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Description

[0001] The invention relates to a system for cultivation and harvesting of mushrooms.

5 [0002] It is commonly known that mushrooms are cultivated in air-conditioned rooms which depending on the mushroom type are dimmed or bright. The mushrooms growing on a substrate are preferably arranged in several levels one above the other in beds on racks. The substrate has a composition harmonized to the mushroom type. After the mushrooms have reached a certain size, they are harvested manually within regular intervals.

10 [0003] For example, EP 1 064 836 A2 discloses that the harvesting is executed by means of a gondola movably arranged at the rack. By the aid of the gondola, each single mushroom is manually picked by a person standing on the gondola. Preferably, the gondola is movable horizontally along the rack.

[0004] EP 1 810 563 A1 relates to a device for harvesting of mushrooms, said device comprising a personnel-moving device transporting a mushroom picker with respect to a cultivating bed.

15 [0005] WO 93/00793 A1 relates to a device for the automatic selective harvesting of mushrooms.

[0006] Furthermore known from WO 2012/110238 A1 is a system for the harvesting of mushrooms which comprises a transfer facility by means of which the mushrooms are transferred from the multi-deck rack to a picking frame. On the picking frames, the mushrooms are located in one level which is so configured that the mushrooms can easily be picked by the pickers standing beside the picking frame.

20 A drawback of prior art systems lies in that only relatively low picking performance rates can thereby be achieved. Picking performance rate is understood to mean the quantity of mushrooms harvested per time unit. In cultivating mushrooms, the picking costs account for the biggest portion of production costs so that there is a demand for systems that make it possible to increase the picking performance rate.

It is therefore the object of the present invention to provide an improved system for the cultivation and harvesting of mushrooms. In particular, it is an object to increase the picking performance rate and to decrease the picking costs.

30 This task is solved by a system having the features of claim 1. Advantageous embodiments each are the subject of dependent claims. It should be noted that the features mentioned individually in the claims can also be combined with each other in arbitrary and technologically sensible manner, thus showing up further embodiments of the present invention.

35 The inventive system for the cultivation and harvesting of mushrooms comprises at least one rack, with the mushrooms growing on a substrate being located on the rack in at least two levels arranged one above the other, and at least one picking station that can be displaced horizontally along the rack and which comprises several picking locations for the persons harvesting the mushrooms. The system is distinguished in that each picking location is allocated to a certain,

different level so that the mushrooms can be harvested simultaneously on different levels of the rack.

As compared to prior art, the advantage of the inventive system lies in that the mushrooms can be harvested simultaneously on the different levels of the rack because several picking locations
5 are arranged at the picking station. The picking performance rate can thus be increased substantially so that the costs on the whole are decreased.

[0007] Picking locations are understood to be those positions at which the persons are standing who harvest the mushrooms and pick those mushrooms ready for harvesting. The picking locations may comprise a weighing scale for weighing the mushrooms and/or a fixed blade for
10 cutting-off the stalk ends of the mushrooms. As a rule, the mushrooms are immediately laid into containers in which they are launched on the market later-on. By means of the weighing scale, the pickers can ensure that each container has got the correct filling weight. Cutting-off the lower ends of mushroom stalks belongs to the harvesting procedure and is indispensable for the quality of the end product. The fixed blade enables the pickers to pick the mushrooms with both hands,
15 cutting-off the stalk simply by guiding the mushroom over the blade.

[0008] The fact that each picking location is allocated to a different level is inventively to be understood to mean that each picking location is assigned to a certain level of the rack. For example, if there are two picking locations, then the first picking location is allocated to a first level of the rack and the second picking location is assigned to a second level of the rack.
20 Advantageously, the number of picking locations of one picking station corresponds exactly to the number of levels of the rack. By way of such an arrangement, all levels of the rack can be harvested simultaneously so that the rack is completely harvested when the picking station has once passed horizontally alongside the rack.

[0009] Preferably, the picking station comprises a picking bridge to accommodate a person
25 harvesting the mushrooms, said bridge being arranged at a distance spaced from the bottom. By means of the picking bridge, the harvesting person stands at a suitable working height relative to the mushrooms arranged on the relevant level. The harvesting person thus is located at a position elevated relative to the ground floor so that the person has easy access, for example to those mushrooms arranged on an upper level of the rack and can harvest them effectively. In the sense
30 of the invention, upper level means a level between which and the ground floor at least another level of the rack is arranged. To make the picking bridge easily accessible, the picking bridge may comprise rungs or step-formed elements.

[0010] The picking bridge may comprise a platform on which the harvesting person stands. But it is also conceivable that the picking bridge is formed like a pedestal.

[0011] It is also conceivable that the picking bridge can be displaced vertically. Hereby, the
35 picking person can comfortably step onto the picking bridge at ground level and then be moved upwards, preferably by actuating a drive unit, and bring itself into an optimal position relative to the mushrooms to be harvested. Upon completion of the harvesting process, the person can then be moved again downwards and comfortably leave the picking bridge at ground level. The drive
40 unit can be driven both motorically and hydraulically. In principle, however, it is also conceivable that the picking bridge can be moved up and down manually by means of a crank handle or the like.

[0012] Advantageously, the rack comprises exactly two levels arranged one above the other, a first and a second level. Accordingly, harvesting of mushrooms from the first level can be carried out preferably through a first picking station and harvesting of mushrooms from the second plane can be carried out preferably through a second picking station. Ideally, the system comprises
5 several racks essentially arranged in parallel to each other. To be able to ensure the most efficient possible harvesting of mushrooms, at least one picking station with a plurality of picking locations is assigned to each rack.

[0013] The inventive system can preferably comprise at least one transverse conveyor having a conveying direction transverse to the longitudinal extent of the rack. The persons harvesting the
10 mushrooms pick the mushrooms and lay them (preferably in a container) on the transverse conveyor which transports the mushrooms then directly for further processing. The transverse conveyor can be configured as a belt conveyor. If the system comprises several racks arranged side by side, then the transverse conveyor can span over the racks. Ideally, the transverse conveyor can be motor-driven at a variable speed in a direction transverse to its conveying
15 direction. Hereby, an adaptation to the picking velocity of the pickers is made possible. If there are still plenty of mushrooms on the substrate, the substrate is harvested more slowly and the transverse conveyor moves at a slower speed alongside the racks. If the substrate has only a few mushrooms, then the movement of the transverse conveyor can be faster.

[0014] Advantageously, the transverse conveyor comprises two transport levels for transporting
20 the harvested mushrooms. The levels lie preferably directly one below the other. But it is also feasible that the transport levels of the transverse conveyor lying one below the other are arranged side by side in staggered arrangement. Ideally, one level is assigned to a first picking location and the second level is allocated to a second picking location.

[0015] The picking locations can be arranged on opposing sides of the transverse conveyor. It
25 bears the advantage that the transverse conveyor can be charged equally well from the picking locations. Ideally, the picking station and thus also the picking locations are firmly fastened to the transverse conveyor so that the transverse conveyor and the picking locations are jointly movable along the rack and thus along the mushroom beds. If the transfer conveyor is displaced horizontally, then the persons harvesting the mushrooms also move along so that the entire
30 substrate existing on the levels of the rack can be harvested successively. Hereby, the harvested mushrooms can be deposited directly on the transverse conveyor so that they are conveyed to a central place for further processing.

[0016] The inventive system may furthermore comprise a framework structure to accommodate
35 the transverse conveyor. The framework structure basically runs in parallel to the rack and preferably comprises a carrier rail. The carrier rail is so configured that the transverse conveyor is movable along this rail. To this effect, the transverse conveyor preferably comprises track rollers arranged on the carrier rail. Ideally, the transverse conveyor is movably arranged at both ends on a framework structure.

[0017] Preferably, the inventive system comprises a conveyor unit that transports picked
40 mushrooms in vertical direction, preferably to the transverse conveyor and then ideally also deposits the mushrooms on the transverse conveyor. The conveyor unit preferably extends from one picking location assigned to a lower level of the rack up to the transverse conveyor which is arranged above the rack. The conveyor unit ideally is a kind of an elevator. The conveyor unit

may comprise a carrier rack in which the harvested mushrooms and/or containers can be arranged, transporting these then in vertical direction, preferably upwards. The conveyor unit may comprise platforms on which the mushrooms and/or containers can be set down. However, the conveyor unit may also be so configured that containers can be hung-in and/or hooked-in into this unit.

[0018] The system may comprise a longitudinal conveyor. The longitudinal conveyor, for example a belt conveyor, preferably provides a conveying direction running in parallel to the longitudinal extent of the rack and zonally comprises two conveyor belts.

[0019] The longitudinal conveyor can be subdivided into several regions, ideally into three regions. In a first region, the longitudinal conveyor preferably comprises two conveying levels, with the conveying levels being assigned to the conveying levels of the transverse conveyor so that a first conveying level of the longitudinal conveyor is assigned to a first level of the transverse conveyor and a second level of the longitudinal conveyor is assigned to a second level of the transverse conveyor. The containers and/or mushrooms arranged on the first level of the transverse conveyor are thus conveyed onto the first level of the longitudinal conveyor. The conveying levels of the longitudinal conveyor extend in particular on levels lying in parallel to each other and are arranged in a mode staggered to each other. A second region of the longitudinal conveyor may be configured as a transfer region. In the transfer region, the longitudinal conveyor is transposed from a configuration with two levels into a configuration with one level. To this effect, the individual conveyor belts of the longitudinal conveyor preferably have gradients/slopes of different degrees. A third region preferably comprises only one level. The containers transported on the different levels converge here. In principle, however, it is also conceivable that the longitudinal conveyor merely comprises a transfer region, that means a region in which the longitudinal conveyor is transposed from a one-level configuration into a two-level configuration. To this effect, the longitudinal conveyor comprises two transport belts that have a slope of a different degree.

[0020] The invention as well as its technical environment are explained in greater detail below based on the appended drawings and figures. It should be noted that the figures show a particularly preferred embodiment variant of the invention. However, the invention is not confined to the embodiment variant shown here. In particular, the invention, inasmuch as technically sensible, encompasses arbitrary combinations of the technical features which are mentioned in the claims or described in the description as being inventively relevant.

[0021] Where:

- FIG.1 shows a schematic side view of the inventive system in a first embodiment;
- FIG.2 shows the system depicted in FIG.1 in a perspective view;
- FIG.3 shows the system depicted in FIG.1 in another perspective view;
- FIG.4 shows a perspective view of an inventive system in another embodiment.

[0022] FIG.1 shows a schematic side view of an inventive system 10 for cultivation and harvesting of mushrooms in a first embodiment. The system 10 comprises a rack 12 with two levels 14,16 arranged one above the other. Arranged on the levels 14,16 is a substrate on which the mushrooms grow. Furthermore, the system 10 comprises a picking station 18 which is
 5 movable alongside rack 12. The picking station 18 comprises two picking locations 20,22 each for at least one person for harvesting of mushrooms. Each picking location 20,22 is assigned to another level 14,16 of rack 12 so that the mushrooms can be harvested simultaneously on the different levels 14,16 of rack 12. In FIG.1, the first picking location 20 is assigned to the lower level 14 and the second picking location 22 is assigned to the upper level 16.

10 [0023] The second picking location is configured as a picking bridge 24 for accommodating a person harvesting the mushrooms. The picking bridge 24 is spaced at a distance from the floor 54 and serves the purpose that the mushrooms existing on the upper levels 16 and/or the upper level 16 of rack 12 can be harvested. By means of the picking bridge 24, the person harvesting is located at a position being elevated relative to the floor 54 so that it gets easy access to the
 15 mushrooms existing on the upper level 16 and can harvest them. The picking bridge 24 may comprise a platform 26 on which the person stands. To ensure easy access to the picking bridge 24, the picking bridge 24 may comprise rungs or step-formed elements. It is also conceivable that the picking bridge 24 is vertically movable. Hereby, the picking person can comfortably step onto the picking bridge 24 at ground floor level and then be moved upwards preferably by
 20 actuating a drive unit, and align itself into an optimal position relative to the mushrooms to be harvested.

[0024] The system 10 depicted in FIG.1 furthermore comprises a transverse conveyor 28 configured as a belt conveyor and extending above the rack 12. The transverse conveyor 28 provides a conveying direction transverse to the longitudinal extent of the rack 12. If the system
 25 10 comprises a plurality of racks 12, which are preferably spaced from each other and basically run in parallel to each other, then the transverse conveyor 28 preferably spans over several racks 12 arranged side by side. The picking locations 20,22 are preferably arranged on opposing sides of the transverse conveyor 28.

30 [0025] FIG.2 shows the system 10 depicted in FIG.1 in a perspective view. The transverse conveyor 28 comprises two levels 30,32 for transportation of harvested mushrooms. A shelf 34 for containers can be arranged at the transverse conveyor 28, preferably above the transverse conveyor 28. Preferably, picked mushrooms at the picking locations 20,22 are directly laid into containers in which the mushrooms are subsequently launched on the market. To be able to determine the exact filling weight, each picking location 20,22 preferably comprises a weighing
 35 scale. The person performing the harvest takes a container from the shelf 34 and fills it until it has reached the required weight, and then puts the container on the transverse conveyor 28 which transports the mushrooms away for further processing.

[0026] Furthermore, FIG.2 shows a framework structure 36 which serves for accommodating the transverse conveyor 28 and which basically runs in parallel to the rack 12. The framework
 40 structure 36 comprises a carrier rail 38, alongside of which the transverse conveyor 28 is movably arranged. The transverse conveyor 28 preferably comprises track rollers 40 which engage to the carrier rail 39. Ideally, the transverse conveyor is arranged at both ends on one carrier rail 38 and/or one framework structure 34 each. The picking station 18 with the two picking locations

20,22 is firmly fastened to the transverse conveyor 28. This bears the advantage that the transverse conveyor 28 and the picking locations 20,22 are jointly movable along the rack 12 and thus along the mushroom beds. The persons harvesting can thus deposit the harvested mushrooms directly onto the transverse conveyor 28 so that these are conveyed to a central place for further processing.

[0027] FIG.3 shows the system 10 depicted in FIG.1 in another perspective view. The first picking location 20 of the picking station 19 is assigned to the lower level 14 of rack 12. To be able to transport harvested mushrooms filled in containers from picking location 20 and to thus provide space there for further mushrooms, the picking station 18 comprises a conveying unit 42. The conveying unit 42 extends from the first picking location 20 vertically to the transverse conveyor 28 and it is so configured that it transports the containers charged with mushrooms to the transverse conveyor 28 and then also deposits them on the transverse conveyor 28. To this effect, the conveyor unit 42 comprises a carrier rack 44 into which the containers, for example, can be hung-in and then be moved vertically upwards. The conveyor unit 42 preferably is a kind of an elevator.

[0028] FIG.4 shows a perspective view on an inventive system 10 in a further embodiment. The system 10 for cultivation of mushrooms comprises four racks 12 spaced from each other and arranged in parallel to each other, said racks comprised of two levels 14,16 each on which mushrooms grow. One picking station 18 each is movably arranged at the longitudinal sides of the racks 12. The picking stations 18 comprise two picking locations 20,22 each, wherein each picking station 20,22 is assigned to one level 14,16 of the rack 12. A transverse conveyor 28 which preferably comprises two levels extends basically vertically to the racks 12 and spans over them. The conveying direction of the transverse conveyor 28 is transverse to the longitudinal extent of the racks 12 (represented by a single arrow in FIG.4). The transverse conveyor 28 is furthermore preferably motorically movable at a variable speed in a direction transverse to its conveying direction (represented by a double arrow in FIG.4). The individual picking stations 18 are firmly arranged at the transverse conveyor 28 so that these together with the transverse conveyor 28 are movable along the racks 12.

[0029] Furthermore, the system 10 depicted in FIG.4 comprises a longitudinal conveyor 46 which provides a conveying direction in parallel to the longitudinal extent of the rack 12 (represented by a dashed arrow in FIG.4). Moreover, the longitudinal conveyor at least zonally comprises two transport belts 60,62. The transverse conveyor 28 transports the mushrooms from the racks 12 to the longitudinal conveyor 46 and this conveys the mushrooms then to a central place. Preferably, the longitudinal conveyor 46 comprises several regions 48,50,52. In the first region 48, the longitudinal conveyor 46 comprises two conveying levels 56,58. These conveying levels 56,58 correspond to the conveying levels 30,32 of the transverse conveyor 28. The conveying levels 56,58 of the longitudinal conveyor 46 extend on levels lying in parallel to each other and they are not arranged one below the other as it is the case with the transverse conveyor 28 but side by side. The second region 50 is configured as a transfer region. It means that the longitudinal conveyor transitions from a two-level configuration into a one-level configuration. To this effect, the individual conveyor belts 60,62 of the longitudinal conveyor 46 have gradients of different degrees. In its third region 52, the longitudinal conveyor 46 then comprises one level only. But it is also conceivable that the longitudinal conveyor 46 merely comprises a transfer region 50,

that means a region in which the longitudinal conveyor 46 transitions from a two-level configuration into a one-level configuration.

List of reference signs

	10	System for cultivation and harvesting of mushrooms
	12	Rack
5	14	First level rack
	16	Second level rack
	18	Picking station
	20	First picking location
	22	Second picking station
10	24	Picking bridge
	26	Platform
	28	Transverse conveyor
	30	First level transverse conveyor
	32	Second level transverse conveyor
15	34	Shelf container
	36	Framework structure
	38	Carrier rail
	40	Track roller
	42	Conveying unit
20	44	Carrier rack
	46	Longitudinal conveyor
	48	First region longitudinal conveyor
	50	Second region longitudinal conveyor
	52	Third region longitudinal conveyor
25	54	Ground floor
	56	First conveying level longitudinal conveyor

- 58 Second conveying level longitudinal conveyor
- 60 First conveyor belt longitudinal conveyor
- 62 Second conveyor belt longitudinal conveyor

PATENTKRAV

1. System (10) til dyrkning og høstning af svampe, omfattende:

- 5 - i det mindste ét stativ (12), hvor svampene, som vokser på et substrat, er anbragt på stativet (12) på i det mindste to niveauer (14, 16) anbragt det ene over det andet, og
- 10 - i det mindste én plukningsstation (18), som kan forskydes horisontalt langs stativet (12) og som har adskillige plukkelokationer (20, 22) for de personer, som høster svampene,

kendetegnet ved, at hver plukkelokation (20, 22) er knyttet til et bestemt, forskelligt niveau (14, 16), og det er derfor muligt at høste svampene på forskellige niveauer (14, 16) i stativet (12) på samme tid.

15

2. System (10) ifølge krav 1, **kendetegnet ved, at** antallet af plukkelokationer (20, 22) svarer til niveauerne (14, 16) i stativet (12).

3. System (10) ifølge ethvert af kravene 1 og 2, **kendetegnet ved, at** plukkestationen (18) har en plukkebro (24) til at optage en svampehøstende person, som er anbragt i afstand fra gulvet (54).

20

4. System (10) ifølge det foregående krav, **kendetegnet ved, at** plukkebroen (24) har en platform (26), hvor personen, som foretager høstningen, står.

25

5. System (10) ifølge ethvert af de foregående krav, **kendetegnet ved, at** systemet (10) omfatter adskillige stativer (12) anbragt i det væsentligt indbyrdes parallelt og hver stativ (12) er tilknyttet i det mindste én plukkestation (18).

30 6. System (10) ifølge ethvert af de foregående krav, **kendetegnet ved, at** systemet (10) omfatter i det mindste én tværtransportør (28), som har en transportretning på tværs af den langsgående udstrækning af stativet (12).

7. System (10) ifølge krav 6, **kendetegnet ved, at** tværtransportøren (28) kan være motordrevet med en variabel hastighed i en retning på tværs af dennes transportretning.

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8. System (10) ifølge det foregående krav, **kendetegnet ved, at** tværtransportøren (28) har to niveauer (28, 30) til at transportere de høstede svampe.
9. System (10) ifølge et af kravene 6 til 8, **kendetegnet ved, at** plukkelokationerne (20, 22) er anbragt på modstående sider af tværtransportøren (28).
10. System (10) ifølge et af kravene 6 til 9, **kendetegnet ved, at** plukkestationerne (18) og således også plukkelokationerne (20, 22) er fikserede på tværtransportøren (28).
11. System (10) ifølge et af kravene 6 til 10, **kendetegnet ved** en transportindretning (42), som transporterer de plukkede svampe i den vertikale retning.
12. System (10) ifølge krav 11, **kendetegnet ved, at** transportenheden (42) er udformet til at transportere de plukkede svampe til tværtransportøren (28).
13. System (10) ifølge et af kravene 6 til 12, **kendetegnet ved** en langsgående transportør (46), som har en transportretning parallelt med den langsgående udstrækning af stativet (12) og, i nogle områder, har to transportbånd (60, 62).
14. System (10) ifølge det foregående krav, **kendetegnet ved, at** den langsgående transportør (46) har tre områder (48, 50, 52), hvor den langsgående transportør (46) i et første område (48) omfatter to transportniveauer og i et andet område (50) har et overføringsområde, og i et tredje område (52) har ét transportniveau.

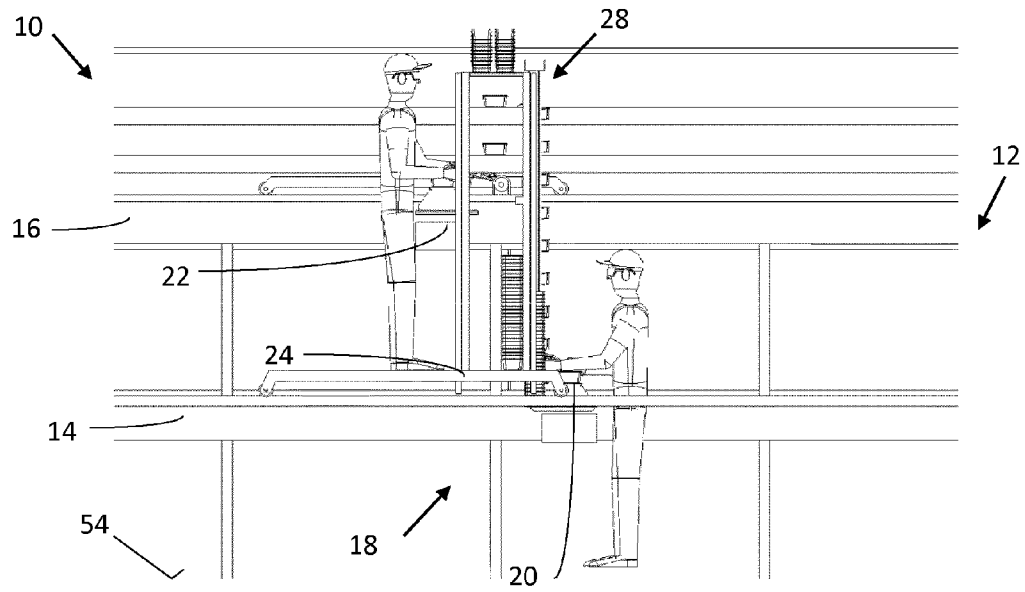


Fig. 1

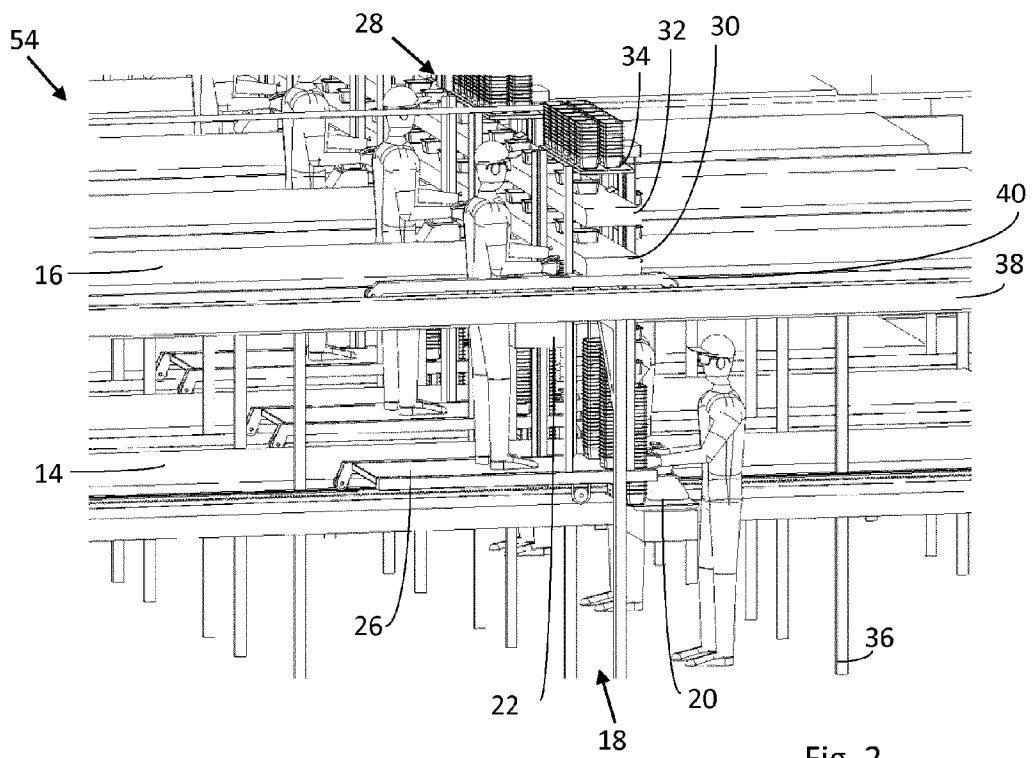


Fig. 2

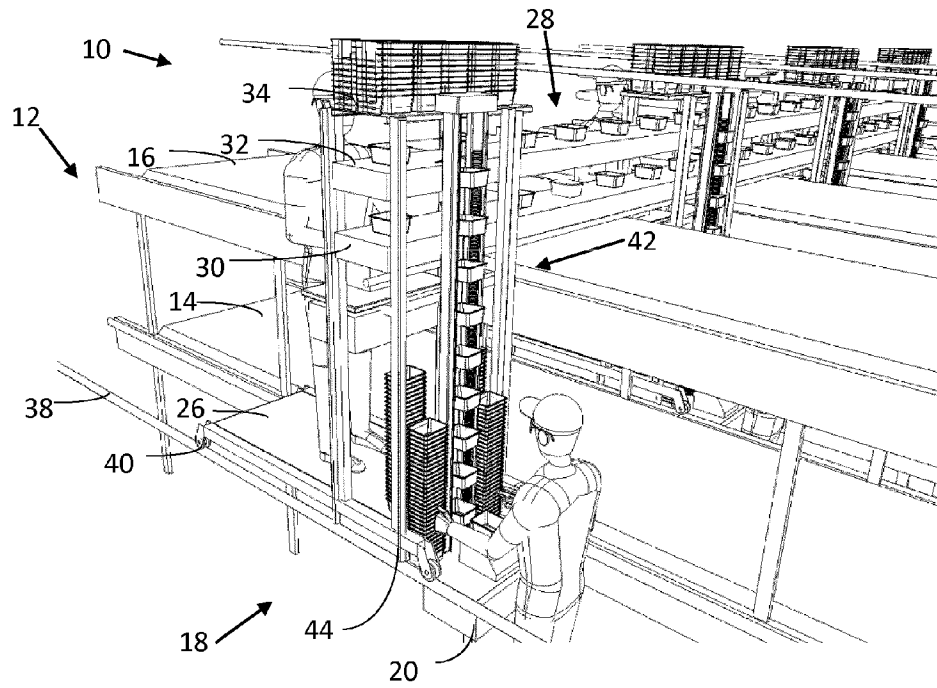


Fig. 3

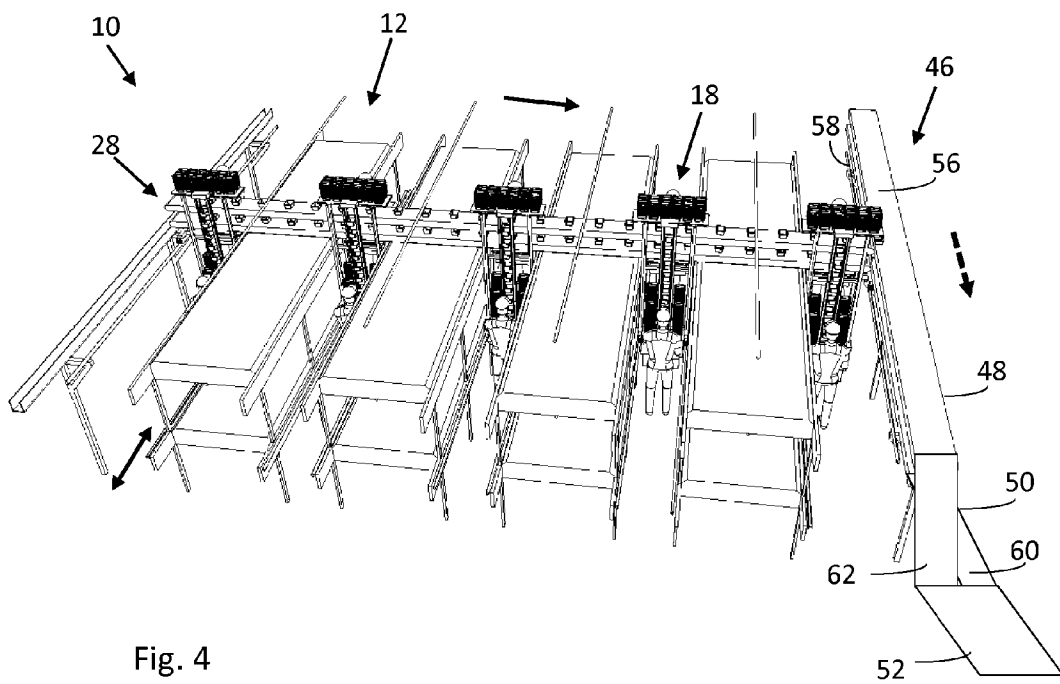


Fig. 4