

CONVEYOR UNIT

REPLACED SHEETS SG

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FIELD OF THE INVENTION

The present invention relates generally to conveyor units, and more particularly to conveyor units of the type used for conveying press dies, for example. Such type of conveyors include, for example, the so-called free ball bearing.

PRIOR ART

A conveyor unit of the above-mentioned type is known from the invention disclosed in Japanese Patent Publication No. 31410/1984 filed by the same applicant as this application.

This prior art unit includes a bar-shaped base member 40 having a plurality of cylinder bores 41 bored in the top surface along a longitudinal direction thereof, as shown in Fig. 6. Pistons 42 are mounted within the cylinder bores 41 so that they can protrude out of and retract into the cylinder bores. The cylinder bores 41 are communicated with one another through passages 43. In use, compressed air can be supplied by means of a compressor, for example, to a passage 44 which is communicated with one of the cylinder bores 41 which is located at one end of the base member 40 so that the pistons 42 can be kept at a raised position.



Further, a conveyor unit 45, e.g. a so-called free ball bearing unit, having a plurality of axially arranged, upwardly protruding rollable ball members 46, is mounted on the vertically actuating pistons 42 on the base member 40.

This prior art has an advantage that it can be manufactured at low costs and can be inspected and maintained very easily since the unit itself may be of a simple structure.

PROBLEMS TO BE SOLVED BY THE INVENTION

The above-mentioned prior art conveyor unit, however, has a serious disadvantage. That is, it has no particular means for lowering the unit body 45. In fact, the compressor is opened to exhaust the cylinder bores 41 in the base member 40 of the compressed air. The compressed air is thus exhausted by virtue of the weight of the unit body 45. In addition, because the base member 40 is of an elongated structure and, as a result, the descending motion is very slow, it takes too long a time for the unit 5 to descend completely, hindering a sequence of operations of conveying workpieces from being smoothly done and thus greatly reducing the working efficiency.

SUMMARY OF THE INVENTION

An object of the present invention is to provide an improved conveyor unit which is capable of quick



ascending and descending motions, in particular of a quicker descending motion, thereby to improve the efficiency of subsequent works.

To achieve the above object, the present invention provides a conveyor unit comprising a unit body 1 having cylinder bores 3 in which rolling member supports 2 provided with rolling members 5 are mounted, wherein a raising port 8 and a lowering port 12 are provided, through which a fluid can be introduced into said cylinder bores 3 from outside so that said rolling member supports 2 can be raised and lowered.

In the conveyor unit so constructed, a fluid, when introduced through the raising port 8 of the unit body 1 into the cylinders 3, will raise the rolling member supports 2 and will maintain the supports 2 in a raised position in which the supports protrude out of the unit body 1.

Meanwhile, if a fluid is introduced through the lowering port 12 into said cylinders 3, the rolling member supports 2 is pressed and smoothly lowered by the fluid, whereby the rolling members 5 will descend into the unit body 1.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will now be described, by way of example, with reference to the accompanying drawings, in which:

Fig. 1a is a fragmentary sectional elevational view



of an embodiment of the conveyor unit according to the present invention, in which an intermediate portion is omitted;

Fig. 1b is a fragmentary plan view of the unit, in which an intermediate portion is omitted;

Fig. 1c is an elevational view of the unit;

Fig. 2 is a sectional view of the unit in use;

Figs. 3 to 5 are sectional views showing principal parts of other embodiments; and

Fig. 6 is a sectional view showing a prior art unit.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIRST EMBODIMENT

In Figs. 1a - 1c, 1 designates a bar-shaped unit body, which has a top lid 1a, body member 1b and bottom plate 1c, respectively having a predetermined length. These members 1a, 1b and 1c are laid on one another to form a laminar structure, and are connected together by means of bolts (not shown), for example. Rolling member supports 2, generally in the form of a tube, are vertically slidably mounted in a plurality of cylinder bores 3 which are formed at predetermined intervals in the top surface of the top lid 1a and the body member 1b of the unit body 1. Each support 2 has a hemispherical recess 2a formed in its top surface, in which a main ball 5 is rollably mounted with rollable small balls 4 arranged between it



and the hemispherical surface. Each support 2 has a flange 2b formed around a lower portion thereof, which engages with a circumferential ridge portion 3a formed along an upper portion of the cylindrical inner surface of the corresponding cylinder bore 3, whereby the support 2 is prevented from ascending. O-rings 6 and 7 are provided to seal between the peripheral surface of the support 2 and the cylinder bore 3.

The bottom plate 1c of the unit body has an inlet port 8 formed in its top surface at one end thereof. The bottom plate 1c is provided with a groove 9a formed in its top surface along a central longitudinal direction thereof, which groove 9a defines a communication passages 9 which connect the inlet port 8 to the cylinder bores 3 in the body member 1b when the body member 1b is mounted on the bottom plate 1c. A lower attachment 10 has a conduction passage 11 which connects to the inlet port 8 of said bottom plate 1c. A compressor, for example, may be connected to this conduction passage 11 in order to supply compressed air into each cylinder 3 through the communication passages 9 in the unit body 1.

The body member 1b of the unit body 1 has an inlet port 12 formed in its top surface at one end portion thereof, which port 12 allows compressed air to be introduced into the cylinder bores 3 such that the compressed



air presses on the top surface of the flange 2b of each support 2. Meanwhile, the cylinder bores 3 are connected to one another through a communicating passage 13. An upper attachment 14, having an inlet passage 15 connected to the inlet port 12, is secured to the top surface of the unit body 1 at one end portion thereof by suitable means such as bolts.

In use, a plurality of the so constructed conveyor units are arranged in corresponding grooves provided side by side in a table 16 in such a manner that the main balls 5 on the supports 2 are sunken in these grooves.

In such a case, compressed air is introduced through the inlet passage 11 in the lower attachment 10, then through the inlet port 8 and communication passages 9, into each cylinder bore 3 from below. The support 2 mounted in each cylinder bore 3 is thereby raised, as shown in Fig. 2, whereby a workpiece placed on the table 16 will be lifted from the table surface and kept at the raised position. The workpiece so raised is movable on the main balls 5 on the supports 2 in any direction, and it can readily be moved to a desired position.

Subsequently, the compressed air is drawn off through the inlet passage 11 in said lower attachment 10 and, simultaneously, compressed air is introduced through the other inlet passage 15 on the upper attachment 14. The



newly introduced compressed air will flow through the other inlet port 12 and communication passage 13 into the cylinder bores 3, and will press the top surface of the flange 2b of each support 2, causing the support to descend, whereby the main balls 5 on the supports 2 are sunken below the level of the top surface of the table 16 and the workpiece will then rest on the table 16.

This embodiment has an advantage that the supports can be very smoothly and quickly lowered and, therefore, objects such as workpieces can be conveniently conveyed since means is particularly provided for lowering the supports 2 by introducing compressed air.

In addition, the conveyor unit is of a not so complicated construction and may be manufactured at low costs. It may also be operated easily.

SECOND EMBODIMENT

While the first embodiment is arranged such that the supports 2 are raised and lowered directly by means of compressed air, another arrangement such as that shown in Fig. 3 may also be possible.

That is, the conveyor unit of Fig. 3 includes pistons 18 having a projection 17 provided at its center on the top thereof. The pistons 18 are mounted in cylinder bores 19 at a lower position, and are connected to the lower surface of the supports 2 through pins 20 protruding from



the top of said projections 17.

To lift the supports 2, compressed air is introduced into the cylinder bores 19 through the inlet port 11 and conduction port 8, thereby to press the pistons from below. Meanwhile, in order to lower the supports 2, compressed air is introduced into the cylinder bores 3 through the other inlet 15 and port 12, whereby the top surface of the flange 2a of each support 2 is pressed downward and the supports 2 are thereby lowered.

THIRD EMBODIMENT

Both of the above-described embodiments comprise a unit body 1 which includes rollable member supports 2 integral therewith. Another, third, embodiment will next be described which comprises a base as raising and lowering means, and a separate bearing unit provided with rollable members.

In Fig. 4, a base 21 comprises a top lid 21a, a body member 21b and a bottom plate 21c, respectively having a predetermined length. These members 21a, 21b and 21c are laid on one another to form a laminar structure, and are connected together by means of bolts (not shown), for example. Pistons 22, used to raise and lower a conveyor unit body 23 provided with a plurality of rollable main balls 5, are vertically slidably mounted in first cylinder chambers 24 arranged side by side along a longitudinal



direction in an upper portion of the base 21. Each piston 22 has a flange 22a provided around its lower portion, and its top surface 22b lies substantially level with the top surface of the top lid 21a. Reference numerals 25 and 38 designate passages interconnecting adjacent first cylinders 24, which passages are used for lowering and raising the pistons 22, respectively.

Under the first cylinder chambers 24, a plurality of second communicating cylinder chambers 26 are arranged side by side along a longitudinal direction in a lower portion of the base 21. An auxiliary piston 27 is mounted vertically slidably in each cylinder chamber 26, which piston 27 has a through hole 27a formed substantially at its central portion. An inlet port 29 is formed in the top surface of the bottom plate 21c of the base 21 at its one end, which port 29 is connected to the lower ends of the first cylinder chambers 24 through, a communication passage 30. A lower attachment 31 is provided with a conduction passage 32 which communicates with the inlet port 29 of said bottom plate 21c. A compressor, for example, may be connected to the conduction passage 32 to introduce compressed air into the first cylinder bores 24 through the communication passage 30 in the base 21.

An inlet port 33 is formed in the top surface of the top lid 21a of the base 21 at one end, which port 33



is formed to allow compressed air to be supplied to press on the top surface of the flanges 22a of the pistons 22 through a communication passage 34 and first cylinder bores 24. An upper attachment 35, provided with an introduction passage 36 communicating with the inlet port 33, is mounted on the top surface of the top lid 21a of the base 21 at one end by suitable means such as bolts. The unit body 23 is mounted to the top lid 21a of the base 21 by means of bolts 37 extending through bores 39 provided at predetermined positions between the rollable members 5.

In this embodiment, compressed air introduced through the introduction passage 32 in the lower attachment 31 will flow into a lower portion of each cylinder bore 21 via the inlet port 29 and communication passages 30 and 38. Each lifting piston 22 mounted in the first cylinder bore 24 will thereby be raised, and compressed air is allowed to flow into the second cylinder chambers 26 via the through holes 27a in the auxiliary pistons 27, thereby to lift the auxiliary pistons 27 to support the lifting pistons 22. The unit body 23 will then be pressed upward by the lifting pistons 22, and kept at an elevated position.

In this embodiment, since bolts 37 interconnecting the unit body 23 and the base 21 will serve as guides for the unit body 23 as it is raised and lowered, an advantage is obtained in that the unit body 23 will be smoothly raised



or lowered without run-out.

The lifted workpiece is movable on the main balls 5 on the supports 2 in any direction, and it can readily be moved to a desired position.

Subsequently, compressed air is drawn off through the inlet passage 32 in said lower attachment 31 and, simultaneously, compressed air is introduced through the other inlet passage 36 in the upper attachment 35. The newly introduced compressed air will flow through the other inlet ports 33 and communication passages 34 and 25 of the base 21 into an upper portion of the first cylinder bores 24, and will press the top surface of the flange 22a of each support 22, causing the support to descend. The auxiliary pistons 27 will also descend and the unit body 23 will smoothly and quickly descend together.

When two types of pistons are used, such as 22 and 27 in the third embodiment, an advantage may be achieved in that a relatively large load can be carried. However, it is not essential to use two types of pistons. An arrangement using only one type of lifting piston 22, such as that shown in Fig. 5, may also be possible.

While in the above-described embodiments compressed air is used to raise and lower the supports 2 or the unit body 23, the present invention is not limited to this, but other fluids such as oil may alternatively be used.



Further, an explanation has been given with respect to an arrangement in which a unit body 23 in the form of a so-called free ball bearing unit is raised and lowered. The present invention is not limited to this, but it is also widely applicable to other unit bodies provided with rolling members comprising, for example, a needle roller bearing, irrespective of the details thereof, such as the length or shape of the unit body 23.

All the features of the conveyor unit according to the present invention may be freely modified or changed within the intended scope of the invention.

As will be clear from the foregoing, the present invention achieves a significant advantage that, because of the presence of a separate means for lowering rolling member supports or pistons, these rolling member supports or pistons can be lowered more smoothly and quickly as compared to those in prior art units which have no such lowering means.

The unit of the invention can thus greatly serve for operations such as conveying of workpieces.

In addition, the unit of the invention has another advantage that it can be manufactured at low costs and can be repaired or maintained easily because of its simple overall structure.



C L A I M S

1. A conveyor unit comprising a unit body (1) having cylinder bores (2; 19) in which rolling member supports (2) provided with rolling members (5) are mounted, wherein a raising inlet port (8; 11) and a lowering inlet port (12, 15) are provided, through which a fluid can be introduced into said cylinder bores (3, 19) from outside so that said rolling member supports (2) can be raised and lowered.
2. A conveyor unit according to claim 1, wherein pistons (18) for raising and lowering of said supports (2) are mounted in the cylinder bores (19).
3. A conveyor unit comprising a bar-shaped unit body (23) provided with a plurality of rollable members (5) which protrude partly from the unit body (23), and a base (21) adapted to raise and lower the unit body (23), wherein the base (21) has a plurality of cylinder bores (24) formed in its top surface along a longitudinal direction thereof, pistons (22) being mounted in the cylinder bores (24), and wherein a raising inlet port (30) and a lowering inlet port (33) are provided, through which a fluid can be introduced into said cylinder bores (24) from outside so that the pistons can be raised and lowered.
4. A conveyor unit according to claim 3, wherein an auxiliary piston (27) for raising and lowering and keeping said lifting piston (22) for raising and lowering and keeping said lifting piston (22) is mounted in a second cylinder bore (26) which is provided under and communicated with the first cylinder bore (24), and wherein said base (21) is provided with an inlet port (29) which communicates with said first cylinder bore (24) for raising both of said pistons (22, 27).



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5. The conveyor unit as claimed in claim 3 or 4, wherein said base 21 has at least one guide member (37) projecting from its top surface, and the unit body (23) has a through hole formed therethrough for insertion of said guide member.



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