core 4 in the finished roll 11 is indicated by dash-dotted lines.

In Figure 4 is shown in plan view an embodiment in which the winding core 4 and the supporting disc 3 are fixed, and the transfer point 10 travels away from the winding core 4 in step with the increasing roll diameter. In this embodiment, the imbricated formation 8 is already set on edge by the feed mechanism, that is to say being fed in with the printed products 9 assuming a vertical position. To this end, the leading edges 9a of the printed products 9 face towards the winding core 4 or towards the roll 11. A rocker device 18 of the conveying system, which is pivotable in the direction of the arrow D is shown diagrammatically. This feed rocker 18 comprises 2 mutually opposed conveyor belts 19 and 20 which are but partially illustrated, which between them form a conveying passage 21 through which the formation 8 is conveyed towards the roll 11 in the direction of the arrow B. The printed products 9 leaving the conveying passage 21 are laid against the roll 11 in the area of the transfer point 10. The support tape 13 wound up with the

1 imbricated formation 8, as well as the separator tape 15
present if need be, are not illustrated in Figure 4. The
feed rocker device 18 is illustrated in its extreme terminal
position which it assumes in the completed roll 11, the
5 outline of which is indicated by the dash-dotted line 22.
The structure of the feed rocker device 18 is such that
the flow of the imbricated formation 8 is offered up to
the roll 11 under approximately identical angles in any
pivotal position of the feed rocker device 18.

10 Another embodiment of a winding station 1 is shown
in Figure 5 in plan view and in Figure 6 in sideview in
the direction of the arrow VI of Figure 5. In this embodiment,
the infeed of the printed products 9 is performed by means
of a conveyor 25 which incorporates grippers 27 which are
15 shown only diagrammatically and are fastened with mutual
spacing on a rotarily driven traction element 26. These
grippers 27 hold the formation 8 in a vertically upright
position and hold the printed products 9 in the area of
their upper edge 9b (Figure 6). The support tape
20 13, and the separator tape 15 - if present - are continuously
laid against the outer side 12 and the inner side 17, res-
pectively, of the formation 8 before the transfer area 10,
over deflecting rollers 23 and 24.

As is apparent from Figure 6 in particular, the printed
25 products 9 supplied suspended by the conveyor 25 are moved
over the supporting disc 3 with their bottom lateral edges
9c extending over the supporting disc 3 at a distance a.
On the one hand, this prevents the printed products 9 from
striking the rim of the supporting disc 3, and on the other
30 hand ensures that the printed products 9 do not have their
bottom edges 9c in contact with the supporting disc 3

1 during their conveying, which could result in damage to
the printed products 9. The grippers 27 are opened at the
transfer point 10 at which the staggered formation 8 comes
into contact with the winding core 4 or the roll 11. As
5 a result of their intrinsic weight, the released printed
products 9 drop downwards and come into contact with the
supporting disc 3 via their bottom edges 9c. The
support tape 13 then prevents the released printed products
9 from falling away from the roll.

10 In this embodiment, the transfer point 10 remains
at the same location throughout the winding operation, whereas
the winding core 4 and the supporting disc 3 are moved away
in the direction of the arrow C (Figure 5) as has already
been described with reference to Figure 3.

15 By contrast thereto, the position of the winding core
4 and of the supporting disc 3 is not altered in the embodiment
according to Figure 7. As in the case of the embodiment
of Figures 5 and 6, the printed products are fed in by means
of a conveyor 25 while suspended a short distance above
20 the supporting disc 3. Before running on to the roll 1,
that is to say before the transfer point 10, the formation
8 is led over a deflecting roller 28 which rotates around
its vertical axis 28a in the direction of the arrow E.
An opening device 30 for the grippers 27, which is illustrated
25 only diagrammatically, is situated in the area in which
the formation 8 runs on to the deflecting roller 28. The
grippers 27 are opened and release the printed products
9 when the grippers 27 run past this opening device 30.
The released printed products are fed by means of the deflec-
30 ting roller 28 and if appropriate by means of a supporting
roller 29, to the transfer point 10 and directed to the
winding core 4 or the roll 11. At this stage the imbricated

26

1 formation 8 is held between the support tape 13 and the separator tape 15.

As the increasing diameter of the roll 11 increases, the deflecting roller 28 and the supporting roller 29, as
5 well as the opening device 30, are moved away from the winding core in the direction of the arrow F.

Other possibilities regarding the feed to and impingement of the printed products on the winding core 4 or the roll 11, are discussed in the following with reference to Figures
10 8 to 13. Only the parts of the winding station required for comprehension are illustrated in these Figures, however.

In the embodiments according to Figures 8 to 11, the printed products 9 are fed in by means of a conveyor 25 exactly as in the embodiments described above the grippers
15 27 of which grasp the printed products 9 by their upper edge 9b. In the embodiment according to Figure 8, the printed products are supplied in a vertical suspended position, in the same way as in the embodiment according to Figures 5 and 6. Whilst this occurs, the printed products 9 run
20 over the supporting disc 3 with their bottom lateral edges 9c spaced above the disc. The printed products 9 are released at the transfer point 10, have their bottom edges 9c placed in contact with the supporting disc 3 and are laid against the roll 11.

25 In the modified forms according to Figures 9 and 11, the printed products 9 are placed in an oblique position sloping to a greater or lesser degree with respect to the vertical. The printed products 9 are initially laid with their bottom edges 9c on the supporting disc 3 at
30 the periphery of the roll 11 at the transfer point 10 before being placed in full contact with the roll 11 by being pivoted

1 upwards in the direction of the arrow G. In the modified
form shown in Figure 10, the supporting disc 3 and thus
also the winding core 4, are set obliquely, with a slight
inclination with respect to the vertical. In the same way
5 as in the embodiment according to Figure 8, the printed
products 9 are supplied via the conveyor 25 in a suspended
vertical position and the laying on of the printed products
9 occurs however in the same way as described in the foregoing
with reference to Figures 9 and 11. The printed products
10 9 initially have their bottom edges 9c set down
on the supporting disc 3 before being placed in contact
with the roll 11.

This laying-on of the printed products 9 may occur
in any appropriate manner. For example, the guiding action
15 of the conveyor 25 may be so arranged that the printed products
9 are placed in contact with the roll 11 or the winding
core 4. It may also be envisaged however to provide complemen-
tary contact thrust devices, for example, such as conveyor
belts or guiding plates. Furthermore, the support tape
20 13 may also be utilised to place the oblique printed products
9 in contact with the roll 11.

In the modified form according to Figure 12, the printed
products are fed in whilst lying horizontally, in similar
manner to that shown in Figures 1 and 2, but whilst being
25 angled in the manner of a ridged roof, as shown by the printed
product denoted by 9' in Figure 12. The placing of these
printed products folded in the shape of a ridged roof 9'
in contact with the roll 11 occurs in a manner similar to
that described with reference to Figures 1 and 2, the half
30 of the printed products 9 facing towards the roll 11 being
placed in contact with the roll 11 first, and the other
half of the printed products being placed in contact with
said roll thereupon.

28

1 In the embodiment according to Figure 13, a deflector
plate 31 or the like is produced, on which the printed products
9 impinge and which causes a deflection of the lower parts
32 of the printed products 9 out of the vertical printed
5 product plane. This deflection of the lower parts 32 with
respect to the upper parts 33 of the printed products causes
their bottom edges 9c to be lifted so far that they
do not strike the lateral rim of the supporting disc 3 nor
lie on the supporting disc 3 whilst being carried over it.
10 In a manner similar to that of the embodiments according
to Figures 9 to 11, the printed products 9 initially come
into contact at the transfer point 10 on the winding core
4 or the roll 11 only in the area of their bottom lateral
edges 9c before subsequently being thrust completely against
15 the roll 11 or the winding core 4.

A modified form is entered dash-dotted in Figure 13,
in which the lower part 32 of the printed products 9 is
deflected away from the roll 11, whereas the upper printed
product part 33 is led on to the roll 11 by the conveyor
20 25. The deflection of the lower part 32 of the printed
products is performed in the same manner as in the version
illustrated by solid lines, for example meaning by means
of a deflector plate. In the version illustrated with broken
lines, the upper part 33 of the printed products will thus
25 be placed in contact with the roll 11. After being released
by the deflector plate, the lower part 32 of each of the
printed products is automatically placed in contact with
the roll of printed products 11 as a result of the inherent
elasticity of the printed products 9. Guiding means must
30 be provided as well however, under particular circumstances,
which place the lower parts 32 of the printed products 9
in contact with the roll 11.

1 After completing a roll 11, the latter may be removed from the winding station 1 together with the winding core 4 and the supporting disc 3 and carried to an unwinding station via an intermediate storage facility or else direct.

5 The unwinding of the imbricated formation 8 from the roll 11 is performed by unwinding the support tape 13 and the separator tape 15. As the printed products 9 are jointly unwound they are taken over by an outwardly directed conveyor of appropriate structure and carried to a further processing
10 station.

Only some of the numerous possible versions have been described in the foregoing with reference to the drawings. A brief reference is also made in the following to some additional possibilities.

15 The position of the printed products 9 within the imbricated formation 8 is immaterial to the perfect forming of a roll. Consequently, it is irrelevant whether the leading edges 9a of the printed products 9 face towards the winding core 4 or not. The supply of the printed products 9 to
20 the winding core 4 or the roll 11 may optionally be performed by means of belt conveyors or of feed conveyors provided with grippers, or even in another appropriate manner.

Furthermore, it may be envisaged not to drive the winding core 4 and the supporting disc 3 via the centre,
25 but via the periphery of the supporting disc 3 or of the roll 11. A definite risk of damaging the printed products 9 arises if the drive is applied to the periphery of the roll 11 of printed products.

The support tape 13 may be omitted if the printed
30 products 9 of the outermost turn 11a of the roll 11 are supported in another manner. For example, this may be

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1 achieved by means of a support tape extending along the
periphery of the roll, which revolves in the same direction
of rotation as the roll 11 and which is provided with a
longitudinal compensator system to allow adpatation to the
5 increasing roll diameter.

Finally, use may also be made of other appropriate
elements, for example cords and the like instead of the
support and separator tapes 15. Plastics material foils
are preferably utilised as support and separator tapes 13,15.

10 It will be appreciated that the method and apparatus
of the invention would also be applicable not only to
printed material but to other essentially flat, flexible
products made from paper, cardboard, plastics or other
similar material which might need to be stored temporarily
15 during manufacture.

CLAIMS

- 1 1. A method for intermediate storage of printed products received in staggered or imbricated formation, in which the printed products are wound into a roll around a rotarily driven spindle which is vertical or slightly inclined with respect to the vertical, whilst the printed products have their bottom edges extending transversely to the winding spindle, placed on a support which rotates together with the winding core.
- 5 2. A method according to claim 1, wherein during the winding action, the turn of the roll which is for the time being outermost is supported on its outer side.
- 10 3. A method according to claim 2, wherein an elongated flexible support element extending along the outer side of the imbricated formation with respect to the winding core is wound on together with the said imbricated formation.
- 15 4. A method according to any preceding claim, wherein an elongated flexible separator element extending along the side of the imbricated formation facing towards the winding core is wound on together with the said imbricated formation.
- 20 5. A method according to any preceding claim, wherein the printed products which are to be wound up and are running towards the winding core or towards the already formed roll are placed on the support only upon running on to the winding core or on to the roll.
- 25 6. A method according to any preceding claim wherein the imbricated formation is fed in horizontally with the printed products arranged at approximately right angles to the vertical and turned and set on edge around its longitudinal axis before running on to the winding core or on to the roll.
- 30 7. A method according to any one of claims 1 to 5, wherein



22

- 1 the imbricated formation is fed in on edge with the printed products arranged in an approximately vertical position, the printed products not being placed on the support until after running on to the winding core or on to the roll.
- 5 8. A method according to any one of claims 1 to 6, wherein the imbricated formation is fed to the winding core or to the roll with the printed products in an oblique position sloping with respect to the vertical and the printed products are initially placed in contact with the winding core or
10 with the roll in the area of their bottom edges and only thereafter in complete contact.
9. A method according to claim 6, wherein the printed products are fed in angled to the shape of a ridged roof.
10. A method according to claim 7, wherein the lower parts
15 of the printed products are deflected from the plane of the imbricated formation in the direction towards or away from the roll prior to running onto the winding core or the roll.
11. A method according to any preceding claim wherein the
20 imbricated formation is laid on to the winding core or on to the roll at a fixed point and that the winding core is displaced in step with the increasing roll diameter.
12. A method according to any one of claims 1 to 10, wherein the imbricated formation is laid on to the stationary winding
25 core or roll at a point moving away from the winding core in step with the increasing roll diameter.
13. A device for intermediate storage of printed products received in staggered or imbricated formation, comprising a rotarily driven winding core and a feed mechanism for
30 infeed of the imbricated formation to the winding core or to the roll being formed thereon, wherein the winding core



- 1 is positioned with the pivot spindle extending vertically or slightly inclined with respect to the vertical, and wherein beneath the winding core is situated a support co-rotating with the former and intended for the printed products wound
- 5 on, on which the printed products are arranged to rest with their edges situated at the bottom and extending transversely to the pivot spindle of the winding core.
14. A device according to claim 13, further comprising a support element which is elongated and flexible and may
- 10 be connected to the winding core and unreeled from a storage reel, which support element may be wound on together with the imbricated formation along the side thereof which is externally situated with respect to the winding core.
15. A device according to claim 13 or claim 14, further
- 15 comprising a separator element which is elongated and flexible and may be connected to the winding core and unreeled from a storage reel, which separator element may be wound on with the imbricated formation along the side thereof facing towards the winding core.
- 20 16. A device according to any one of claims 13 to 15, wherein the feed mechanism comprises a feeder equipped with grippers, arranged one behind the other on a rotarily driven traction element, which grasp the printed products by their top edges extending in the conveying direction.
- 25 17. A device according to claim 16, wherein the feeder feeds in the printed products suspended and having their bottom edges spaced above the support, and releases the same in the area of impingement on the winding core or on to the roll.
- 30 18. A device according to claim 16, wherein the feeder feeds the printed products to the winding core or to the



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34

- 1 roll in an oblique position sloping with respect to the vertical, and that means are provided for the laying-on of the printed products which are initially laid on to the winding core or the roll with their bottom edges.
- 5 19. A device according to claim 16, further comprising means for deflecting the suspended printed products in a direction towards or away from the winding core or the roll, before the printed products run on to the winding core or on to the roll.
- 10 20. A device according to any one of claims 13 to 15, wherein the feed mechanism comprises a belt conveyor directing the scale formation to the winding core or to the roll.
21. A device according to any one of claims 13 to 20, wherein the point of transfer of the printed products from
- 15 the feed mechanism to the winding core or roll is fixedly arranged and wherein the winding core is displaceable in step with the increasing roll diameter.
22. A device according to any one of claims 13 to 20, wherein the winding core is fixedly positioned and the point
- 20 of transfer of the printed products from the feed mechanism to the winding core or to the roll is displaceable in step with the increasing roll diameter.
23. A device according to any one of claims 13 to 22, wherein the support is produced in the form of a disc and
- 25 is connected to the winding core.
24. A method for intermediate storage of printed products, substantially as herein described with reference to Figures 1 and 2, Figures 3 and 4, Figures 5 and 6 or Figure 7 of the accompanying drawings.
- 30 25. A device for intermediate storage of printed products, substantially as herein described with reference to Figures 1 and 2, Figures 3 and 4, Figures 5 and 6 or Figure 7 of the accompanying drawings, taken in conjunction with any of Figures 8 to 13.

