

HANDLING APPARATUS & METHOD FOR A LEAD FRAME PROCESSING SYSTEM

FIELD OF THE INVENTION

This invention relates to an apparatus and method for handling lead frame magazines and lead frames. In particular this relates to the handling of lead frame magazines for loading/unloading lead frames into a solder plating machine.

BACKGROUND OF THE INVENTION

Solder plating of lead frames is typically an automatic line process. This process is continuous and may involve an endless carrier belt onto which the lead frames are mounted. At the loading station, frames are removed from magazines (cassettes) and mounted onto the belt. These frames are then carried through the various process stations of a plating process. At the end of the process line, the frames, after being plated, are dismounted from the belt and unloaded into magazines.

As the fabrication of integrated circuit wafer is increasingly complex and expensive, the importance of lead frames for IC chips cannot be over-emphasized. The handling and processing of lead frames has become more challenging, not only due to the finer feature sizes but also to the economic value of each IC chip that is finally mounted on a lead frame.

In mass production, as in other manufacturing industries, the products or work-in-progress must be traceable, from batches to batches or from lots to lots, depending on the processes that the batches or lots go through. In particular, in solder plating, each batch or lot may be associated with the chips from a particular wafer or batch of wafers. It is very important not to lose the traceability of each load of frames after being processed through the plating machine because the final product quality will be sampled and sorted according to the processes that a particular lot had gone through. For example, in the event of an oven O having a malfunction from 10:00 to 12:00 hours, during which time wafer lots X and Y had undergone a diffusion process in oven O, the chips from these particular lots may be found to have unacceptably low yield. In that case, the entire lots traceable to oven O for that time period would be rejected; it is possible that when trouble is promptly traced, the entire lots

affected may be isolated before they go through the complete manufacturing process. Thus saving money.

Currently in plating systems, record systems are fairly imperfect. Usually a batch of lead frames in a magazine is accompanied with its identification tag or papers attached manually to the magazine. The frames are removed from the magazine for processing and then put back into a separate magazine. The identification tag or papers has to be removed from the first magazine and attached to the second one. Unfortunately, human operators sometimes forget to do this or attach the identification tag or papers to the wrong magazine.

Alternatively, the frames are put back into the same magazine, which, once emptied, requires that the magazine be removed from the loading station and moved to the unloading station to contain the frames after being plated. The spatial separation of the loading and unloading stations requiring the manual transfer of the magazines from the loading station to unloading station may give rise to batch or lot identification error. This human intervention in the handling of the magazines can also give rise to the mixing-up of the frames between batches/lots.

Figs 1 to 3 illustrate typical arrangements of continuous line processes in common use. For simplicity of illustration, the processes have been classified into six groups, namely: loading 1; pre-cleaning 2; plating 3; post-cleaning 4; unloading 5; and belt stripping 6. Fig. 1 shows the load and unload stations at the extreme ends, while all the other processes are at one side and the belt stripping process along the other. Fig. 2 shows the load and unload stations being separated by the belt stripping process. Fig. 3 shows the load and unload stations being on opposite sides and a belt stripping loop in between.

OBJECT OF THE INVENTION

It is an aim of the present invention to alleviate some of these problems, at least partially.

SUMMARY OF THE INVENTION

According to a first aspect of the present invention, there is provided handling apparatus for a lead frame processing system which uses a carrier, the lead frames being loaded onto

said carrier for processing and removed therefrom after processing, said apparatus comprising:

removing means for removing lead frames from a magazine at a load position of said apparatus, for loading onto said carrier;

placing means for placing processed lead frames unloaded from said carrier into a magazine at an unload position of said apparatus; and

magazine transfer means for transferring a magazine from said load position to said unload position.

Preferably, said magazine transfer means is operable to transfer a magazine from said unload position automatically, when the placing means has finished placing lead frames therein.

Said magazine transfer means may transfer a magazine from said load position toward said unload position automatically, when said removing means has finished removing lead frames therefrom.

It is also preferred if said magazine transfer means is operable to transfer a second magazine automatically to said load position for removal of lead frames therefrom, when a first magazine is transferred from said load position toward said unload position.

The handling apparatus may further comprise a queuing position between said load and unload positions with said magazine transfer means operable to transfer a second magazine, removed from said load position, to said queuing position when a first magazine is still present at said unload position.

The apparatus may also include a loading buffer for containing a plurality of magazines of lead frames in a plurality of sequential loading buffer positions with said magazine transfer means operable to provide magazines from said loading buffer sequentially to said load position. Likewise there may be an unloading buffer for containing a plurality of magazines of processed lead frames in a plurality of sequential unloading buffer positions with said magazine transfer means operable to transfer magazines from said unload position into said unloading buffer.

The invention also covers the apparatus with loading means for loading frames, removed by said removing means from a magazine at said load position, onto said carrier and unloading means for unloading processed frames from said carrier, for placing into a magazine at said unload position by said placing means.

Advantageously, the apparatus is arranged and operable such that the same lead frames removed from a magazine at said load position, after processing, are replaced into the same magazine at the unload position.

According to a second aspect of the present invention, there is provided a lead frame processing system comprising handling apparatus as above and said carrier for receiving lead frames from said loading means and for providing processed lead frames to said unloading means, and on which said lead frames are to be processed.

According to a further aspect of the present invention, there is provided a method of handling lead frames and lead frame magazines in a lead frame processing system which uses a carrier, the lead frames being loaded onto said carrier for processing and removed therefrom after processing, said method comprising the steps of:

- removing lead frames from a magazine at a load position of said system, for loading onto said carrier;
- transferring a magazine from said load position to an unload position of said system;
- and
- placing processed lead frames unloaded from said carrier into a magazine at said unload position.

Said transferring step is preferably automatic after said removing step.

The method may further comprise the step of automatically providing a second magazine to said load position after said transferring step transfers a first magazine away from the load position and the removing, transferring and placing steps are repeated for said second magazine. There is also the possibility of automatically the step of taking a magazine from the unload position after said placing step.

Said transferring step preferably includes the step of holding a second magazine, removed from said load position, at a queuing position of said system when a first magazine is still

present at said unload position. Said transferring step may then complete the transfer of said second magazine to said unload position after said first magazine is taken in said taking step.

Advantageously the same lead frames removed by said removing step from a magazine at said load position, after processing, should be replaced by said placing step into the same magazine at the unload position.

The method may further comprise the steps of loading frames, removed by said removing step from a magazine at said load position, onto said carrier and unloading processed frames from said carrier, for placing into a magazine at said unload position by said placing step.

According to yet a further aspect of the present invention, there is provided a lead frame processing method including the above method.

This may further comprise the step of stripping solder from said carrier between a portion of the carrier having a first frame removed therefrom by said unloading step and the same portion having a second frame loaded thereon in said loading step.

This may also include the step of processing said lead frames between the removing and placing steps for those same frames, for instance in-line plating or even solder plating lead frames for integrated circuit components.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will be further described by way of non-limitative examples with reference to the accompanying drawings, in which:-

Figures 1 to 3 show the typical schematic layouts of known continuous line-processes;

Figure 4 shows a perspective view of a processing apparatus, including a handling station of the present invention;

Figure 5 shows a schematic of the integrated handling station of the apparatus of Fig. 4;

Figures 6a - 6i show the transfer of a plated lead frame from belt to buffer in the handling station; and

Figures 7a & 7b show an operation flow chart of the handling station of Fig. 5.

DESCRIPTION OF EMBODIMENTS OF THE INVENTION

Figure 4 shows a perspective view of a continuous line plating process apparatus embodying the present invention. As with prior machines, there is a loading station 10a, a pre-cleaning section 2, a plating section 3, a post-cleaning section 4, an unloading station 10b and a belt stripping section 6.

In this description the term magazine is used, however, this is meant to cover any type of arrangement by which the lead frames are held together.

In use, a magazine of lead frames is placed in the loading station 10a. There the lead frames are unloaded from the magazine onto a carrier belt (see Fig 6a). The belt then takes each lead frame sequentially around each section and station of the apparatus. Firstly, the frames are cleaned and prepared for plating in pre-cleaning section 2. In the plating section 3 they are plated as required. Excess chemicals and other materials are cleaned off in the post-cleaning section 4. The components are also dried and finished off in other relevant ways. The plated frames are removed from the belt in the unloading station 10b. From thence the belt moves into the stripping section 6 to remove the plated materials from the surfaces of the belt. This ensures that the belt is clean and that there is no build-up of materials that may affect the positioning of the lead frames with respect to mounting and dismounting onto and from the belt.

Fig. 5 shows a schematic view of handling station 10. Handling station 10 houses both a loading station 10a and an unloading station 10b. Lead frames for plating are introduced into loading station 10a in magazines 20. There they are unloaded from the magazines 20 onto the belt and processed. The empty magazine 20 is automatically transferred to the unloading section 10b and the same frames that were removed from that magazine 20, now plated, are placed back into it. In this way there is no need for human intervention to ensure that the correct identification materials are transferred to a new magazine. There is also no

need for someone to remove the magazine from the loading station to the unloading station, in the hope that all the same frames as were taken out are now put back in.

Loading station 10a has a magazine load buffer 25a which accepts a full magazine 20 loaded into the loading station 10a. The magazine load buffer 25a can hold a number of such magazines 20 in a stack, all waiting for processing, one by one. Magazine load guides 30a keep the magazines 20 aligned in the magazine load buffer 25a. The foremost position in the magazine load buffer 25a is the load buffer head position 45a. The magazines in the magazine load buffer 25a are pushed towards this by load holding means in the form of a load pusher 35a operated by a rodless cylinder 40a.

The frames are removed from the magazines 20 by a loader at load position 50. Magazines 20 are transferred from the load buffer head position 45a to the load position 50 by transfer means 60 having a clamp assembly 62 to clamp the magazines 20, moved to and fro on a rodless cylinder 70.

At load position 50 a load elevator (not shown) moves upwards and pushes the lead frames upwards from inside the magazine to a pick-up buffer position (above the magazine - out of the paper, as one views Fig 5).

With a full magazine at the load position 50, a load elevator (not shown) moves from its home (lowered) position, to the bottom of the stack of frames in the magazine. It then begins to lift them through the hollow part of the magazine above the magazine in a pick-up buffer. One by one the frames are taken from the pick-up buffer and put on the belt. As the processed frames are removed from the pick-up buffer, the load elevator indexes upwards to allow the next one to be removed. Once all the frames have been removed from the buffer, the load elevator moves downward and back to its home position.

Once the stack of lead frames has been so removed from the magazine 20, magazine transfer means 60 transfers the empty magazine from the load position 50 to a queuing position 80. It waits there until an unload position 90 of unloading station 10b is free. At that point the magazine transfer means 60 transfers the empty magazine to the unload position 90.

Unloading station 10b has a magazine unload buffer 25b, which can hold a stack of magazines 20 containing processed lead frames. In this case they are held in the buffer waiting to be removed. Magazine unload guides 30b keep the magazines 20 aligned in the magazine unload buffer 25b. Magazines enter this magazine unload buffer 25b at the other end from the end at which they enter the magazine load buffer 25a. That is they enter the magazine unload buffer 25b at the unload buffer tail position 45b. The magazines in the magazine unload buffer 25b are kept together by unload holding means in the form of an unload pusher 35b operated by a rodless cylinder 40b.

With an empty magazine at the unload position 90, the unload elevator (not shown) moves from its home (lowered) position, through the hollow part of the magazine and to an extended position to receive the processed lead frames that have been solder plated and cleaned into a put-down buffer. As the processed frames are dismounted from the carrier belt and transferred to the put-down buffer, the unload elevator indexes downwards as each processed frame is added onto it. Once all the frames have been tallied with the number of frames loaded at unit 10a, the unload elevator moves downward and places the processed frames into the same magazine that the frames were removed from at the beginning of the process. The unload elevator continues to move to its home position before the magazine (with the processed frames) is transferred over to the magazine buffer of the unloading unit 10b.

The method by which processed lead frames are removed from the carrier belt into a put-down buffer is described later with reference to Fig.s 6a - 6i. An unload elevator of the unloader lowers the processed frames from the put-down buffer into the empty magazine 20 waiting at unload position 90. This is the same magazine 20 from which those frames were removed before processing.

Once a waiting magazine 20 has been refilled, the magazine transfer means 60 transfers it along to unload buffer tail position 45b. Refilled magazines 20 can be removed from the magazine unload buffer 25b either singly, severally or all together.

Fig.s 6a to 6i show a frame unloading process, by which frames 100 are unloaded from the carrier belt 102 into the put-down buffer 104 of the unloader in the station 10b.

As shown in Figure 6a, a belt 102 carries a processed frame 100, gripped on the belt 102 by a spring leg 106. Spaced on one side of the belt 102 is a belt support plate 108. Spaced on the other side is a belt opener 110. Below the belt opener 110, spaced on one side of the processed frame 100, is a frame support plate 112. Spaced on the other side of the processed frame 100 is an unloading arm 114 with a frame clamp finger 116.

During the process of dismounting processed frames 100 from the belt 102, unloading arm 114 and frame support plate 112 move into contact with and clamp the frame 100. A recess in the unloading arm 114 allows protruding portions of the frame 100 to be accommodated, whilst the level portions of the frame are in contact with its front surface. The belt opener 110 rotates to push the spring leg 106 away from the belt 102, thereby releasing the frame 100. The frame does not drop, because it is supported by the unloading arm 114 and frame support plate 112. At the same time, the frame clamp finger 116 rotates to clamp the lower edge of the frame 100 against the front surface of the unloading arm 114. In this way when the frame support plate 112 is no longer clamping the frame 100, as shown in Fig.6d, the frame 100 does not fall away from the unloading arm 114. Further in Fig. 6d the belt opener 110 is still in the rotated position, which allows the frame 100 to be moved horizontally away.

Figs. 6e to 6i show a continuation of the unloading process, by which the processed frames 100, removed from the belt 102, are loaded into the put-down buffer 104. These figures no longer show the belt 102 and various support plates, etc. but show the put-down buffer 104 and portions of the unload elevator.

In Fig. 6e the unloading arm 114 and processed frame 100 have the same orientation as in Fig.6d and are situated above the put-down buffer 104 into which unloaded processed frames 100 are stacked horizontally. Within the put-down buffer 104, the frames 100 are stacked on top of a take-over fork 118, which controls their vertical position. The top of the top frame in the stack is just below the top of the put-down buffer 104. The horizontal positions of the unloaded processed frame 100 are determined by the edge of the top magazine 104 and a frame padder 120.

The unloading arm 114 and lead frame 100 are rotated through 90° about a pivot point 122. The unloading arm 114 then moves vertically downwards to the top of the put-down buffer 104. At the same time, the frame padder 120 moves horizontally away to avoid interfering with the frame clamp finger 116. The frame clamp finger 116 then rotates to allow the frame

100 to drop onto the stack of previously unloaded frames. Then, as shown in Fig. 6i, the unloading arm 114 is rotated back through 90° to the position that it occupies in Fig. 6a. At the same time, the frame padder 120 is also moved back to the position it occupied in Fig. 6e, if necessary pushing the end of the latest added frame 100 to maintain a regular stack. As the processed frames are dismounted from the carrier belt and transferred into the put-down buffer 104, the take-over fork 118 indexes downwards as each processed frame is added onto it.

Once the put-down buffer 104 is full or all the frames of a magazine have been returned to it, the unload elevator is lowered through the magazine 20 in the unload position below until the ends of the lowermost processed lead frame in the stack come to rest on protruding portions in the ends of the magazine 20, thereby supporting the whole stack.

Although the loading process at the loader of the loading station 10a is not shown, it can be achieved through the reversal of the processes shown in Figs 6a - 6i with suitable modifications.

Fig. 7a shows an operation flow chart of the handling station. The individual steps are listed in the table of Fig. 7b.

S100 represents the start of the handling process. At S102 an operator places one or more full magazines into the load buffer 25a of load station 10a. The system then determines at S104 whether the loader is empty, i.e. if the pick-up buffer has any frames left in it for loading onto the belt. If it is not empty, the system waits until it is. Otherwise at S106 the magazine transfer assembly 60 transfers a magazine 20 from the load buffer head position 45a to the load position 50. Although not shown in this flow chart, this is followed by activation of the load holding means in the form of the load pusher 35a operated by the rodless cylinder 40a, to push the remaining magazines up the stack.

Once a magazine has been transferred to the load position 50, S108 initiates a load elevator of the loader to pass up through that magazine 20 to lift the lead frames into the pick-up buffer. The system determines when the load elevator is extended above the magazine 20, at S110. Until then S111 continues this motion, ensuring that the elevator continues to extend.

Once the load elevator has reached its extended position above the magazine (i.e. it is out of the way), the lead frames are transferred to the pick-up buffer and the magazine is transferred to the queuing position 80, S112, where it waits until the unloader is determined to be ready for it, S114. At that stage it is transferred to the unload position 90, S116.

A dotted line is shown in Fig. 7a, passing from step S110, once the elevator is above the magazine, to step S116. This is an alternative operation, whereby, instead of queuing, the magazine passes straight from the load position 50 to the unload position 90.

Once the magazine has been transferred to the unload position 90 in S116, the unload elevator lowers the stack of processed frames from the put-down buffer 104 down into the magazine, S118. The system determines when the stack of frames has been fully unloaded into the magazine, S120, and continues the lowering of the unload elevator until then, S121.

Once the complete unloading has been affirmed, step S122 is activated and the unload elevator returns to its home position. Finally step S124 is activated and the magazine containing the processed lead frames is transferred over to the unload buffer tail position 45b of magazine unload buffer 25b. This requires that any magazine previously in that position is removed further up the stack, which requires activation of the unload holding means in the form of the unload pusher 35b operated by the rodless cylinder 40b.

The preferred embodiment includes counting or otherwise keeping track of the numbers of frames taken from a magazine and returned to it. Thus the magazine at the unload position 90 will not be deemed to be refilled until the same number have been replaced in it as were removed. This could be achieved through using a stack height sensor to compare before and after stack heights or a photo-sensor to count the number of gaps in each stack (the photo-sensor would be the preferred of these two options, as the plating process would alter the total stack heights), or by other known means. By additionally having bar codes or other electronically readable information on the magazines which indicate the number of frames within them, it is possible to determine if all have been removed or returned, which can be useful in detecting problems or in trouble-shooting.

By using the process and apparatus of the present invention, there is a reduced risk of mis-identification with a resultant drop in errors and wastage. A further advantage is that different frames can be processed in batches one after the other, even if the frames are

different sizes and shapes. There would be no chance of putting the wrong frames in the wrong magazines or mixing them up, even if they look identical to the human eye.

A typical carrier belt usually has a capacity of 50 - 150 lead frames. Typically a single magazine might hold 50 - 200 such lead frames. In such instances where the belt capacity is higher than the magazine capacity, no form of pick-up buffer or put-down buffer is necessary, although the queue of one or magazines between the load position 50 and unload position 90 would be. On the other hand, where the magazine capacity is higher than the belt capacity, at least one of the pick-up buffer and put-down buffer is necessary. It depends on the sizes of those buffers and of the magazine and belt capacities. Thus the apparatus can be provided with neither, one or both pick-up buffer and put-down buffer and the invention can work using neither, one or both pick-up buffer and put-down buffer, with the possibility of buffers not being used even when present. The buffers could be used to improve the ease of design or maintenance or other practicalities of the apparatus, with nothing to do with relative capacities. The present invention allows the queuing position 80 to be ignored if there is no magazine at the unload position 90. It could also do without the queuing position altogether. Empty magazines would simply wait at the load position until the unload position is free. The preferred embodiment has both pick-up buffer and put-down buffer, as well as a queuing position 80, to cover all possibilities.

The described embodiment assumes the pick-up buffer can accommodate all the frames from a magazine in one transfer. This does not have to be the case. It may be that a first number of frames would have to be mounted onto the belt before the magazine can move off. Or it may be that it requires multiple movement cycles of the load elevator. Likewise the contents of the put-down buffer may have to be unloaded into the magazine several times.

Fig. 5 shows the load buffer 25a and unload buffer 25b with a capacity of five magazines each. They can have different capacities from each other, although in that case the unload buffer should preferably not be the smaller. Further, it is not necessary for the invention for either the loading station 10a or unloading station 10b to have such buffers. However, it does make the apparatus more practical to use. Within each magazine buffer at any one time, the magazines will generally have the same dimensions. However, the magazine guides can be adjusted to allow use with different sized or shaped magazines.

Although the carrier has been embodied as a continuous belt, it does not need to be a belt. Nor, for that matter, does it need to be continuous.

While only one main embodiment of the present invention has been described and illustrated, it is to be understood that many changes, modifications and variations could be made to the present invention without departing from the scope of the invention. For instance, direction of movement of the carrier belt may be reversed and/or the process layout altered. Most particularly, whilst the present invention has been described with reference to a plating process, it clearly applies to any process in which frames are removed from a magazine, processed and put back in their magazines.



CLAIMS

1. Handling apparatus for a lead frame processing system which uses a carrier, the lead frames being loaded onto said carrier for processing and removed therefrom after processing, said apparatus comprising:
 - removing means for removing lead frames from a magazine at a load position of said apparatus, for loading onto said carrier;
 - placing means for placing processed lead frames unloaded from said carrier into a magazine at an unload position of said apparatus; and
 - magazine transfer means for transferring a magazine from said load position to said unload position.
2. Apparatus according to claim 1, wherein said magazine transfer means is operable to transfer a magazine away from said unload position.
3. Apparatus according to claim 2, wherein said magazine transfer means is operable to transfer a magazine from said unload position automatically, when the placing means has finished placing lead frames therein.
4. Apparatus according to any one of the preceding claims, wherein said magazine transfer means is operable to transfer a magazine from said load position toward said unload position automatically, when said removing means has finished removing lead frames therefrom.
5. Apparatus according to claim any one of the preceding claims, wherein said magazine transfer means is operable to transfer a magazine to said load position for removal of lead frames therefrom.
6. Apparatus according to claim 4 and 5, wherein said magazine transfer means is operable to transfer a second magazine automatically to said load position for removal of lead frames therefrom, when a first magazine is transferred from said load position toward said unload position.
7. Apparatus according to any one of the preceding claims, further comprising:
 - a queuing position between said load and unload positions; wherein



said magazine transfer means is operable to transfer a second magazine, removed from said load position, to said queuing position when a first magazine is still present at said unload position.

8. Apparatus according to any one of the preceding claims, further comprising:
a loading buffer for containing a plurality of magazines of lead frames in a plurality of sequential loading buffer positions; and wherein
said magazine transfer means is operable to provide magazines from said loading buffer sequentially to said load position.
9. Apparatus according to claim 8, further comprising:
load stack adjusting means for moving each magazine in said loading buffer to its next sequential loading buffer position, when a magazine is removed therefrom to said load position.
10. Apparatus according to any one of the preceding claims, further comprising:
an unloading buffer for containing a plurality of magazines of processed lead frames in a plurality of sequential unloading buffer positions; and wherein
said magazine transfer means is operable to transfer magazines from said unload position into said unloading buffer.
11. Apparatus according to claim 10, further comprising:
unload stack adjusting means for moving each magazine in said unloading buffer to its next sequential unloading buffer position, when a magazine is transferred therein by said magazine transfer means.
12. Apparatus according to any one of the preceding claims, further comprising:
loading means for loading frames, removed by said removing means from a magazine at said load position, onto said carrier; and
unloading means for unloading processed frames from said carrier, for placing into a magazine at said unload position by said placing means.
13. Apparatus according to any one of the preceding claims, arranged and operable such that the same lead frames removed from a magazine at said load



position, after processing, are replaced into the same magazine at the unload position.

14. Handling apparatus for a lead frame processing system constructed and arranged to operate substantially as hereinbefore described, with reference to and as illustrated in figures 4 to 7b of the accompanying drawings.
15. A lead frame processing system comprising:
handling apparatus according to any one of the preceding claims; and
said carrier for receiving lead frames from said loading means and for providing processed lead frames to said unloading means, and on which said lead frames are to be processed.
16. A system according to claim 15, being a system for in-line plating.
17. A system according to claim 16, being a system for solder plating lead frames for integrated circuit components.
18. A system according to any one of claims 15 to 17, further comprising stripping means for stripping solder from said carrier between the carrier leaving the unloading means and arriving at the loading means.
19. A lead frame processing system constructed and arranged to operate substantially as hereinbefore described, with reference to and as illustrated in figures 4 to 7b of the accompanying drawings.
20. A method of handling lead frames and lead frame magazines in a lead frame processing system which uses a carrier, the lead frames being loaded onto said carrier for processing and removed therefrom after processing, said method comprising the steps of:
removing lead frames from a magazine at a load position of said system, for loading onto said carrier;
transferring a magazine from said load position to an unload position of said system; and



placing processed lead frames unloaded from said carrier into a magazine at said unload position.

21. A method according to claim 20, wherein said transferring step is automatic after said removing step.
22. A method according to claim 20 or 21, further comprising the step of providing a magazine to said load position for said removing step.
23. A method according to claim 22, wherein said providing step automatically provides a second magazine to said load position after said transferring step transfers a first magazine away from the load position and the removing, transferring and placing steps are repeated for said second magazine.
24. A method according to any one of claims 20 to 23, further comprising the step of taking a magazine from the unload position.
25. A method according to claim 24, wherein said taking step is automatic after said placing step.
26. A method according to any one of claims 20 to 25, wherein said transferring step includes the step of holding a second magazine, removed from said load position, at a queuing position of said system when a first magazine is still present at said unload position.
27. A method according to claim 26 when dependent on at least claim 24, wherein said transferring step completes the transfer of said second magazine to said unload position after said first magazine is taken in said taking step.
28. A method according to claim 22 or any one of claims 23 to 27 when dependent on at least claim 22, wherein said system includes:
 - a loading buffer for containing a plurality of magazines of lead frames in a plurality of sequential loading buffer positions; and
 - said providing step provides magazines from said loading buffer sequentially to said load position.



29. A method according to claim 28, further comprising the step of:
moving each magazine in said loading buffer to its next sequential loading buffer position, after said providing step.
30. A method according to claim 24 or any one of claims 25 to 29 when dependent on at least claim 24, wherein said system includes:
an unloading buffer for containing a plurality of magazines of lead frames in a plurality of sequential unloading buffer positions; and
said taking step provides magazines from said unload position into said unloading buffer.
31. A method according to claim 30, further comprising the step of:
moving each magazine in said unloading buffer to its next sequential unloading buffer position with said taking step.
32. A method according to any one of claims 20 to 31, wherein the same lead frames removed by said removing step from a magazine at said load position, after processing, are replaced by said placing step into the same magazine at the unload position.
33. A method according to any one of claims 20 to 32, further comprising the steps of:
loading frames, removed by said removing step from a magazine at said load position, onto said carrier; and
unloading processed frames from said carrier, for placing into a magazine at said unload position by said placing step.
34. A method of handling lead frames and lead frame magazines substantially as hereinbefore described, with reference to and as illustrated in figures 4 to 7b of the accompanying drawings.
35. A lead frame processing method including the method of any one of claims 20 to 34.



36. A method according to claims 33 and 34, further comprising the step of stripping solder from said carrier between a portion of the carrier having a first frame removed therefrom by said unloading step and the same portion having a second frame loaded thereon in said loading step.
37. A method according to claim 34 or 35, further comprising the step of processing said lead frames between the removing and placing steps for those same frames.
38. A method according to claim 36, wherein said processing step comprises in-line plating.
39. A method according to claim 36, wherein said processing step comprises solder plating lead frames for integrated circuit components.
40. A lead frame processing method substantially as hereinbefore described, with reference to and as illustrated in figures 4 to 7b of the accompanying drawings.
41. A method of manufacturing an integrated circuit component, comprising the steps of:
processing a lead frame according to the method of any one of claims 35 to 40; and
further processing and combining the processed lead frame with other components.
42. A method of manufacturing electronic apparatus, comprising the steps of:
manufacturing an integrated circuit component according to the method of claim 41; and
installing the manufactured integrated circuit component and other components in a body of said electronic apparatus.