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Declarations under Rule 4.17:

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— *with international search report (Art. 21(3))*

(54) **Title**: CONVEYOR WORK STATION

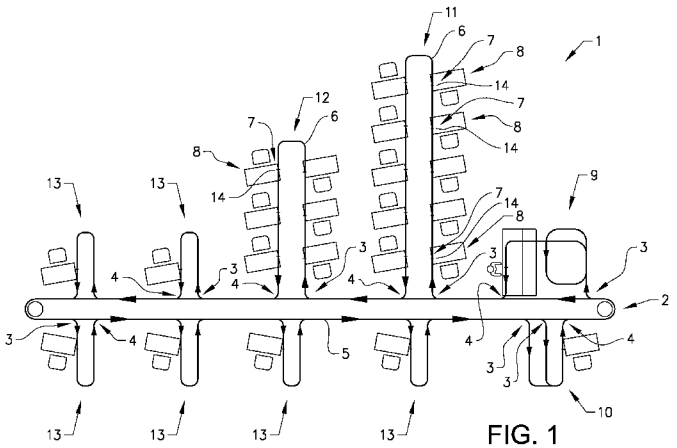

FIG. 1

(57) **Abstract**: A multiple work station for a conveyor system adapted to transport product carriers by which the product holder of the product carriers hangs down from the conveyor system, where the work station is adapted to connect to the main conveyor of the conveyor system by a first switching element and a second switching element, and where the multiple work station comprises a plurality of operation stations arranged along a sub-rail, where each operation station is provided with a operating position. The advantage of the invention is that a multiple work station is provided, m which a plurality of operation stations are provided. The multiple work station is integrated with the main flow of the conveyor system, and also the identification system of the conveyor system is fully integrated with the control system of the main flow in order to provide an efficient productivity and to minimize faults in the production. The multiple work station is further advantageous for synchronous operations having approximately the same duration.

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CONVEYOR WORK STATION

TECHNICAL FIELD

The present invention relates to a work station for the use in a conveyor system for conveying product carriers, where the work station comprises a plurality of operation stations according to the preamble of claim 1. The arrangement is suitable for conveyors comprising a main conveyor and a plurality of work stations.

BACKGROUND ART

In conveyor systems for the forward feeding of product carriers which are movably running on a main rail, there is often a need to divert a product carrier from the main flow in order to allow an operation on the product carried by the product carrier. Such devices are commonly known in textile factories, for example for sewing shirts, wherein different pieces of cloth are loaded in a product carrier, where the product carrier travels on a rail to a workstation in which part of or all the pieces are to be sewn together. Such conveyor systems concern not only manufacturing of shirts or the textile industry but are generally applicable for forward feeding of a product carrier holding one or more parts that requires one or more operations. When a product is diverted from the main flow, the operation on the product may be made in a flexible manner, since the operation can take the required time without affecting the flow in the main flow. When the operation is completed, the product carrier with the product is directed into the main flow again. Individual identification means on each product carriers allows the system to track each product carriers and thus each product such that the each product can be diverted into the required work stations.

The product carriers are transported by an endless belt. Guiding means are used in order to ensure that the product carriers are securely transported along the main rail and to ensure that the product carriers do

not derail from the main rail. In order for the product carrier to be able to be diverted from the main rail to a sub-rail at a work station or reinserted from a sub-rail at a work station to the main rail, the main rail may be provided with switches that allows transfer of the product carrier to and from the branches of the sub-rails at a work station.

The beam profile comprises the support surfaces of the main rail on which the product carrier runs during transport, and also the guiding means formed as an upwardly protruding flange between the said support surfaces. The product carrier's wheels are placed on each side of the flange wherein derailing of the product carrier is hindered.

A work station comprises a single operation station in which one or more operations can be made on the product. Such operations may e.g. include sewing together different parts of fabric to form a garment, e.g. a shirt, assembling different product parts into a product or to modify one or more products or product parts. The work station may further comprise one or more sub-rails and may also comprise, since the conveyor system is adapted for product carriers arranged above the operation station at the work stations, a vertical chain carrier which conveys the product carrier from a sub-rail down to the work station and, after the operation, back up to a sub-rail to the main conveyor.

Such a work station is efficient in many ways, but for some type of operations, it may be unnecessarily advanced, since each work station requires a switch and a conveyor loop. Further, such a work station requires a relatively large space along the main conveyor rail, which means that the main rail must pass each work station. For some types of operations, the traditional work station layout may thus take up too much space and is further too complicated and too costly. Thus, there is a need for a modified and improved work station.

DISCLOSURE OF INVENTION

An object of the invention is therefore to provide a work station for a conveyor system, where the work station is provided with a plurality of operation stations. A further object of the invention is to provide a conveyor system comprising a work station having a plurality of operation stations.

The solution to the problem according to the invention is described in the characterizing part of claim 1 regarding the work station and in claim 11 regarding the conveyor system. The other claims contain advantageous further developments of the inventive work station and conveyor system.

In a multiple work station for a conveyor system, where the conveyor system is adapted to transport product carriers by which the product holder of the product carriers hangs down from the conveyor system and where the product carriers are conveyed along a main conveyor (2) of the conveyor system by a forwarding means driven by a motor, where the work station is adapted to connect to the main conveyor of the conveyor system by a first switching element and a second switching element, the object of the invention is achieved in that the multiple work station comprises a plurality of operation stations arranged along a sub-rail, where each operation station is provided with a operating position.

By this first embodiment of the multiple work station, a work station having a plurality of operation stations is provided. The work station is especially suitable for subsequent operations which all requires approximately the same time, since the flow of the work station is synchronous. The primary use for such a work station is operations which take approximately the same time to complete. Such operations may include pre-assembly of smaller parts for a shirt, where all parts for the shirt is held by the product carrier. It is also possible to use the multiple work station e.g. for pre-assembling smaller parts for a shirt, where several parts are grouped into bundles and where a bundle of parts is handled in each operation station. Other types of pre-mounting of parts are also possible. Since the product

flow through the work station is synchronous, it is of advantage that all parts are conveyed with the same product carrier, in order to secure that the proper parts are used for that specific shirt. However, since the product carriers are provided with identification means, it is also possible to track all parts for a product even when the parts are conveyed by different product carriers. Due to the synchronous flow, the time spent at each operation station by the product carrier should preferably also be approximately the same. During this time, one or more operation steps may be performed by an operator.

In an advantageous development of the inventive multiple work station, the product carriers in the work station are conveyed by rolling on an inclined sub-rail of the work station. In this way, the work station is simple and cost-effective and does not require any separate drive means. The product carrier can be forwarded to the next operation station by the previous operator. Since all operation stations are provided with a stop member at the operating position, the product flow must not be synchronous. It is possible to provide a buffer space that can hold a number of product carriers at one or more of the operating positions. This may be advantageous in order to optimize the product flow and to minimize the waiting times at the different operation stations. A buffer is also advantageous for products that must rest between the operations, e.g. when a product must dry or harden.

In an advantageous development of the inventive multiple work station, the product carriers in the work station are conveyed by a forwarding means driven by a motor, e.g. a driven chain or belt or other types of forwarding means, arranged at the sub-rail of the work station. In this way, the work station is adapted for an automated product flow, in which all product carriers are conveyed at the same time with the same speed. The stop members are here controlled by the control system of the conveyor system, such that they are opened at the same time. In this example, the

product flow will be synchronous. In this case, a buffer at an operating position is not necessary since there will be no build up of product carriers at one specific operation station.

In an advantageous development of the inventive multiple work station, the work station is provided with at least one identification reader adapted to read a serial number or the like from each product carrier. In this way, the control system of the conveyor system will be able to follow and control the product flow in the work station and also in the complete conveyor system. In a further development, each operation station is provided with an identification reader. This allows the control system to monitor the production process even further.

By using identification means on each product carrier and at least one identification reader at the multiple work station, a production control system can monitor all product carriers and will also be able to balance the production system depending on the information retrieved from the identification readers. This is especially advantageous in larger systems, where the forwarding of product carrier to different work stations can be decided in real time by the production control system. In this way, the production control system can balance the production system, e.g. when a work station breaks down or depending on the specific operations that is to be performed at a given time. By integrating also the pre-assembly of the multiple work stations in the production control system, an even better control of the production system is possible.

In a conveyor system comprising a main conveyor and a plurality of different work stations, the object of the invention is achieved in that the conveyor system comprises at least one multiple work station. In this way, a conveyor system is provided, in which pre-assembly operations can be performed in a time efficient and space efficient manner. It is thus not required to provide a normal single work station for each operation, and it is at the same time possible to integrate the pre-assembly operations into

the product flow of the conveyor system. The integration of all operations of a product into the same product flow will help to ensure that the product is assembled in a proper manner.

In known systems, such pre-assembly operations are normally performed in specific pre-stations positioned apart from the main product flow. There is thus always a risk that wrong parts are combined together into one product since the pre-assembled parts are handled manually. Such pre-stations also require specific storing and buffer spaces.

In an advantageous development of the inventive conveyor system, the conveyor system further comprises a production control system. In this way, the product flow can be monitored, scheduled and controlled in an efficient manner.

BRIEF DESCRIPTION OF DRAWINGS

The invention will be described in further detail below, with reference to the attached drawing, where

Fig. 1 shows a schematic view of a conveyor system comprising a multiple work station according to the invention.

MODES FOR CARRYING OUT THE INVENTION

The embodiments of the invention with further developments described in the following are to be regarded only as examples and are in no way to limit the scope of the protection provided by the patent claims. In the described example, a simplified conveyor system for the manufacturing of shirts is used as an example of a conveyor system comprising a multiple work station. In the conveyor system, product carriers where the product holders hang down from the main rail of the conveyor system are used. Other types of conveyor systems adapted for different kind of products where the product hangs from the product carrier can also be used with

the inventive multiple work station. Such conveyor systems adapted for hanging products are well known in the art and are not described in detail.

Fig. 1 shows schematically a conveyor system 1 comprising several different work stations 9, 10, 11, 12 and 13. The conveyor system comprises a main conveyor 2 having a main rail 5 in which a forwarding means in the form of a drive chain or drive belt is arranged. In the described example, an endless drive chain is used. Other types of forwarding means are also possible to use. The drive chain is advantageously made from a plastic that makes it bendable at least in the horizontal plane, and that at the same time is stiff enough to allow the chain to be either pulled or pushed forwards. If the main rail comprises different levels in the vertical direction, the chain is preferably also bendable in the vertical direction. The drive chain is in the described conveyor system driven by a gear wheel that is powered by a motor. Even though the use of a drive chain according to the above is a preferred embodiment, the invention may be used with drive belts and chains of a different conventional kind. The drive chain is formed such that it may be used to power other components anywhere along the entire length of the main rail.

A work station is connected to the main rail by switching means 3, 4, where switch 3 is adapted to divert a product carrier from the main rail to a sub-rail at the work station and where switch 4 is adapted to reintroduce the product carrier back to the main rail. The work station further comprises a feeding conveyor that will convey the product carrier from the switch to the operation station of the work station. When the operation is completed, the product carrier is conveyed back to the second switch and into the main rail. Since the main rail is positioned high above the operation station, the feeding conveyor normally comprises a vertical chain that will transport the product carrier down to the operation station and up to the level of the main rail after the operation. Depending on the

type of work station, the work station may also comprise a sub-rail that may act as a buffer.

The conveyor system comprises a loading station 9 arranged at the beginning of the product flow. In the loading station, the operator may load all the pieces that will make up one product into the product carrier. It is also possible to load the product carrier with several parts of the same type, e.g. arranged in bundles, which are to be pre-assembled. The loading station may also comprise a buffer for product carriers. When a product carrier is loaded, it will be routed through the different operation steps with the pieces. At each operation station, one or more operations will be performed. In the described example, all the pieces that are required for a shirt are loaded in the loading station.

The conveyor system further comprises an inventive multiple work station 11 comprising several operation stations 8. The multiple work station is provided with a sub-rail on which the product carriers are conveyed. The sub-rail is in one example an inclined rail that allows the product carriers to roll on the rail, from one operation station to the next one. It is also possible to provide the multiple work station with a feeding chain or belt that drives the product carriers along the rail. The sub-rail is preferably mounted at such a height that the product carrier must not leave the sub-rail during the operation at the operation station. Depending on the type of operation, the parts held by the product carrier may either be removed from the product carrier or may not be removed during the operation. When smaller parts are sewn together, the parts are removed from the product holder of the product carrier and are sewn and the completed part is then reloaded to a product holder of the product carrier. A larger part may be sewn when the part is still attached to the product carrier. Other operations, e.g. when components are assembled to a product held by the product carrier, may be performed when the product is held by a product

carrier. The height of the sub-rail is thus adapted to the type of operation that is to be performed at the operation station.

The number of operation stations in a multiple work station may differ, and is preferably adapted to the type of operations that are to be performed in the multiple work station. A multiple work station may have as little as two operation stations and may have up to 20 or more operation stations, even though a suitable number normally is in the range of 6 to 20.

Each operation station preferably comprises a stop member 14 of some kind, which stops the product carrier at the operating position. One simple stop function is a small protrusion on the sub-rail of the multiple work station. The product carrier will stop at the protrusion and the operation can be performed. After the operation, the operator pushes the product carrier over the protrusion such that the product carriers can roll to the stop member of the next operating station. It is also possible to use e.g. a resilient stop means that can be passed by pushing the product carrier such that the stop means deflects when the product carrier is pushed through.

The stop member may also be a remotely controlled catch or the like that is released with an external signal. The signal may be provided by the control system of the conveyor system, or may be provided by a switch operated by the operator of the operation station. When the multiple operation station is controlled in a synchronous manner, each operator may push a switch indicating that the operation is completed. When all operators have pushed the switch, the system may release all product carriers at the same time. In this way, there is no need for a buffer function in the multiple operation station.

A multiple work station is suitable to use when several operations that take approximately the same time are to be performed on a product. Such an example may e.g. pre-assembly of parts for a shirt. In the multiple work

station 11, all smaller parts for a shirt are produced. Such parts are e.g. the cuffs, the collar and the front pocket. In the multiple work station, each operator at the operation stations performs one operation each. Each operation at an operation station is planned such that all operations at the different operation stations will require approximately the same time.

It is also possible that each operator performs more than one operation step at an operation station, as long as the duration of the operation steps at one operation station is approximately equal to the duration of operations of the other operation stations in the work station. An operator may also perform the same operation on several like parts, such as several identical parts grouped in a bundle. It is thus possible that one operator produces e.g. 10 identical cuffs at one operation station. Often, an operation station is adapted for one specific operation. Thus, it may be advantageous to produce several identical parts at one operation station. One operation station may e.g. be specifically adapted to sew cuffs, another for the sewing of collars, another for sewing button holes and yet another for sewing buttons. The operators may thus also move between the operation stations in order to perform the different operations.

In the described example, the first operator sews e.g. one or more seams of a first cuff, the second operator sews the remaining seams of the first cuff, the third operator sews the buttonhole and the buttons on the first cuff, the fourth operator sews one or more seams of the second cuff, the fifth operator sews the remaining seams of the second cuff, etc.

In the shown example, the conveyor system further comprises a second multiple work station 12 similar to the first multiple work station 11 but having fewer operation stations. Such a multiple working station is also used when several operations that take approximately the same time are to be performed on a product. Such an example may e.g. assembly of parts for a shirt. In the shown example, the second multiple work station 12 is used to pre-assemble somewhat larger parts of the shirts, such as

sewing the sleeves together or sewing a cuff to a sleeve. Each operation at an operation station is planned such that the operations at each operation station will require approximately the same time. In this example, the first operator sews the first seam of one sleeve, the second operator sews the second seam of the first sleeve, the third operator sews the cuff to the first sleeve, etc. It is also possible that each operator performs more than one operation, as long as the total time of the operation steps at each operation station equals the duration of the operations at the other operation stations in the work station.

When a product carrier with the pre-assembled parts has left the last operation station of a multiple work station, the product carrier is reintroduced to the main rail. The product carrier continues along the main rail and is diverted into one of the single work stations 13. In each single work station 13, more operations are preferably performed on each product, or operations with different durations may be performed without interrupting the product flow of the main conveyor. Thus, the single work stations 13 may be used as finishing stations, where the shirt is completed. The operator of each single work station may complete a shirt or may prepare the shirt for a completion in a subsequent single work station. It is also possible that an operator of a single work station performs different operations on different products, in order to optimize the product flow. When a shirt is completed, it arrives at the unloading station 10, in which the product is inspected and packed. The unloading station may comprise several sub-rails acting as buffers, e.g. in order to group products of the same type, e.g. having the same size and/or colour. At the unloading station, the product carriers are emptied and forwarded to the loading station.

In the shown example, the conveyor system comprises two multiple work stations, several single work stations, a loading station and an unloading station. The number of work stations and the types of work stations are of

course flexible and are preferably chosen such that an even product flow is achieved. The number of different work stations is thus selected such that the duration of the operations of one work station or group of work stations corresponds with the duration of the operations at the other work stations or groups of work stations.

Each product carrier is provided with an identification means that can be read by identification readers throughout the conveyor system. The identification means may be an RFID tag, a bar code or another suitable identification means. The information from the identification reader is sent to a production control system of the conveyor system. The production control system can monitor and control the product flow of the production system. In larger production systems, there are several similar work stations in which the same operations can be performed. The production control system can thus balance the production flow by directing the product carrier to an available work station.

The system may further comprise an information system having information displays at the operation stations that can inform the operators of e.g. the operations that are to be performed, the upcoming operations such that the operator can prepare the work station for that specific operation, quality reports of the operations performed by that operator or other important information. The production control system can further monitor the productivity of each operator. By integrating the pre-assembly of a multiple work station in the production control system, an even better control of the production system is possible. In a multiple work station, each operating position may be provided with an identification reader, or one identification reader is provided at the beginning of the multiple work station. If each operating position is provided with a switch that detects that a product carrier has passed the operating position, those switches will provide information to the production control system regarding the

status of each product carriers in the multiple work station without having an identification reader at each operating position.

The invention is not to be regarded as being limited to the embodiments described above, a number of additional variants and modifications being possible within the scope of the subsequent patent claims.

REFERENCE SIGNS

1:	Conveyor system
2:	Main conveyor
3:	Switching element
4:	Switching element
5:	Main rail
6:	Sub-rail
7:	Operating position
8:	Operation station
9:	Loading station
10:	Unloading station
11:	Multiple work station
12:	Multiple work station
13:	Single work station
14:	Stop member

CLAIMS

1. A multiple work station (11, 12) for a conveyor system (1), where the conveyor system is adapted to transport product carriers by which the product holder of the product carriers hangs down from the conveyor system and where the product carriers are conveyed along a main conveyor (2) of the conveyor system by a forwarding means driven by a motor, where the work station is adapted to connect to the main conveyor (2) of the conveyor system by a first switching element (3) and a second switching element (4), characterized in that the multiple work station (11, 12) comprises a plurality of operation stations (8) arranged along a sub-rail (6), where the sub-rail (6) is provided with a declination from the start of the sub-rail to the end of the sub-rail which allows the product carriers to roll on the sub-rail, and where each operation station is provided with a operating position (7) and where each operating position (7) is provided with a stop member (14).

2. Multiple work station according to claim 1, characterized in that the forwarding means of the main conveyor is an endless belt or chain.

3. Multiple work station according to claim 1 or 2, characterized in that the multiple work station comprises a forwarding means driven by a motor adapted to convey the product carriers along a sub-rail (6) of the multiple work station.

4. Multiple work station according to claim 3, characterized in that the forwarding means of the multiple work station is an endless belt or chain.

5. Multiple work station according to any of the preceding claims, characterized in that the stop member (14) is controllable by an external signal.

6. Multiple work station according to any of the preceding claims, characterized in that all stop members (14) are released synchronously.

7. Multiple work station according to any of claims 1 to 6, characterized in that the multiple work station is provided with at least one identification reading means.

8. Multiple work station according to claim 7, characterized in that each operation station (8) is provided with an identification reading means.

9. Conveyor system (1) comprising a main conveyor (2) and a plurality of different work stations (9; 10; 11; 12; 13), characterized in that the conveyor system comprises at least one multiple work station (11, 12) according to any of claims 1 to 10.

10. Conveyor system according to claim 9, characterized in that the conveyor system comprises at least two multiple work stations (11, 12) having different numbers of operation stations (8).

11. Conveyor system according to claim 9 or 10, characterized in that the conveyor system further comprises a production control system.

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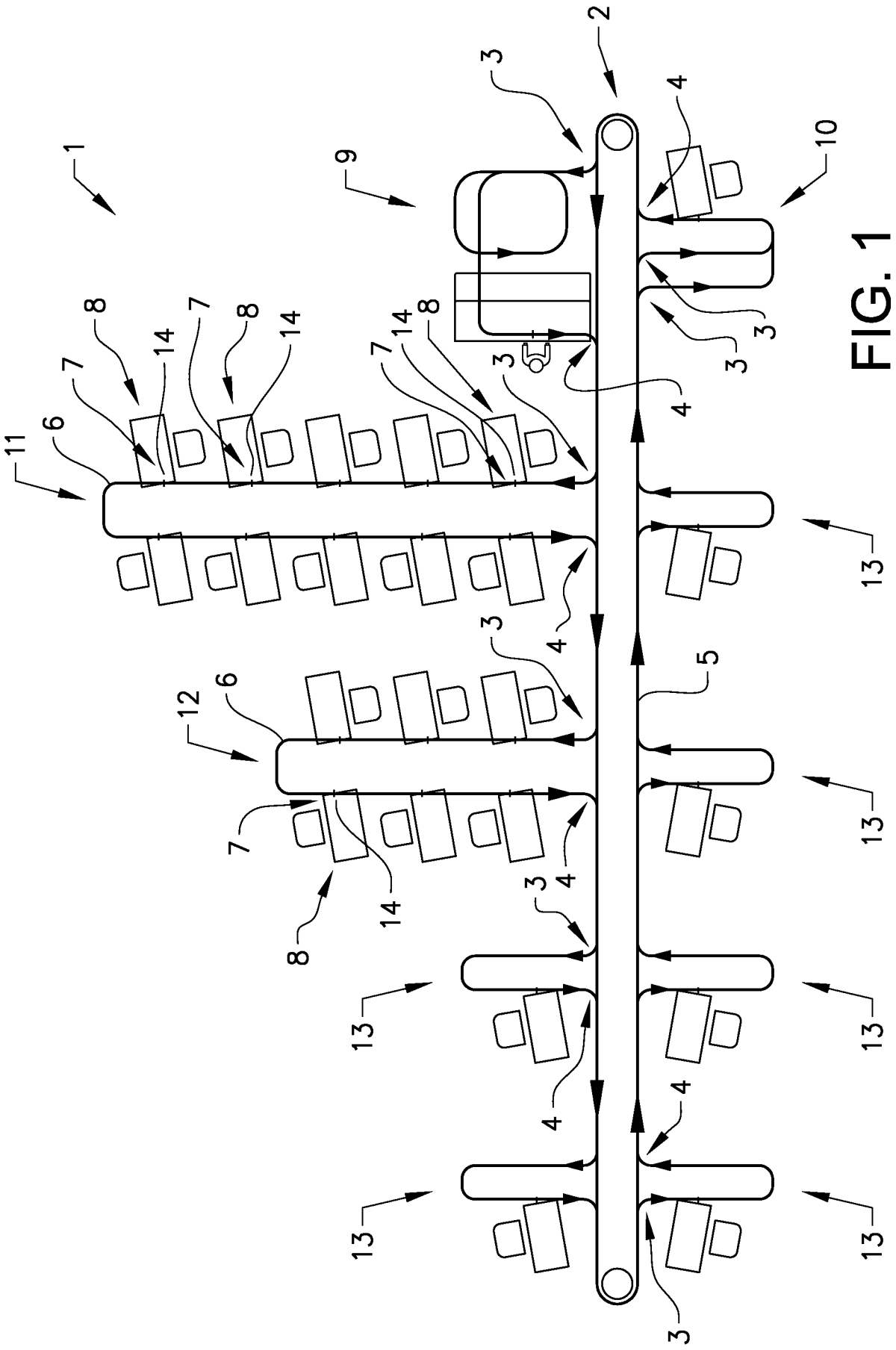

FIG. 1

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE2012/050299

A. CLASSIFICATION OF SUBJECT MATTER

IPC: see extra sheet

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC: A41H, B61B, B65G, G05B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE, DK, FI, NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, PAJ, WPI data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4878176 A (TERANISHI MITSUJI ET AL), 31 October 1989 (1989-10-31); abstract; column 3, line 59 - column 4, line 14; column 5, line 36 - column 5, line 65; column 13; figures 1,2 --	1-11
A	US 3734027 A (ISLEY S), 22 May 1973 (1973-05-22); whole document --	3, 4
A	GB 2146795 A (LINDQVIST DAVID), 24 April 1985 (1985-04-24); whole document --	1-11

☒ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
18-06-2012	18-06-2012

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE2012/050299

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	GB 2284619 A (MAYO WORKWEAR RESEARCH & DEV L), 14 June 1995 (1995-06-14); whole document --	1-11
A	US 5233534 A (OSTHUS HAROLD L ET AL), 3 August 1993 (1993-08-03); whole document --	1-11
A	US 20070244594 A1 (CHIK MOHD AZIZI ET AL), 18 October 2007 (2007-10-18); whole document --	1, 11
A	EP 0737543 A2 (OPEL ADAM AG), 16 October 1996 (1996-10-16); whole document --	1, 11
A	US 5551348 A (MATSUMOTO HAJIME), 3 September 1996 (1996-09-03); whole document --	1, 11
A	US 3889797 A (NAITO KAZUO ET AL), 17 June 1975 (1975-06-17); whole document --	1, 11
A	US 20030229416 A1 (TAI AKITO ET AL), 11 December 2003 (2003-12-11); whole document -- --------	1, 11

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE2012/050299

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☒ Claims Nos.: 3 and 4
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

See Extra sheet page 4

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.

☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

☐ No protest accompanied the payment of additional search fees.

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Continuation of: Box No. II

The description gives two distinct alternatives for the drive of the sub-rail. Either gravity (declining rail) or forwarding means driven by a motor. The description does not indicate that the sub-rail can have both these features. Thus, the multiple work station according to claims 3 and 4 is not supported by the description, and has to be excluded from the claims.

Continuation of: second sheet

International Patent Classification (IPC)

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B61B 3/02 (2006.01)
B65G 37/02 (2006.01)
G05B 19/418 (2006.01)
A41H 42/00 (2006.01)
B65G 19/02 (2006.01)

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Cited literature, if any, will be enclosed in paper form.

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