

Singulation system for flat workpieces

Description

The invention relates to a singulation system for flat workpieces.

In manufacturing machines, it is very often required to feed flat workpieces individually. As prefabricated workpieces are stacked and are put in temporary storage, it might become difficult to remove these workpieces individually from the stack. Adhering oils and fats may cause this, which were needed in the previous manufacturing process and remain on the workpieces and thus increase adhesion among the workpieces. However, it might be corrosion as well, which makes the flat workpieces stick together after a longer period of storage. Magnetic workpieces are likewise very difficult to remove individually from a stack. In particular with very thin flat workpieces, which are resting one on top of the other with their very plane surfaces, it might become difficult and time consuming to separate them from each other. If two or more workpieces are then introduced by accident into the processing machine, breaking of the tool is pre-programmed.

Therefore, it is the object of the invention to provide a singulation system for flat workpieces in remedying the above described disadvantages.

The problem is solved according to the features of patent claim 1.

In this case, the dependent claims represent further embodiments of the invention.

The inventive singulation system for singling out flat workpieces, which are stacked on top of each other, comprises a magazine for receiving the stacked flat workpieces, an abutment with a gap, and a pusher, which pushes the lowest workpiece of the stack through the gap. It is thereby ensured that each time only one workpiece is removed from the stack and fed to the following processing machine.

In a preferred embodiment, the magazine has magazine walls, which have a conical or slanted inclination towards the inner chamber of the magazine. Centring of unsorted stacked workpieces is thereby possible such that the workpieces are always output appropriately oriented to the processing machine.

Another improvement is achieved, if the magazine, the abutment, and the pusher are disposed at or on a baseplate. Thus a singulation system can be attached to an adjacent workbench or directly to a processing machine, and possibly incorporated into a complete production process.

In case of a batch change, it is advantageous if the magazine and the abutment are disposed at or on the baseplate and can be exchanged. Therefore, it is possible to utilize the singulation system for workpieces, which are differently formed and have different sizes.

Hereinafter, the invention will be explained in more detail based on the diagrammatically illustrated drawing, wherein:

Figure 1: shows a perspective illustration of a singulation system.

In Figure 1, a perspective view of a singulation system 1 is illustrated. A magazine 3, which receives the flat workpieces, is disposed on a baseplate 2. The singulation system 1 may be set up separately adjacently to a machine on a workbench; for this purpose the baseplate 2 is equipped with seating devices 13, which serve as feet. However, the singulation system 1 may be installed

securely to a machine, such that an attachment device, not illustrated in detail, in the shape of dovetail grooves or bores for machine screws, may be provided. In order to be able to align the singulation system 1, at least one lateral adjustment 5 is provided underneath the baseplate 2 which can be adjusted for example by a hand wheel 6 or semi-automatically, respectively fully automatically.

A full stack of flat workpieces is inserted into the magazine 3, wherein the magazine walls 4a to 4g may consist of closed walls 4a or of centring rods 4b to 4g, which have a conical or slanted inclination towards the inner chamber of the magazine 3, such that unprecisely stacked workpieces will be able to self-center towards the bottom of the magazine 3. It is furthermore possible to remove the entire magazine 3 from the baseplate 2, on the one hand to perform cleaning work, and on the other hand to install a larger magazine 3 or a magazine 3 having a different shape, for example for round workpieces. Feeding the magazine 3 is realized from the top, so no complicated devices are required for holding the stacked workpieces.

Spaced apart from the baseplate 2, an abutment 7 is disposed at the magazine 3, such that a gap 8, which is slightly larger than the width of an individual workpiece, is generated between the abutment 7 and the baseplate 2.

Either the abutment 7 together with the gap 8 can be disassembled or are adjustable such that the singulation system 1 can be adjusted to different thicknesses of flat workpieces. The abutment 7 together with the gap 8 and the magazine 3 are configured to be able to be dismountable and, according to the workpieces to be processed, may be exchanged quickly. A pusher 9, which may be manually actuated or driven, can travel over at least a partial area of the bottom of the magazine 3. In this embodiment, the pusher 9 is actuated by a drive 10, which may be configured for example as a pneumatic cylinder. The drive 10 may be disposed at the magazine 3 on the opposite side of the gap 8, or depending on the available space, underneath the baseplate 2. The thickness of the pusher 9 is configured such as to be slightly thinner than the thickness of the workpieces wherein the height of the pusher is guided, in order to avoid jamming in the gap 8.

The gap is approximately 50% higher than the thickness of the workpieces such that the workpieces, which have become non-flat or crowned on account of the stacking, the stocking and the handling, will likewise pass through the gap 8 without getting stuck.

In this embodiment, the singulation system 1 serves to feed blanks to a hydraulic press. The blanks may be configured

as thinly cut sheet metal, which are greased with highly viscous lubricant, which will later on facilitate the forming process of the blank. For the purpose of temporary stocking, these blanks are stacked in a way that approximately 100 pieces are stacked on top of each other. On account of the applied lubricant, it becomes very difficult and time-consuming to remove individual blanks from the stack. The stack with the blanks is introduced into the magazine 3 and is aligned towards the bottom of the magazine 3 by the centring of the inclined magazine walls 4a to 4g. In this case, the lowest blank may partially rest on the pusher 9. A signal will displace the pusher 9 by means of the drive 10 completely into the starting position thereof such that the blanks slide onto the bottom of the magazine 3. By further displacing the pusher 9 into the processing position, the lowest blank is pushed underneath the stack through the gap 8 and out of the magazine 3. On account of the abutment 7, the blanks located above remain in the magazine 3. In this case, the pusher 9 pushes the blank as far out of the magazine 3 that the blank reaches the catching surface 11 and the movement of the blank is stopped at the edge 12. Now, the blank is singled out and the operator of the machine can remove the blank manually or it may be automatically fed to the manufacturing process by the machine. The pusher 9 is again displaced into the starting position thereof such that

the next workpiece is able to slide onto the bottom of the magazine.

This process can be realized manually, semi-automatically or fully automatically and coupled to the processing machine.

List of reference numerals

1	singulation system
2	baseplate
3	magazine
4a to 4g	magazine walls
5	lateral adjustment
6	hand wheel
7	abutment
8	gap
9	pusher
10	drive
11	catch surface
12	edge
13	seating device

Patent claims

1. A singulation system (1) for singling out flat workpieces stacked on top of each other, comprising a magazine (3) for receiving the stacked flat workpieces, an abutment (7) with a gap (8), and a pusher (9), which pushes the lowest workpiece in the stack through the gap (8).
2. The singulation system according to claim 1, **characterized in that** the magazine (3) has magazine walls (4a to 4g), which have a conical or slanted inclination towards the inner chamber of the magazine (3).
3. The singulation system according to claim 1, **characterized in that** the magazine (3), the abutment (7), and the pusher (9) are disposed at or on a baseplate (2).
4. The singulation system according to claim 3, **characterized in that** the magazine (3) and the abutment (7) are disposed at or on the baseplate (2) in an exchangeable manner.

5. The singulation system according to claim 1,
characterized in that the pusher (9) is guided on
the baseplate (2).
6. The singulation system according to claim 5,
characterized in that the pusher (9) is guided in
parallel with regard to the baseplate (2).
7. The singulation system according to claim 3,
characterized in that the gap (8) is disposed
between the abutment (7) and the baseplate (2).
8. The singulation system according to claim 1,
characterized in that the singulation system (1)
has a catch surface (11).
9. The singulation system according to claim 8,
characterized in that the catch surface (11) is
disposed at the baseplate (2).
10. The singulation system according to claim 8,
characterized in that the catch surface (11) has
an edge (12).

11. The singulation system according to one of the preceding claims, **characterized in that** the pusher (9) has a drive.
12. The singulation system according to one of the preceding claims, **characterized in that** the singulation system (1) is operated manually or semi-automatically or fully automatically.