

A METHOD AND A SYSTEM FOR PROCESSING PRINTED PRODUCTS

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BACKGROUND OF THE INVENTION

1. Technical Field

The present invention relates generally to processing printed products and more particularly to a method and a system for processing printed products, such as books and parts thereof.

2. Description of the Related Art

Known systems for processing printed products comprise a number of processing stations which are arranged one after another along a given processing path. The products to be processed are transported along the processing path, processed at the various processing stations and finally removed from the processing path at a removal location. A typical example of a system of this kind is disclosed in U.S. published patent application US 2002/0061238 A1 which shows an apparatus for producing books.

In systems of this type with the processing stations being fixedly arranged along a predetermined processing path (so-called "in-line systems") the processing steps have to be carried out in a predetermined sequential order defined by the mutual arrangement of the processing stations.

SUMMARY OF THE INVENTION

In a first aspect of the present invention, a printed product is fed to a first infeeding location of a transfer station, then transported in any sequence from the transfer station to one of a number of processing stations connected to the transfer station and processed at the respective processing station. The processed printed product is transported back to the transfer station after completion of the processing step at one of the processing stations.

According to a further embodiment of the present invention, a printed product fed to a first infeeding location of a transfer station is moved within the transfer station to a first outfeeding location of the transfer station. From this first outfeeding location the printed product is transported to a first processing station connected to the transfer station. At this first processing station the printed product is processed. After being processed at this first processing station, the printed product is transported back to a first receiving location of the transfer station. The processed printed product is then moved within the transfer station to a first removal location of the transfer station and finally removed from the transfer station at the first removal location.

Preferably the processed printed product infed to the first receiving location of the transfer station is subsequently transported to further processing stations connected to the transfer station and processed in these further processing stations. After completion of the processing step in one of the processing stations the processed printed product is transported back to the transfer station.

In a still further embodiment the printed product is temporarily stored or buffered in the transfer station between the various processing steps carried out at the further processing stations.

5 In a further aspect of the present invention a system for processing printed products comprises a transfer station which is provided with at least a first infeeding location for infeeding printed products to the transfer station, at least a first removal location for removing processed printed products
10 from the transfer station and at least a first connecting location. A first processing station is operatively connected to this first connecting location of the transfer device. The transfer station is further provided with a transporting device for moving the printed products within the transfer
15 device between the first infeeding location, the first connecting location and the first removal location.

According to a still further embodiment of the present invention a system for processing printed products comprises a transfer station which is provided with at least a first
20 infeeding location for infeeding printed products to the transfer station, at least a first removal location for removing processed printed products from the transfer station and a number of connecting locations. A processing station is operatively connected to each of the connecting locations.

25 In a further aspect of the present invention the transfer station comprises buffer means for temporarily storing printed products. Preferably these buffer means comprise shelving means for temporarily shelving printed products.

In general the present invention provides for a central
30 transfer station to which the articles to be processed are fed. A number of processing stations are connected to the transfer station. The articles fed to the transfer station are

transported in sequence to the various processing stations.
After termination of the processing step in a particular
processing station, the articles are always transported back
to the transfer station and from there to the next processing
5 station or to a removal location. The transfer station serves
as a kind of interchange for the processing stations.

The method and the system for processing printed products
according to the present invention provides for many different
production paths along which the products to be processed can
10 be moved. This results in a great flexibility in the sequence
of the various processing operations. This means that the
sequence of the various steps in the processing of a printed
product can easily be optimized.

The printed products can anytime be buffered or
15 temporarily stored in the transfer station until the products
are needed for the next processing step or the removal.

The system can still operate even if a processing station
is temporarily out of service.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will be readily understood by the following detailed description in conjunction with the accompanying drawings, wherein like reference numerals
5 designate like structural elements, and in which:

Fig. 1 is a schematic illustration of a system for processing printed products according to the present invention,

10 Fig. 2 is a top plan view of an embodiment of the present invention,

Fig. 3 is a side elevational view of one embodiment of the transfer station,

Fig. 4 is a top plan view of the transfer station shown in Fig. 3, and

15 Fig. 5 is a cross-sectional view taken along line A-A of Fig. 3.

DETAILED DESCRIPTION OF THE INVENTION

The following description is provided to enable any
20 person skilled in the art to make and use the invention and sets forth the best modes contemplated by the inventor for carrying out the invention. Various modifications, however, will remain readily apparent to those skilled in the art. Any and all such modifications, equivalents and alternatives are
25 intended to fall within the spirit and scope of the present invention.

Figure 1 illustrates the basic concept of a system for processing printed products and other articles according to the present invention. As shown in this Fig. 1 such a system comprises a transfer station 1 which is provided with an infeeding location 2, a number of connecting locations 3, 4, 5 and a removal location 6. A delivery station 7 is connected to the infeeding location 2 and delivers printed products to be fed to the transfer station 1. Processing stations 8, 9 and 10 are connected to an associated connecting location 3, 4, 5, respectively. These processing stations 8, 9, 10 receive printed products from the transfer station 1 and process these printed products. After the completion of the processing step in one of these processing stations 8, 9, 10, the processed printed products are transported back to the transfer station 1. An output station 11 is connected to the removal location 6 and receives the processed printed products from the transfer station 1.

The basic mode of operation of the system shown in Fig. 1 is as follows:

A printed product (or another article to be processed) is fed to the infeeding location 2 of the transfer device 1. The product is then moved within the transfer station 1 to a first connecting location, e.g. to connecting location 3. From this first connecting location 3 the printed product is transported to the processing station connected to the first connecting location, i.e. in our example to processing station 8. After the processing step in said processing station 8 is finished, the processed printed product is fed back to the transfer station 1. If no further processing is required, the finished printed product is moved within the transfer station 1 to the removal location 6 and from there to the output station 11. In case the printed product needs further processing, the product is moved within the transfer station to a second connecting

location, e.g. to connecting location 5, then transported to the associated processing station, in our example to processing station 10, processed in this processing station and subsequently transported back to the transfer station 1.

5 If a further processing of the printed product is required, the latter is moved to a third connecting location, in our example to connecting location 4, processed in the associated processing station (processing station 9) and then moved back to the transfer station 1. The finished processed product is

10 then moved within the transfer station 1 to the removal location 6 and from there to the output station 11.

In an alternative embodiment the printed product fed to the infeeding location 2 is directly moved within the transfer station 1 to the removal location 6. In this embodiment no

15 processing of the infed printed product takes place.

If required, the printed products can temporarily be buffered or stored within the transfer station 1 between the processing steps carried out at the various processing stations as well as after being infed to the transfer station

20 1 or prior to the removal from the transfer station 1.

Since all the processing stations 8, 9, 10 are connected to the transfer station 1 which serves as a kind of interchange for the processing stations 8, 9, 10 the products to be processed can be fed to the various processing stations

25 in any possible sequence or order. In other words, the products can for example be processed first in the processing station 8, then in the processing station 9 and finally in the processing station 10.

Alternatively the printed product can first be processed

30 in the processing station 10, then in the processing station 8 and finally in the processing station 9 without changing the

physical layout of the system. It is also possible to route the product through only part of the processing stations.

Thus, in one embodiment, the system consists of a dynamic
5 system allowing for the production of books with virtually no setup costs, totally automated production, high level of reliability as a system (without the single point of failure inherent to an inline system), high throughput, and the ability to easily add or modify processes.

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The system starts with the software that accepts orders and sends the jobs to be produced to the print engines. The information on the job is contained in the software, as is various methods for tracking the product through the
15 production process. Multiple print engines are used to gain high levels of throughput with high print quality (high quality is preferred in most cases, but not needed in some cases).

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The print engines are connected by very fast robots (typically on a track, to allow for the highest speed and precision) allowing for any number of print engines to be connected to multiple finishing devices (although it could be multiple print engines to one finishing device, or one print
25 engine to multiple finishing devices). When the book block is finished, the robot accepts the book from each print engine and brings it to the next step in the production process. The process of bringing it from one step to another can be repeated multiple times, until the final step of the robot
30 bringing it to the completion area, which in most cases is a shipping station (it could be an inventory area, or many other locations).

Figures 2 - 5 show an embodiment of the system represented in Fig. 1 in greater detail. In Figs. 2 - 5 the same reference numerals are used as in Fig. 1 for like structural elements.

5 The system shown in Fig. 2 comprises also a transfer station 1, which is shown in greater detail in Figs. 3 - 5. This transfer station 1 comprises a first infeeding location 2, first, second and third connecting locations 3, 4, 5 respectively and a first removal location 6 - as the transfer
10 station 1 of the system shown in Fig. 1. In addition thereto, the system of Fig. 2 is provided with a second infeeding location 12 and a second removal location 17. As in the system shown in Fig. 1 a first delivery station 7 is connected to the first infeeding location 2. First, second and third
15 processing stations 8, 9, 10 are connected to the connecting locations 3, 4, 5, respectively. An output station 11 is connected to the first removal location 6.

 A second delivery station 13 is connected to the second infeeding location 12 of the transfer station 1. A conveyor
20 device 18 is connected to the second removal location 17. This conveying device 18 serves to remove the printed products leaving the transfer station 1 at the second removal location 12.

 As shown in Fig. 2 the first, second and third connecting
25 locations 3, 4, 5, respectively, comprise an outfeeding location 14 and a receiving location 15. The third connecting location 5 has a second outfeeding location 14'. The printed products transported from the transfer station 11 to a processing station 8, 9, 10 are leaving the transfer station 1
30 at an outfeeding location 14, 14'. The printed products processed in a processing station 8, 9, 10 are fed back to the transfer station 1 at the associated receiving location 15.

Further shown in Fig. 2 is a supply station 16 connected to the first processing station 8.

As mentioned earlier the construction of the transfer station 1 is shown in greater detail in Fig. 3 - 5.

5 The elongated transfer station 1 has a central shelve 19 extending in the longitudinal direction of the transfer station 1. This shelve 19 is divided into a number of compartments 19a. Each compartment 19a is provided with a number of storage locations 20 arranged one upon another. The
10 compartments 19a of the shelve 19 are accessible from both sides.

 The transfer station 1 further comprises handling devices 21, 22, 23, 24 arranged on both sides of the shelve 19. The handling devices 21 and 22 are provided on one side of the
15 shelve 19 and are travelling along a linear track 25 extending in the longitudinal direction of the shelve 19. The handling devices 23 and 24 are located on the other side of the shelve 19 and are also travelling along a linear track 26 extending in the longitudinal direction of the shelve 19. Each handling
20 device 21, 22, 23, 24 is provided with a drive system (not shown) for moving the associated handling device 21, 22, 23, 24 along the track 25, 26, respectively.

 It is evident that only one handling device or even more than two handling devices can be arranged on each side of the
25 shelve 19.

 The handling devices 21, 22, 23, 24 take over the printed products at an infeeding location 2, 12 or at a receiving location 15, move the products within the transfer station 1 and release the products at a removal location 6, 17 or at an
30 outfeeding location 14. If a buffering or storing of a product is required, the handling devices 21, 22, 23, 24 place the

product into a storage location 20 of the shelve 19 and remove the stored products from the shelve 19.

Each handling device 21, 22, 23, 24 is provided with at least one releasable gripper for seizing the printed products.

5 The shelve 19 and the handling devices 21, 22, 23, 24 are enclosed in a housing 27 (Fig. 5).

 The mode of operation of the system shown in Figs. 2 - 5 is the same as the mode of operation already explained in connection with Fig. 1. This means that the printed products
10 fed to the transfer station at the infeeding locations 2, 12 are moved within the transfer station 1 to the outfeeding location 14 assigned to a first processing station 8, 9 or 10. After completion of the processing operation the printed product is moved back to the associated receiving location of
15 the transfer station 1 and moved within the transfer station 1 to either a removal location 6, 17 or to a second outfeeding location 14 assigned to a second processing station 8, 9 or 10. From this second processing station the processed printed product is transported back to the related receiving location
20 15 and then either moved within the transfer station 1 to a removal location 6, 17 or - in the manner as explained earlier - to the third processing station 8, 9 or 10.

 If required the products are temporarily stored or buffered in the shelve 19 between the various processing
25 operations or after the infeeding or before the removal. The transport of the products within the transfer station 1 is taken over by the handling devices 21, 22, 23 and 24 as explained earlier.

 In a preferred embodiment the system shown in Figs. 2 - 5
30 is used for processing or producing books. In this embodiment the delivery stations 7 and 13 are printing stations and the

output station 11 is a packaging station, whereas the first processing station 8 is a binding station, the second processing station 9 a trimming station and the third processing station 10 a shrink wrapping station. The supply station 16 delivers book covers to the binding station 8.

The printing units 7, 13 are used for printing book blocks which are transferred to the transfer station 1 and then transported to the binding station 8. In this binding station 8 the covers supplied by the supply station 16 and the book blocks are bound together. The bound components are then transferred back to the transfer station 1 and then transported to the trimming station 9, where excess margins are cut. The books processed in the trimming station 9 are transferred back to the transfer station 1 and then either transported to the removal location 6 in order to be packed in the packaging station 11 or fed to the shrink wrapping station 10 and from the latter back to the transfer station 1. The shrink wrapped books are then either transported to the first removal location 6 for packaging or to the second removal location 17 for being transported away by the conveying device 18.

The book blocks delivered to the transfer station 1 by the printing stations 7, 13 can be stored in the shelve 19 prior to being transported to the binding station 8. Equally the bound components transported back to the transfer station 1 can be temporarily stored in the shelve 19 prior to being delivered to the trimming station 9 and/or the shrink wrapping station 10. The finished books can also be temporarily stored in the shelve 19 prior to the removal at the removal locations 6 and 17.

It is understood that additional processing stations can be provided, e.g. a drilling station for drilling holes or an

inserting station for inserting products, such as for example CDs, into the books.

The system shown in Figs. 1 - 5 allows for a great flexibility in the order or sequence the various processing steps are carried out. Furthermore, any number of processing stations, infeeding locations and removal locations is possible.

Various modifications of the system shown and described above are conceivable, a few of which will now be referred to.

10 If required the products fed to the transfer station 1 can be moved directly to a removal location 6, 17 without undergoing a processing operation in one or more of the processing stations 8, 9, 10.

The product processed in a processing station can be transported away directly from this particular processing station without first being transported back to the transfer station 1.

The transfer station 1 itself can be of a construction different from the one shown in Figs. 2 - 5.

20 The shelve 19 of the transfer station 1 can be designed to be open only at one side which results in a shelve 19 which is accessible from one side only.

Instead of the handling devices 21, 22, 23, 24 other suitable systems for transporting the products within the transfer station 1 are possible. For example a conveying system can be used which comprises one or more conveyors equipped with controllable grippers for seizing the printed products.

Although the system described above is preferably used for processing printed products, in particular books and components thereof, it is also conceivable to process other types of articles in the described manner.

5 Those skilled in the art will appreciate that various adaptations and modifications of the preferred embodiments described above can be configured without departing from the scope and spirit of the invention. Therefore, it is to be understood that, within the scope of the appended claims, the
10 invention may be practised other than as specifically described herein.

CLAIMS:

1. A method for processing a printed product, the method comprising:
selecting a sequence of processing the printed product through a plurality
of processing stations connected to a central transfer station;
5 feeding the printed product to a first infeeding location of the central
transfer station; and
processing the printed product through the plurality of processing stations
based on the selected sequence, wherein the following steps are repeated for
each processing station:
10 transporting the printed product from the central transfer station to
the processing station, wherein the printed product is transported directly
to the processing station from the central transfer station without passing
through another processing station;
processing the printed product at the processing station; and
15 transporting the processed printed product back to the central
transfer station after completion of the processing step at the processing
station.
2. A method according to claim 1, wherein the printed product is removed
20 from the transfer station at a first removal location of the transfer station.
3. A method for processing a printed product, the method comprising:
selecting a sequence of processing the printed product through a plurality
of processing stations connected to a central transfer station;

feeding the printed product to a first infeeding location of the central transfer station;

moving the printed product within the central transfer station to a first outfeeding location of the central transfer station;

5 transporting the printed product from the first outfeeding location of the central transfer station to a first processing station in the selected sequence, wherein the printed product is transported directly to the first processing station without passing through another processing station;

processing the printed product at the first processing station;

10 transporting the printed product processed at the first processing station back to a first receiving location of the central transfer station, wherein the printed product is transported directly back to the central transfer station without passing through another processing station;

moving the processed printed product within the central transfer station to
15 a first removal location of the central transfer station; and

removing the processed printed product from the central transfer station at the first removal location.

4. A method according to claim 3, wherein the processed printed product
20 removed from the transfer station at the first removal location is transferred to an output station connected to the transfer station.

5. A method according to claim 3, wherein the printed product fed to the first infeeding location of the transfer station is temporarily stored in the transfer

station prior to its transport from the first outfeeding location of the transfer station to the first processing station.

6. A method according to claim 3, wherein the processed printed product
5 transported back to the first receiving location of the transfer station is temporarily stored in the transfer station prior to its removal from the transfer station at the first removal location.

7. A method according to claim 3, wherein the processed printed product infed
10 to the first receiving location of the transfer station is moved within the transfer station to a second outfeeding location of the transfer station, subsequently transported to a second processing station connected to the transfer station, then processed at the second processing station and afterwards transported back to a second receiving location of the transfer station.

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8. A method according to claim 3, wherein the processed printed product infed to the first receiving location of the transfer station is subsequently transported to further processing stations connected to the transfer station and processed in these further processing stations, whereby the processed printed product is
20 transported back to the transfer station after completion of the processing step in one of the further processing stations.

9. A method according to claim 8, wherein the processed printed product is temporarily stored in the transfer station between the various processing steps carried out at the further processing stations.
- 5 10. A method according to claim 3, wherein the printed products are fed to the first infeeding location of the transfer station from a delivery station.
11. A method according to claim 3, wherein the printed products are fed to the first infeeding location of the transfer station from a printing station.
- 10 12. A method according to claim 3, wherein a further printed product is fed to a second infeeding location of the transfer station.
13. A method for processing a workpiece, the method comprising:
- 15 selecting a sequence of processing the workpiece through a plurality of processing stations connected to a central transfer station;
- feeding the workpiece to a first infeeding location of the central transfer station; and
- processing the workpiece through the plurality of processing stations
- 20 based on the selected sequence, wherein the following steps are repeated for each processing station:
- transporting the workpiece from the central transfer station to the processing station;
- processing the workpiece at the processing station; and

transporting the processed workpiece back to the central transfer station after completion of the processing step at the processing station, wherein the workpiece is transported directly back to the central transfer station without passing through another processing station.

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14. A method for processing a workpiece, the method comprising:

selecting a sequence to process the workpiece through a plurality of processing stations connected to a central transfer station;

10 feeding the workpiece to a first infeeding location of the central transfer station;

moving the workpiece within the central transfer station to a first outfeeding location of the central transfer station;

15 transporting the workpiece from the first outfeeding location of the central transfer station to a first processing station in the selected sequence, wherein the workpiece is transported directly to the first processing station without passing through another processing station;

processing the workpiece at the first processing station;

20 transporting the workpiece processed at the first processing station back to a first receiving location of the central transfer station, wherein the workpiece is transported directly back to the first receiving location without passing through another processing station;

moving the processed workpiece within the central transfer station to a first removal location of the central transfer station; and

25 removing the workpiece from the central transfer station at the first removal location.

15. A system for processing printed products, the system comprising:

a central transfer station;

the central transfer station being provided with at least a first infeeding

5 location for infeeding printed products to the central transfer station, at least a first removal location for removing processed printed products from the central transfer station, and at least a first connecting location for connecting a processing device to the central transfer station;

the central transfer station being further provided with a transporting

10 device for moving the printed products within the central transfer device between the first infeeding location, the first connecting location and the first removal location;

the system further comprising a plurality of processing stations

operatively connected to the first connecting location of the central transfer

15 device, wherein the printed products are transferred to a first processing station from the central transfer station for processing and are returned to the central transfer station after processing at the first processing station, before being transferred to the first removal location; and

wherein the system is configurable to transfer the printed products in any

20 sequence through the plurality of processing stations connected to the central transfer station.

16. A system according to claim 15, wherein the first connecting location comprises an outfeeding location for feeding the printed products from the

transfer station to the first processing station and a receiving location for receiving the printed products processed in the first processing station.

17. A system according to claim 15, wherein the transfer station is provided with
5 at least a further, second connecting location for connecting a processing device to the transfer station, the system further comprising at least a further, second processing station operatively connected to the second connecting location.

10 18. A system according to claim 17, wherein the second connecting location comprises an outfeeding location for feeding the printed products from the transfer station to the second processing station and a receiving location for receiving the printed products processed in the second processing station.

15 19. A system according to claim 15, wherein the transfer station is provided with a number of further connecting locations for connecting further processing devices to the transfer station, the system further comprising a number of further processing stations, each further processing station being operatively connected to one of the further connecting locations.

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20. A system according to claim 19, wherein each of the further connecting locations comprises an outfeeding location for feeding the printed products from the transfer station to the associated processing station and a receiving location

for receiving the printed products processed in the associated processing station.

21. A system according to claim 15, wherein the transfer station comprises a
5 buffer unit for temporarily storing printed products.

22. A system according to claim 21, wherein the buffer unit comprises a shelving unit for temporarily shelving printed products.

10 23. A system according to claim 21, wherein the transporting device comprises at least one handling device movable between the first infeeding location, the connecting location and the removal location.

24. A system according to claim 23, wherein the at least one handling device is
15 movable along a linear path of movement.

25. A system according to claim 23, wherein the handling device serves to feed printed products to the buffer unit and to remove the printed products stored in the buffer unit from the buffer unit.

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26. A system according to claim 15, further comprising an output station connected to the first removal location of the transfer device.

27. A system according to claim 15, further comprising a delivery station connected to the first infeeding location of the transfer device.
28. A system according to claim 15, further comprising a printing station
5 connected to the first infeeding location of the transfer device.
29. A system according to claim 15, further comprising at least a second infeeding location for infeeding printed products to the transfer device.
- 10 30. A system according to claim 15, further comprising at least a second removal location for removing printed products from the transfer device.
31. A system for processing printed products, the system comprising:
a central transfer station;
15 the central transfer station being provided with at least a first infeeding location for infeeding printed products to the transfer station, at least a first removal location for removing processed printed products from the transfer station, and a plurality of connecting locations for connecting a plurality of processing devices to the central transfer station;
20 the central transfer station being further provided with a transporting device for moving the printed products within the central transfer device between the first infeeding location, the connecting locations and the first removal location;

the system further comprising a plurality of processing stations, each processing station being operatively connected to one of the connecting locations, wherein the printed products are transferred to one of the processing stations from the central transfer station for processing and are returned to the central transfer station after processing at one of the processing stations, before
5 being transferred to a next processing station; and

wherein the system is configurable to transfer the printed products in any sequence through the plurality of processing stations connected to the central transfer station.

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32. A system according to claim 31, wherein each of the further connecting locations comprises an outfeeding location for feeding the printed products from the transfer station to the associated processing station and a receiving location for receiving the printed products processed in the associated processing
15 station.

33. A system according to claim 31, wherein the transfer station comprises a buffer unit for temporarily storing printed products.

20 34. A system according to claim 33, wherein the transporting device comprises a handling device movable between the first infeeding location, the connecting locations and the removal location.

35. A system according to claim 34, wherein the handling device serves to feed printed products to the buffer unit and to remove the printed products stored in the buffer unit from the buffer unit.

5 36. A system for processing workpieces, the system comprising:

a central transfer station;

the central transfer station being provided with at least a first infeeding location for infeeding workpieces to the central transfer station, at least a first removal location for removing processed workpieces from the central transfer station, and at least a first connecting location for connecting a processing
10 device to the central transfer station;

the central transfer station being further provided with a transporting device for moving the workpieces within the central transfer device between the first infeeding location, the first connecting location and the first removal location;

15 the system further comprising a plurality of processing stations operatively connected to the first connecting location of the central transfer device, wherein the workpieces are transferred to a first processing station from the central transfer station for processing and are returned to the central transfer station after processing at the first processing station, before being
20 transferred to the removal location; and

wherein the system is configurable to transfer the printed products in any sequence through the plurality of processing stations connected to the central transfer station.

37. A system for processing workpieces, the system comprising:

a central transfer station having a buffer unit;

the central transfer station being provided with at least a first infeeding location for infeeding workpieces to the central transfer station, at least a first
5 removal location for removing processed workpieces from the central transfer station, and a number of connecting locations for connecting a number of processing devices to the central transfer station;

the central transfer station being further provided with a transporting device for moving the workpieces within the central transfer device between the
10 first infeeding location, the connecting locations and the first removal location;

the system further comprising a plurality of further processing stations, each further processing station being operatively connected to one of the further connecting locations, wherein the workpieces are transferred to one of the further processing stations from the central transfer station for processing and
15 are returned to the central transfer station after processing at one of the further processing stations and stored in the buffer unit, before being transferred to a next further processing station; and

wherein the system is configurable to transfer the workpieces in any sequence through the plurality of further processing stations connected to the
20 further connecting locations.