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Datasheet for the decision of 25 May 2023

Case Number: T 1230/20 - 3.5.01

Application Number: 15798260.4

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IPC: G06Q10/08, B65G1/04, G05D1/02

Language of the proceedings: EN

Title of invention:
STORAGE MATERIAL HANDLING SYSTEM

Applicant:
NextShift Robotics, Inc.

Headword:
Storage material handling system/NEXTSHIFT ROBOTICS

Relevant legal provisions:
EPC Art. 56

Keyword:
Inventive step - deciding whether robots wait with totes for a human picker or leave the tote and proceed without waiting (no - not technical and obvious)

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Case Number: T 1230/20 - 3.5.01

D E C I S I O N
of Technical Board of Appeal 3.5.01
of 25 May 2023

Appellant: (Applicant)	NextShift Robotics, Inc. 10 Berkeley Lane Andover, MA 01810 (US)
Representative:	Ipside 7-9 Allées Haussmann 33300 Bordeaux Cedex (FR)
Decision under appeal:	**Decision of the Examining Division of the European Patent Office posted on 7 November 2019 refusing European patent application No. 15798260.4 pursuant to Article 97(2) EPC.**

Composition of the Board:

Chairman	W. Chandler
Members:	R. Moser
	L. Basterreix

Summary of Facts and Submissions

I. This case concerns the applicant's appeal against the decision of the examining division to refuse the European patent application No. 15798260.4.

II. The examining division found that the claimed invention lacked an inventive step over D1 (US 2009/0185884 A1). Essentially, they considered that the distinguishing features, in particular the claimed method of interaction between human pickers and mobile robots, referred to as "coupled" and "decoupled interface", related to business rules for organising and managing a distribution centre.

III. In the statement setting out the grounds of appeal, the appellant requested that the decision of the examining division be set aside and a patent be granted on the basis of the main, or first, or second auxiliary request, all newly filed with the grounds of appeal.

IV. In the communication accompanying the summons to oral proceedings, the Board considered that the amendments introduced new objections under Articles 84 and 123(2) EPC and, *prima facie,* appeared not to be suitable to overcome the examining division's objection under Article 56 EPC.

Furthermore, the Board tended to consider that D3 (US 2014/0100998 A1), which had been cited as an "X" document in the International Search Report, was a more suitable starting point for assessing inventive step. The Board tended to regard the distinguishing features over D3 as non-technical in nature.

V. In a letter dated 2 May 2023, the appellant submitted a third auxiliary request and provided arguments in favour of inventive step over D3.

VI. Oral proceedings took place by videoconference on 25 May 2023. The appellant's final request was that a patent be granted on the basis of the third auxiliary request which, thus, became the sole request.

At the end of the oral proceedings the Chairman announced the Board's decision.

VII. Claim 1 of the sole request reads:

A storage fill and retrieval system for a storage space, the system comprising:

a multiplicity of fixed storage locations distributed in the storage space in a predetermined ordered configuration and defining at least one human pick zone arranged for human picker access to the fixed storage locations arrayed in the at least one human pick zone so as to pick, or place, items from the fixed storage locations arrayed in the at least one human pick zone, characterized in that

each of the at least one human pick zones having at least one collection tote location;

at least one autonomous mobile robot picker configured for holding and transporting a single tote within the storage space, each of the at least one autonomous mobile robot picker has a frame (130F), and an end effector (133) connected to the frame (130F), the end effector (133) has two or three degrees of freedom that include at least translation along one horizontal axis for transferring a single tote between the at least one autonomous mobile robot picker and a tote holding station and between the at least one

autonomous mobile robot picker and a collection tote location; and

a storage management system (101) including an automation controller (105) and a material handling robot traffic controller and scheduler (166), each being communicably connected to the at least one autonomous mobile robot picker, the material handling robot traffic controller and scheduler (106) knows where all of the autonomous mobile robots and human pickers are and the automation controller (105) being configured to associate each autonomous mobile robot picker of the at least one autonomous mobile robot picker with a human pick zone from the at least one human pick zones based on the known information from the material handling robot traffic controller and scheduler (106), a database (106) in communication with the automation controller includes a store and/or pick order of the storage management system and identifies each of the related human pick zones having at least one stored item in the fixed storage locations, of the related human pick zone, corresponding to the store and/or customer pick order of the storage management system;

wherein the at least one autonomous mobile robot picker is configured to transport the tote to the collection tote location of each associated human pick zone, and wherein the storage management system (101):

dynamically varies each collection tote location, arranged for human picker access, according to a predetermined characteristic of an order where the predetermined characteristic is a location of a stored item, a location of a picker, a location of a robot, a path or traverse route of a robot, or a quantity of an item,

defines an interface between a human picker in the human pick zone and the at least one autonomous mobile

robot picker, and

dynamically selectively determines if a state of the interface is:

a coupled interface where the material handling traffic controller and scheduler is optimized for the storage fill and retrieval system (100) where the autonomous mobile robot (130) and the human picker (170) operations are coupled where the autonomous mobile robot waits for the picker or vice versa to complete a transaction, or

a decoupled interface where the material handling traffic controller and scheduler is optimized for the storage fill and retrieval system where the autonomous mobile robot and the human picker operations are decoupled via a tote that both the human picker and the autonomous mobile robot have independent access to and where the autonomous mobile robot does not wait for the human picker and vice versa in order to complete a transaction;

where the determination of the state configures the at least one autonomous mobile robot picker so as to dynamically update the at least one autonomous mobile robot configuration for the coupled interface or the decoupled interface.

VIII. The appellant's arguments are discussed in detail in the reasons for the decision.

Reasons for the Decision

The invention

1. The invention relates to the automated storage and retrieval of goods such as items stored in racks within a distribution centre.

Conventional automated retrieval or picking systems necessitate customised rack structures, resulting in costly and time-consuming installations - see paragraph [0003] of the published application.

2. The invention, as shown in Figure 1, utilises fixed storage racks 110 and a combination of human pickers 170 and autonomous mobile robot pickers 130 to efficiently fulfill orders according to a schedule generated by a storage management system 101. The storage management system comprises a database for storing logistics data such as "a store and/or pick order". It further includes various controllers such as an "automation controller" and a "material handling robot traffic controller and scheduler" that facilitate communication with the robots, including receiving their positions and issuing commands.

As shown in Figure 4, a robot 130 retrieves an empty container (tote) 113 and transports it to a collection point 112A within a designated "human pick zone" 111A. At this point, a human picker 170A selects an item 220A from the storage rack SR and places it into the tote. The robot follows a predefined path P to move to the next collection point 112B, repeating this process until the entire order is fulfilled.

3. Each collection point acts as an "interface" that establishes an interaction between the picker and the robot. When generating a pick order, the management system determines these collection points and the type of interaction to establish, taking into account factors such as availability of pickers and robots (see paragraph [0038]). Based on these considerations, the system provides instructions to the robots.

In a first interaction scenario ("decoupled interface"), the robot is directed to transport an empty tote to a collection point, leave it there, and proceed without waiting for the picker. In a second scenario ("coupled interface"), the robot is instructed to wait at the collection point for the picker to fill the tote (see paragraphs [0038] to [0040]).

Admissibility

4. The filing of the third auxiliary request was prompted by the Board's preliminary opinion, specifically the choice of D3 as closest prior art and the objections concerning clarity and added subject-matter.

The Board considers this to be exceptional circumstances in the sense of Article 13(2) RPBA and admits the third auxiliary request into the appeal proceedings. This became the sole request.

Interpretation of claim 1

5. In claim 1 the features defining the coupled and decoupled interfaces are still not entirely clear. In particular, the term "dynamically selectively", the concept of the picker waiting for the robot, the phrase "complete a transaction" and the optimisation of the material handling traffic controller and scheduler are vague and lack precise definitions within the claim.

6. The Board's interpretation of the latter part of claim 1, beginning with "the storage management system(101): dynamically varies each collection tote location ...", is as follows:

Within the storage management system, a dynamic adjustment is made to the locations where collection totes are assigned based on factors such as the storage location of the ordered items. The system also determines whether the robot should wait for the human picker to place the items in the tote (coupled interface) or proceed to deposit the tote and continue its operations (decoupled interface). This determination appears to involve some form of optimisation, although the specifics are not defined. According to the description, particularly the final sentence of paragraph [0040], the decoupling scenario serves the purpose of reducing "the scheduling task requirements of the task management system 101".

Inventive step

7. It is common ground that D3 is the closest prior art.

Figures 2 and 3 of D3 illustrate a distribution centre 10 wherein items are stored in inventory holders 30 (racks) on the supply side of an inventory pier 50. Human pickers put the items into order holders 40 (totes) transported by mobile drive units 20 on the opposite demand side (paragraphs [0019] and [0029]).

The human pickers are assigned to specific areas designated as work zones (see paragraphs [0032] and [0034]) and including several collection points 64 (as illustrated in Figure 5 and mentioned in paragraph [0091], with reference to "indicator 64a"). As the robot passes by or halts at a collection point, the human pickers select items and place them into the tote.

Automated order fulfillment is facilitated by a management module (see paragraphs [0057] and [0062]). The module performs the functions attributed to the various controllers in claim 1. These include obtaining knowledge where the robots and human pickers are (see paragraphs [0022], [0025], or [0068]), generating a schedule for picking items within work zones including determining collection points (see for instance paragraphs [0070], [0072] and [0124]), defining a path corresponding to an order (paragraphs [0062] and [0071]), and routing a robot along that path (paragraphs [0063] and [0072]) towards collection points (paragraphs [0091] and [0092]). Similar to the invention, the collection points establish an interaction (point) between the robot and a human picker.

The Board notes in particular, as this was contested by the appellant, that the robots in D3 can freely navigate within the distribution centre. For example, robots are not limited to traversing along the inventory pier but can also move directly to specific collection points on the pier or even proceed from there to inventory stations 56 (see paragraph [19]: "... may move directly to a location along inventory pier 50", paragraph [0039] and Figure 3). Additionally, the mobile robot is equipped with a rotatable docking head, enabling it to dock or undock with inventory or order holders (see Figure 2, paragraphs [0036] to [0038]).

8. The Board judges that claim 1 differs from D3 by the following features:

(A) Fixed storage locations if these are interpreted as fixed racks (see Figure 1 and paragraph

[0026] of the application).

(B) The robot's end effector has the ability to perform a translation along one horizontal axis.

(C) The management system dynamically determines a state of the interface as being a coupled or decoupled interface. The material handling traffic controller and scheduler is optimised for the determined interface and the system sends corresponding commands to the robot.

9. Feature (A) does not provide any technical effect over D3 as the mobile racks, once positioned near the inventory pier (see paragraph [0033]), functionally resemble fixed racks as in claim 1.

In the Board's view there is no synergistic interaction between features (B) and (C). The additional functionality of the end effector remains unaffected whether the robot waits for the human picker or not. The only functional requirement is the robot's ability to dock and undock with a tote, which is already disclosed in D3 (see point 7, above).

Hence, each distinguishing features can be independently evaluated for inventive step.

10. As just mentioned, feature (A) does not provide any technical effect over D3. Additionally, the decision to opt for fixed or mobile racks is the responsibility of warehouse and logistics managers, who would consider factors like space availability and cost considerations when making such choices.

Feature (B) is also not inventive. The skilled person would select end effectors depending on the robot's

purpose and intended functionality, considering the specific tasks to be performed. Moreover, the teaching of D3, although describing robots with a docking head for lifting and rotating totes, is not limited to that particular aspect (see paragraph [0038]).

11. Feature (C) concerns the key idea of the invention, namely the way robots and human pickers interact when fulfilling an order. The Board judges that both this idea and the corresponding optimisation performed by the storage management system is not inventive for several reasons.

12. Firstly, the optimisation and potential efficiency gains achieved by allowing robots to either wait for a human picker or proceed without waiting are simply the result of non-technical activities, namely scheduling and organising pick orders. These orders typically involve a series of specific tasks, such as transporting a tote to rack X, placing a printer in the tote, moving to rack Y, and leaving the tote there for the picker to fill with cartridges and printing paper; transporting an empty tote to rack Z and so forth. Defining and assigning these tasks are non-technical activities.

Given this, the Board concludes that the general concept of the coupled or decoupled interface, which involves the choice of either waiting for the human picker to fill the tote or setting it down and moving forward, must also be deemed non-technical.

13. Secondly, the decoupled interface primarily serves the purpose of reducing "the scheduling task requirements of the task management system 101" (see paragraph [0040]). However, contrary to the appellant's argument,

it does not optimise the technical functionality of the mobile robots, such as avoiding collisions or facilitating interactions with human pickers.

The appellant argued that D3 did not disclose a decoupled interface because the robot never left the tote at a collection point to retrieve it later. Figure 1 showed that the robot only moved along one side of a cage-like construction, the inventory pier, which did not allow for mingling with a picker in a human pick zone as claimed.

The Board acknowledges that, indeed, on the demand side of the inventory pier, the robot never undocks from the tote. However, on the supply side, robots place filled inventory holders and remove empty ones - see paragraph [0019]. This demonstrates that the general principle of decoupling is known from D3, albeit applied differently, namely in the supply process.

Furthermore, both the invention and D3 involve dynamically determining collection points by the management system. These points are situated in work zones, where human pickers interact with mobile robots, selecting items and placing them into totes carried by the robots (see Figure 5 and paragraph [0070]).

14. Thirdly, the Board remains unconvinced that the claim achieves a technical optimisation of the system's operation.

The appellant argued that the invention pertained to a technical domain, evident from the claim's inclusion of mobile robots and various controllers, such as the material handling traffic controller and scheduler, aimed at optimising the robots' functionality in

collaboration with human pickers. The claimed technical effect was time-saving and, through intelligent scheduling performed by the management system, enhancing the scheduling and resource utilisation to improve technical operations.

The Board notes that the claim simply acknowledges the potential for optimising the scheduling, whether through a coupled or a decoupled interface. However, it does not specify the actual process of optimising the schedule, such as utilising an intelligent optimisation algorithm to generate an optimised output.

As previously mentioned, the Board has reservations regarding the technical nature of task scheduling and its optimisation through the provision of coupled or decoupled approaches. This can be likened to a scenario encountered when picking apples, where one can either place an empty basket under an apple tree and return later to collect it or wait until it is filled before moving on. Clearly, if there are multiple pickers and only one person responsible for carrying baskets, it would be inefficient for that individual to wait for each basket to be filled.

The same scenario would arise if one replaced the mobile robots in the invention with human carriers. Regardless of the nature of the carrier, the decision to wait or not, depending on the circumstances, could indeed result in increased efficiency. Therefore, the efficiency gain is an inherent consequence of the scheduling method itself, irrespective of whether the tote is carried by a robot or a human. The Board judges that this strongly suggests that optimising task scheduling within the context of the invention is not

of a technical nature.

15. Even if it were considered a technical matter, the Board judges that the implementation of a decoupled interface is an obvious solution. As mentioned, if, for example, only one robot were available, it would be apparent to utilise it in a manner that allows for the placement of totes at multiple collection locations, enabling human pickers to work without waiting for the robot to pass by.

Implementing this aspect in the system of D3 is obvious, specially considering that it is claimed in functional terms without providing specific technical details. The skilled person would simply need to program the management system accordingly, instructing the robots with commands such as "Move to location X", "Decouple from the tote", "Move to location Y", and so forth.

16. As none of the solutions to the partial problems is inventive, the Board judges that claim 1 lacks an inventive step (Article 56 EPC).

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

T. Buschek W. Chandler

Decision electronically authenticated