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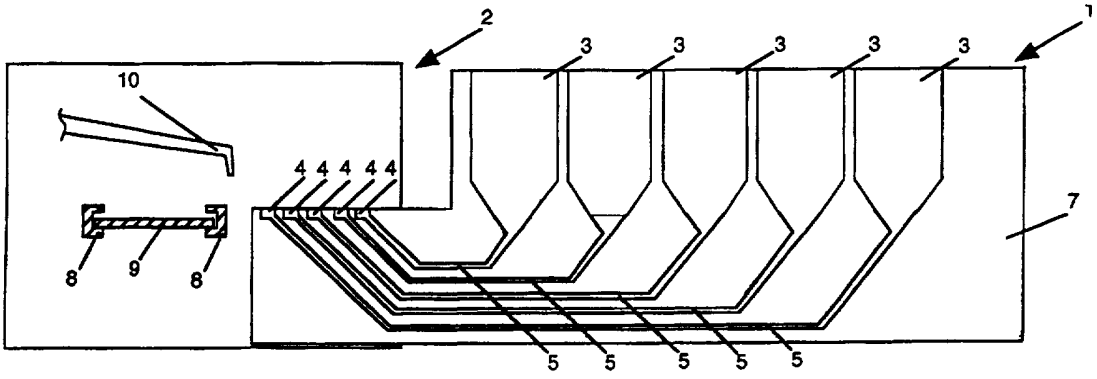
(54) Title: A FEEDER SYSTEM FOR SUPPLYING ELECTRICAL COMPONENTS TO PICK UP LOCATIONS



(57) Abstract

A feeder system (1) for supplying electrical components to pick-and-place machine (2). The feeder system (1) has a plurality of hoppers (3) for storing the components. There is also a plurality of pick up locations (4) for supplying the components to said pick-and-place machine. A plurality of channels (5) for providing communication between a respective hopper (3) and pick up location (4) are provided, wherein a length of each of the channels (5) is aligned in an upright plane.

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A FEEDER SYSTEM FOR SUPPLYING ELECTRICAL COMPONENTS TO PICK UP LOCATIONS

FIELD OF THE INVENTION

This invention relates to a feeder system for supplying electrical components to pick up locations. The invention is particularly useful for, but not necessarily limited to, supplying surface mountable electrical components stored in hoppers to respective pick up locations for subsequent mounting to a circuit board.

BACKGROUND ART

Component feeding is a well-known process in Surface Mounting Technology (SMT). In general, a feeder is used to sequentially supply surface mountable electrical components to a pick up location for subsequent placing, by a pick-and-place machine, onto a Printed Circuit Board (PCB) which is pre-printed with solder paste.

One form of feeder is a tape and reel feeder in which the electrical components are packaged on a tape that is wound onto a reel. The tape comprises individual pockets each containing one of the electrical components that are individually sealed in the pockets by a covering of thin film. In use, the film is removed when the tape enters the pick up location therefore leaving a pocket containing one of the electrical components in a position accessible by the pick-and-place machine.

Unfortunately, there is waste tape and film generated by tape and reel feeders and the placing and sealing of the electrical components in the pockets is relatively expensive. Also, there are a significant number of moving parts required by tape and reel feeders that add to increased costs associated with maintenance and replacement.

Hopper feeders also known as bulk or tube feeders are an alternative to tape and reel feeders. Hopper feeders comprise a hopper in communication, via a passage, with the pick up location. The passage is inclined to make use of gravity for supplying the components to the pick up location. In addition, air blasting may be used to assist gravity when supplying the components to the pick up location.

In use, both conventional hopper feeders or tape and reel feeders are positioned on either sides of a conveyor track extending along a length of a pick-and-place machine. The conveyor track transports

printed circuit boards into an area of the pick-and-place machine to allow components, fed from the hopper feeders or tape and reel feeders, to be mounted to the circuit boards. Such pick-and-place machines are expensive and their length is relatively short.

In addition, the conventional hopper feeders or tape and reel feeders are not configured to fully utilize the relatively short length of the pick-and-place machine. Accordingly, there is typically less than 400 hopper or tape and reel feeders, or combinations of both, used per pick-and-place machine (200 either side of the track). Due to this poor space utilization of the pick-and-place machine, extra pick-and place machines may be required to complete the mounting of components to the circuit boards. This therefore can result in increased manufacturing and maintenance costs.

SUMMARY OF THE INVENTION

It is an aim of this invention to overcome or alleviate at least one of the problems associated with space utilization of feeders associated with a pick-and-place machine.

According to one aspect of this invention there is provided a feeder system for supplying electrical components to pick-and-place machine, the feeder system comprising:

a plurality of storage means for storing some of said components;

a plurality of pick up locations for supplying said components to said pick-and-place machine,

a plurality of channels for providing communication between a respective one of said storage means and one of said pick up locations,

wherein a length of at least some of said channels is aligned in an upright plane.

Suitably, said length of at least some of said channels may be aligned above each other.

Preferably, said channels may be in alignment with said upright plane along a majority of their respective lengths.

More preferably, said channels may be in alignment with said upright plane along their full respective lengths.

Suitably, each of said storage means may be in alignment with said upright plane.

Preferably, each said storage means may be a hopper.

Suitably, each of said pick up locations may be in alignment with said upright plane.

Preferably, said upright plane may be transverse to a longitudinal axis of a printed circuit board conveyor track of said pick-and-place machine.

Suitably, said upright plane may be normal to a axis of said conveyor track.

Preferably, said upright plane may be substantially vertical.

BRIEF DESCRIPTION OF THE DRAWINGS

In order that the invention may be readily understood and put into practical effect, reference will now be made to a preferred embodiment illustrated in the accompanying drawings in which:

Fig. 1 is a side view of a feeder system in accordance with this invention;

Fig. 2 is a plan view of the feeder system of Fig. 1; and

Fig. 3 is a cross sectional view through A-A of Fig. 2.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT OF THE INVENTION

Referring to Figs. 1 to 3 there is illustrated a feeder system 1 for supplying electrical components to pick-and-place machine 2. The feeder system 1 comprises a plurality of storage means in the form of hoppers 3, a plurality of pick up locations 4 and a plurality of channels 5. The channels 5 provide communication between a respective one of the hoppers 3 and one of the pick up locations 4.

The channels 5, pick up locations 4 and hoppers 3 are machined into a surface of a block 6 and enclosed by a transparent plate 7 that is bolted to block 6 (bolts not shown).

The pick-and-place machine 2 (not shown in detail) has a printed circuit board conveyor track 8 for transporting a printed circuit board 9 into an area of the pick-and-place machine 2. The pick-and-place machine 2 also has a robot arm 10 for removing electrical components (not shown) from the pick up locations 4.

As illustrated, a total length of the channels 5 are aligned above each other in an upright and vertical plane P that is transverse and at an angle normal to a longitudinal axis L of conveyor track 6. Further, the

pick and place locations 4 and hoppers 3 are also aligned along the vertical plane P.

In use, electrical components are stored in the hoppers 3. The components in the hoppers 5 are agitated by air blasts. These air blasts push streams of the components from the hoppers 3 to the respective pick up locations. The robot arm 10 then removes the components from the pick up locations and places them on the printed circuit board 9.

Advantageously, due to the channels 5 being aligned in vertical plane P, the present invention makes efficient use of the space extending along longitudinal axis L of the pick-and-place machine 2. Space utilization is also advantageously improved by the channels 5 being aligned above each other. In addition, because the pick and place locations 4 and hoppers 3 are also aligned along the vertical plane P, which is normal to the longitudinal axis L, further space utilization is achieved. Accordingly, more pick and place locations 4 can be used on a single pick and place machine 2 that may therefore reduce manufacturing and maintenance costs.

Additionally, the vertical position of the pickup locations 4 are arranged to be at substantially the same vertical height as a bottom portion of the hoppers 3. This arrangement creates a situation wherein the potential energy that a component has when exiting the hopper into the channel is substantially the same as the potential energy of a component arriving at the pickup location. Thus, the transfer of the component is very easy, as it does not have to overcome any gravitational energy barriers.

Although this invention has been described with reference to a preferred embodiment, it is to be understood that the invention is not limited to the specific embodiment described herein.

CLAIMS

1. A feeder system for supplying electrical components to pick-and-place machine, the feeder system comprising:

a plurality of storage means for storing some of said components;

a plurality of pick up locations for supplying said components to said pick-and-place machine,

a plurality of channels for providing communication between a respective one of said storage means and one of said pick up locations,

wherein a length of at least some of said channels is aligned in an upright plane.

2. A feeder system as claimed in claim 1, wherein said length of at least some of said channels are aligned above each other.

3. A feeder system as claimed in claim 2, wherein said channels are in alignment with said upright plane along a majority of their respective lengths.

4. A feeder system as claimed in claim 3, wherein said channels are in alignment with said upright plane along their full respective lengths.

5. A feeder system as claimed in claim 2, wherein each of said storage means is in alignment with said upright plane.

6. A feeder system as claimed in claim 2, wherein each of said pick up locations is in alignment with said upright plane.

7. A feeder system as claimed in claim 1, wherein said upright plane is transverse to a longitudinal axis of a printed circuit board conveyor track of said pick-and-place machine.

8. A feeder system as claimed in claim 7, wherein said upright plane is normal to said axis.

9. A feeder system as claimed in claim 1, wherein said upright plane is substantially vertical.

10. A feeder system as claimed in claim 1, wherein said plurality of pickup locations are at substantially the same vertical height as a bottom portion of said storage means.

11. A feeder system as claimed in claim 10, wherein a bottom portion of said storage means and said plurality of pickup locations are arranged with respect to each other such that the potential energy of said electrical component at said bottom portion of said storage means and at said plurality of pickup locations is the same.

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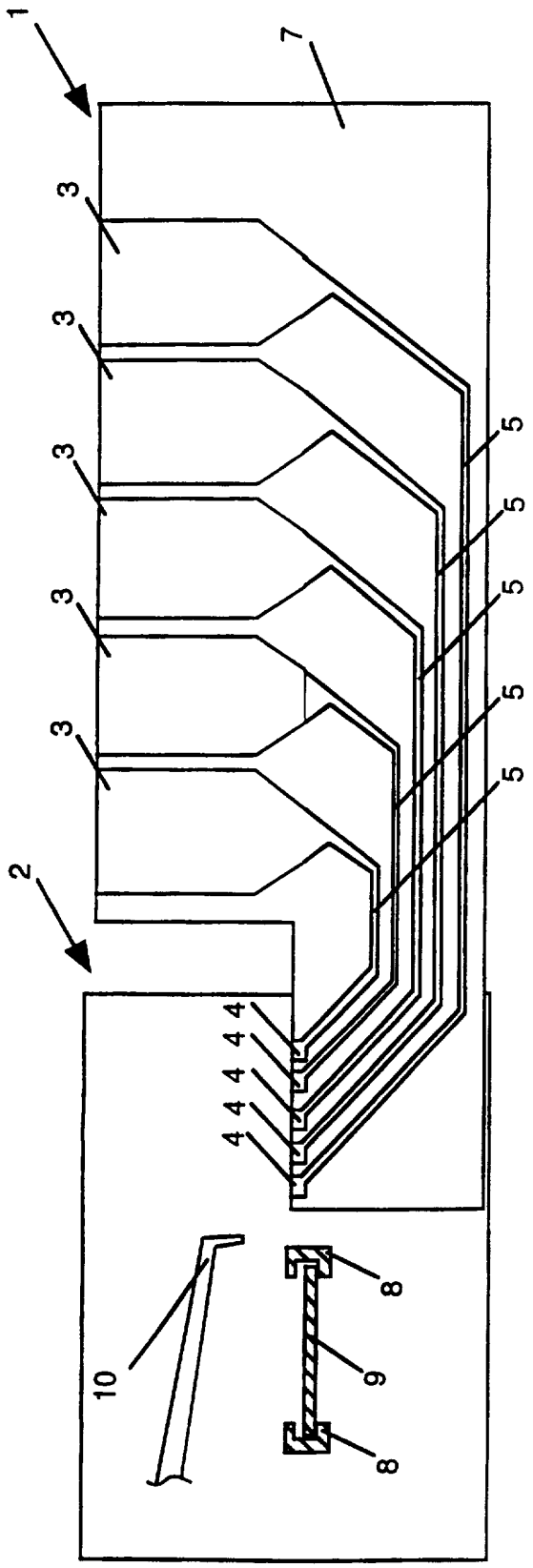
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Fig. 1

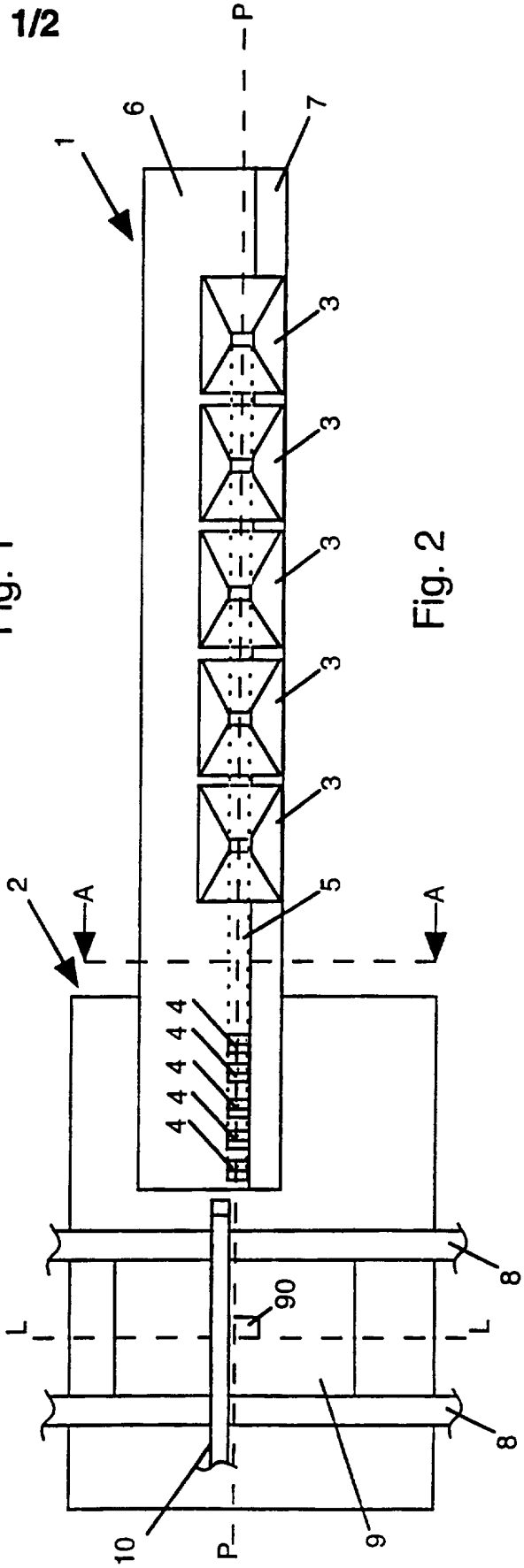
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Fig. 2

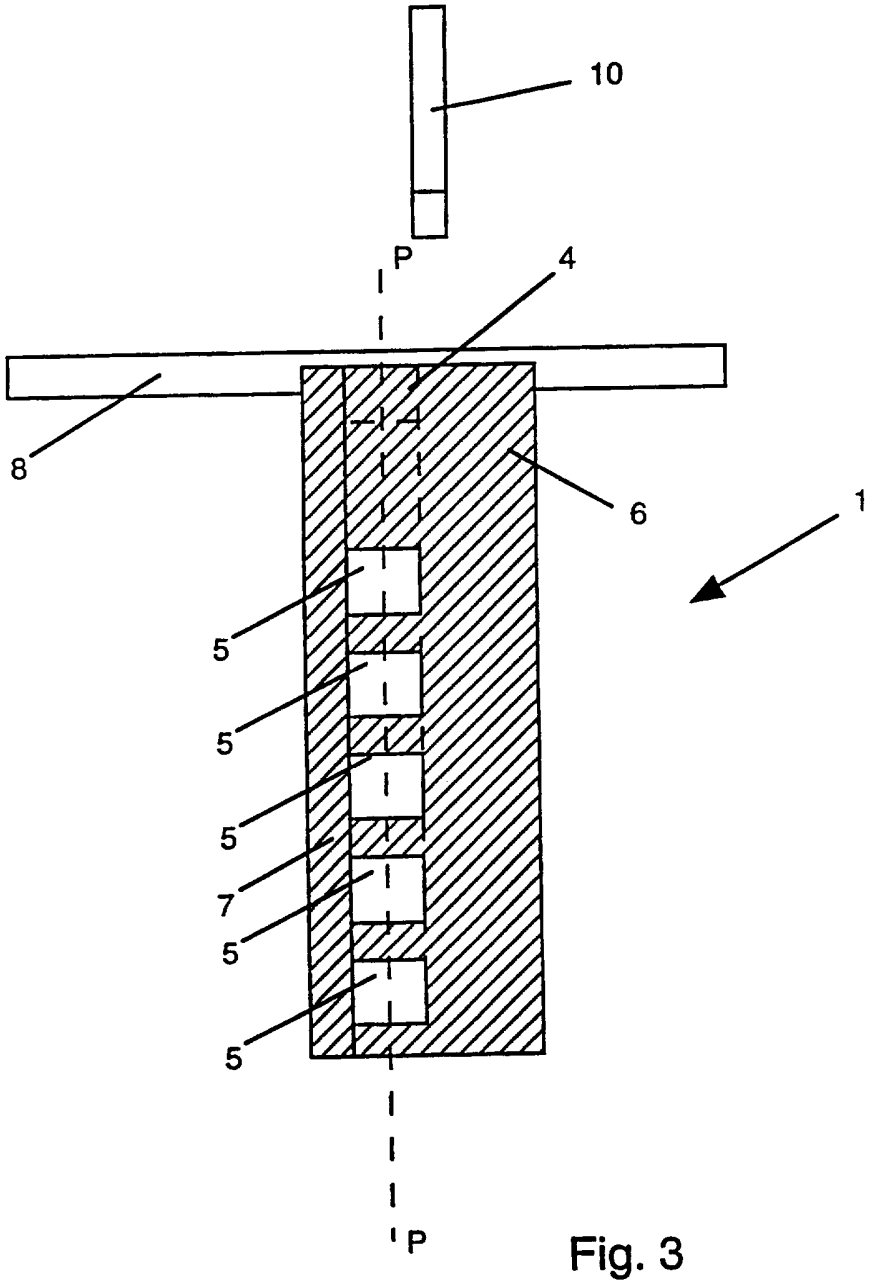

Fig. 3

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US97/04920

A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) : H05K 03/30

US CL : 414/222; 29/832, 836; 198/601

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)

U.S. : 414/222; 29/832, 833, 834, 835, 836; 198/601

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

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4,451,324 A (Ichikawa et al) 29 MAY 1984, Fig. 1.	1-6, 9
A	US 5,035,047 (Harigane et al.) 30 July 1991, Fig. 1	NONE
A	US 4,598,459 (Klink et al.) 8 July 1986, Fig. 1.	NONE
A	US 4,283,847 (May) 18 August 1981, Fig. 1.	None
A	US 4,386,464 (Yanai et al.) 7 June 1983, Fig.1.	1-11

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

*	Special categories of cited documents:	"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
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