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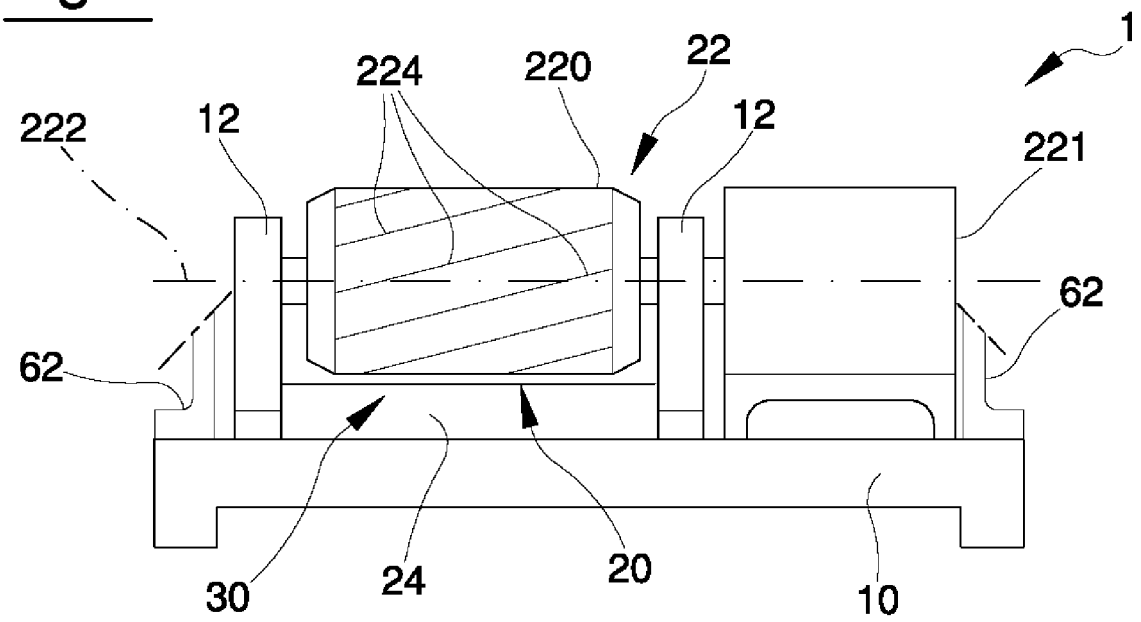
(54) **Machine tool**

(57) A method and a machine tool (1) for treating packaging material (M) so as to facilitate disposal operations thereof; the material (M) comprising tape (N) of the elastic type; said method presenting a first phase of reducing said tape (N) into slices (T) substantially identical to each another in a cutting station (20) through a shortening unit (22); a phase of feeding each slice (T) to a discharge station (40).

Fig. 1




EP 2 119 506 A1

## Description

**[0001]** The present invention relates to a machine tool comprising a cutting unit. In particular, the present invention relates to a machine tool comprising a cutting unit designed for treating packaging material of a given type. In more detail, the present invention relates to a machine tool comprising a cutting unit designed for treating packaging material of a given type, which can be validly used in the disposal chain of this material.

## BACKGROUND TO THE INVENTION

**[0002]** In the packaging activities, which represent a significant part of the box production sectors, in the paper mills and in the warehouses of companies in the logistic sector, it is well known to use tapes or elastic bands, whose end edges are connected to each other in a permanent manner in order to close the packages in a loop-like, stable manner, performing a containment function. These tapes can be produced in various materials, and it is apparent that each of these materials requires a particular method for connecting the respective edges and making the connection permanent.

**[0003]** Recently, the above described tapes have been mainly produced using plastics, typically PET or polypropylene, which are increasingly substituting for the use of metal, due to the high costs of this latter. Just for the sake of completeness of the information, the PET tapes are characterised by the green colour, whilst the polypropylene tapes are generally black or white. PET and polypropylene are elastic materials; therefore the tapes used for packaging tend to assume a rectilinear configuration if there is no load acting on them, once they have been cut in order to allow accessing the content of the package. In the case of tapes made of the above mentioned plastics, "strap" is the term generally used to identify the particular type of packaging product; this term may be therefore used hereunder to synthesise form and characteristic of this product.

**[0004]** The particular elasticity of the material of the strap, which remains intact at room temperature, makes the selective collection thereof for disposal difficult. Usually, the collection of the strap is performed by winding it into a skein, as it is usually made with textile or electrical material, and subsequently by twisting the end of this strap around the set of the turns, so as to obtain an hour-glass-shape. This operation requires a long time and, in any case, each skein presents a final bulk which greatly exceeds the calculated volume of the individual strap; consequently, the containers, sacks or boxes, used for disposal of the strap, present a really low filling degree. Naturally, this entails that these containers full of strap wound in skeins globally present a very low specific weight. Maximising the exploitation of each unit of space available inside the transport means is a problem also in the sector of disposal of inorganic waste, such as the packaging strap, and, inexplicably, the above described solution is the most widely used methodology for reducing the volume of the strap used as packaging product; it is therefore clearly apparent that this problem is currently unsolved, and the solution thereto is therefore necessarily improvable. Therefore, this problem represents an interesting challenge for the applicant, in order to minimise the economic impact of using the strap.

**[0005]** In view of the situation described above, it would be desirable to have available a method and possibly a machine to implement it, which, in addition to enabling to limit and possibly to overcome the typical drawbacks of the prior art illustrated above, define a new standard for the packaging strap and other similar materials.

## SUMMARY OF THE PRESENT INVENTION

**[0006]** The present invention relates to a machine tool comprising a cutting unit. In particular, the present invention relates to a machine tool comprising a cutting unit designed for treating packaging material of a given type.

**[0007]** In more detail, the present invention relates to a machine tool comprising a cutting unit designed for treating packaging material of a given type, which can be validly used for disposal of this material.

**[0008]** A scope of the present invention is to provide a machine tool which can be used to reduce the volume occupied by the packaging strap once it has been used as containment member, in order to allow the disadvantages described above to be solved, which is suitable to satisfy a plurality of requirements that to date have still not been addressed and, therefore, suitable to represent a new and original source of economic interest and capable of modifying the current market of the equipment for the disposal of packaging strap.

**[0009]** According to the present invention, a machine tool is provided, whose main characteristics will be described in at least one of the appended claims.

**[0010]** A scope of the present invention is to provide a method for treating packaging material, in particular tape in an elastic material, tending to assume a rectilinear configuration if there is no load acting on it, similarly to the so called packaging strap.

**[0011]** According to the present invention, a method is provide for treating packaging material, said packaging material comprising tape in elastic material tending to assume a rectilinear configuration if there is no load acting on it, similarly to the packaging strap, and suitable to reduce the volume occupied by such product once it has been used as containment member in the packaging sector.

## BRIEF DESCRIPTION OF DRAWINGS

**[0012]** Further characteristics and advantages of the machine tool according to the present invention will be more apparent from the description below, set forth with reference to the accompanying drawings, which illustrate a non-limiting example of embodiment, in which identical

or corresponding parts of the device are identified by the same reference numbers. In particular:

- figure 1 is a front elevation schematic view in of a first preferred embodiment of a machine tool which can be produced to implement the method according to the present invention, with some parts removed for the sake of clarity;
- figure 2 is a schematic plan view of figure 1, with parts in cross-section and parts removed for the sake of clarity;
- figure 3 is a side elevation view of figure 1 with some parts removed for the sake of clarity;
- figure 4 is a side elevation view of a variant of a first detail illustrated in figure 3;
- figure 5 is a side elevation view of a variant of a second detail illustrated in figure 3;
- figure 6 shows a second preferred embodiment of figure 2, with some parts removed for the sake of clarity;
- figure 7 is a side elevation view of a third preferred embodiment of figure 1, with some parts removed for the sake of clarity; and
- figure 8 is a plan view of a fourth preferred embodiment of figure 1, with some parts removed for the sake of clarity.

DETAILED DESCRIPTION OF THE PRESENT INVENTION

**[0013]** In figure 1, number 1 indicates, in its entirety, a machine tool validly usable to implement a method for treating packaging material M, indicated in figure 2, of substantially elastic nature, similarly to packaging strap. This machine toll 1 comprises a tape N, indicated in figure 2, so as to facilitate operations of disposal thereof.

**[0014]** The machine tool 1 comprises a frame 10 provided with an operating station 20 for cutting a given material M. This operating station 20 is arranged between a feeding station 30 and a discharge station 40 for discharging the cut material M. The machine 1 further comprises a cutting device 22, arranged in the operating station 20, for step cutting the tape N / material M in such a way so as to produce slices T, indicated in figure 2, of substantially rectangular dimensions, one length of which substantially approximates the measure of the width of the tape N, or at least a respective order of magnitude. With particular reference to figures 2 and 3, the cutting device 22 comprises a shortening unit 22, suitable to cut in a stepped manner the tape N so as to obtain the slices T. It is easily understood that this conformation of the slices T greatly simplifies the problem of disposal of the material M.

**[0015]** Again with particular reference to figures 2 and 3, the shortening unit 22 comprises a cut plane 24, carried integral by the frame 10, and a cutting member 220, carried by the frame 10 in a freely rotatable manner around an axis 222 of rotation, which is oriented perpendicularly to the given direction D above the cut plane 24. The machine tool 1 illustrated in figures 1 to 5 presents the axis 222 horizontally oriented. The cutting member 220 can validly comprise a cylindrical milling cutter 220, actuated by a rotary engine 221, and therefore presents a plurality of peripheral cutting edges 224 arranged in a uniform stepped manner. It should be noted that, in order to cut the tape N, the axis 222 of rotation must be spaced from the plane 24 by a length which is slightly less than a thickness of the tape N. Only in this way it is possible transversally to cut the tape N, thus reducing it into slices T of substantially equal length. Therefore, if it is deemed appropriate, the frame 10 of the machine tool 1 can provide for the use of supports 12 adjustable in height relative to the cut plane 24, which is also a reference plane. Figure 5 shows a simplified example of the way in which a support 12 may be produced, for example using a screw device 80 for fine adjustment.

**[0016]** Furthermore, it should be noted that, in order to make the penetration of the cutting edge 224 inside the tape N gradual, it is advantageous that the cutter 220 presents the respective cutting edges inclined by and angle · relative to the axis 222 / to the given direction D. In this way, the cut of the tape N can start from a respective side longitudinal portion in the operating station 20. In view of the above description, this angle · of inclination of the cutting edges 224 shall advantageously present a width comprised between 0° and 30°. In particular, the applicant verified that the optimum angle of the cutting edges 224 of the cutter 220 shall approximate 30 20°.

**[0017]** In view of the above description, the cutter 220 can be interpreted as a gripping or dragging member 220, shaped so as to feed tape N to the operating station 20 along a given direction D. In fact, each cutting edge 224 is substantially transverse to the tape N; this allows each cutting edge 224 to bend the tape N towards the cut plane 24, progressively to engrave the tape N transversally after having brought the tape N into contact with the plane 24, to feed the tape N during the gradual progress of the engraving until the final separation of a slice T from the tape N. From now on, each cutting edge 224 acts as a feeding member, which feeds the slice T towards the discharge station 40 along the given direction D and subsequently eject it towards the outside. It should be noted that an adequate choice of the number of the cutting edges 224 of the cutter 220 allows to use it as a gripping and dragging member, and it allows therefore to drive the tape N whilst the cut of the tape N is in progress, to produce the slices T. Naturally, an effective choice of the cutter 220 must be made based upon the principle according to which each cutting edge 224 inserted into the tape N shall be spaced from the previous cutting edge at least by a minimum value proportional to the thickness of the tape N and of the radius of the cutter 220, notwithstanding the value of the rotation speed of the cutter 220. In view of the above description, the number of teeth shall be comprised between 12 and 30, so as to avoid chipping the tape N into too fine pieces.

The applicant verified that the optimum number of cutting edges may be about 12 cutting edges.

**[0018]** With reference to figures 2 and 3, is should be noted that the machine tool 1 further comprises a conveying member 26, which is arranged transversally to the axis 222 of rotation in the feeding station 30 facing the cutter 220 of the shortening unit 22, in order to channel the given tape N towards the cutting edges 224 according to the given direction D. In particular, this conveying member 26, shown only partially in figure 2, presents an entrance mouth 260 designed so as to be engaged transversally by the tape N, as it is better shown in figure 7, and is delimited by a feeding mouth 262 of the convergent type, arranged at the side of the cutter 220. For the sake of practicality, this conveying member 26 can be actuated by means of a curved duct with rectangular section and with width compatible with the width of the tape N to be cut. This curved duct of the conveying member 26 is represented in section view in figures 3 and 4.

**[0019]** In view of the above description, it is clearly apparent that the machine tool 1 can be validly used to implement the method described above. In particular, this method comprises a first phase of reducing the tape N into slices T substantially identical to each another in the operating cutting station 20 through the shortening unit 22; a phase of feeding each slice T to the discharge station 40.

**[0020]** In view of the above description, the first phase of reducing the tape N into slices T is preceded by a phase of feeding a free end portion P of the tape N towards the operating station 20 along the given direction D, followed by a phase of dragging the tape N in the operating station 20 through the gripping unit 22, designed so as to interact with a respective face SF of the free portion P through the respective cutter 220, suitable to perform gripping and dragging actions. In particular, the phase of feeding each slice T to the discharge station 40 comprises a phase of engraving progressively the tape N transversally starting from this face SF, and then gripping the tape N, and a phase of feeding the tape N until the final separation of a slice T from the tape N, and then a phase of dragging and cutting, once the tape N has been brought below the cutter 220 on the cut plane 24.

**[0021]** At this point, the phase of feeding each slice T to the discharge station 40 is improved by a phase of projecting the slice T to the discharge station 40 and by a phase of collecting the slices T in a container 50, better shown in figures 3 and 4, inside which they are guided by a protective case 62 for protecting the shortening unit 22, better shown in figures 3 and 4. This shield 62 presents a discharge mouth 52, facing the container 50, and it has the purpose of acting as guide and control member for the slices T just cut, so as to guide them in an orderly way towards the container 50 through the mouth 52. The container 50 can comprise a collector, which can be obtained, respectively or in combination, through a sack 54, as shown in figure 3, or a box-shaped member 56, as shown in figure 4. It should be noted that figures 2-3 schematically show the support 51 for the sack 54 and figure 4 shows the variant for the support of the box 56, illustrated through a respective rectangular perimeter.

**[0022]** Lastly, it is clearly apparent that modifications and/or variants can be made to the machine tool 1 described and illustrated herein, and therefore to the method which can be implemented by means of this machine tool, without however departing from the protective scope of the present invention.

**[0023]** For example, with reference to figure 6, a second embodiment of the machine tool 1 is illustrated, which differs from the machine tool 1 of figures 1 to 5 in that the shortening unit 22 is developed vertically instead of horizontally. This allows to arrange the support 51 completely at the side of the protective shield 62, thus facilitating the placement of the machine tool 1 in the plant. It should be noted that identical parts or parts functionally identical to that of figures 1 to 5 are indicated in figure 6 with the same reference numbers previously used.

**[0024]** According to a further embodiment, shown in figure 7, the machine tool 1 can comprise a control unit 70 arranged between the feeding station 30 and the operating station 20. This control unit 70 is carried by the conveying member 26 and is designed so as to interact with the tape N, which, in use, is fed to the shortening unit 22, and in particular to the cutter 220 rigidly connected to the rotary engine 221, in order to condition the operation thereof. In this regard, the control unit 70 comprises an electronic control station 80, electronically connected to the rotary engine 221 so as to commutate the cutter 220 from an idle condition and a movement condition, based upon at least one information value regarding the characteristics of the tape N detected by the control unit 70. In particular, the control unit 70 comprises a proximity sensor 72, arranged between the feeding station 30 and the operating station 20, through which it is possible to inform the control station 80 about the local presence / absence of the tape N. For the sake of simplicity, the proximity sensor 72 illustrated in figure 7 is of the mechanical type, provided with a tracer suitable to interact with the tape N, but it can be of the electronic type or of any other nature, without affecting the effectiveness or the scope of the present invention. The control unit 70 further comprises a colour sensor 74, arranged close to the proximity sensor 72, opposite in figure 7 relative to the mouth 260 of the conveying member 26. This colour sensor 74 can be used to inform the control station 80 about the colour of the tape N and thus the composition of the slices T which can be fed to the discharge station 40 because, according to what has been described above, the PET tapes are usually green and the polypropylene tapes are black or white. Alternatively, the colour sensor can be validly replaced with a transparency sensor 73, comprising a photoelectric sensor 73.

**[0025]** The use of the colour sensor 74 or of a transparency sensor 73, adequately set, allows to condition

the operation of the rotary engine 221, so as to determine it only by feeding the tape N of given colour, so as to feed to the corresponding container 50 these slices T of homogeneous composition. The operation of the engine 221 is therefore conditioned by a consent signal which can be given by the control station 80 exclusively if two situations contemporaneously occur: the presence of tape N fed between the feeding station 30 and the operating station 20 and the colour of the tape identical to that set in correspondence of this localisation.

**[0026]** The lack of a standard law which imposes the use of strap produced in a given plastic material for given types of packaging makes it difficult to produce slices T in an homogeneous material through the use of a single machine tool as the one described above, and imposes the frequent replacement of the container 50 when passing from the green colour to the white or black colour. This operating requirement greatly affects the performance of the activities for recycling the waste material, with the result that the disposal of the strap in slices T of homogeneous composition could be considered not much economical. Therefore, the applicant planned to modify the structure of the machine tool 1 in such a way so as to place a plurality of mutually distinct feeding stations 30 side by side along the axis 222, and to make a discharge station 40 to correspond to each of these feeding stations 30, as schematically shown in figure 8. Consequently, this choice requires that the machine tool 1 of figure 8 presents a plurality of cutting members 220 flanking each other, so as to allow a corresponding plurality of tapes N of given composition to be cut and to allow slices T of homogeneous material to be fed into a container 50 among a plurality of containers 50 flanking each other. It should be noted that this cutting operation could be performed contemporaneously, thanks to the particular construction design of the cutter 220.

**[0027]** In view of the above description, it is easily understood that each version of the machine tool 1 illustrated above allows the disadvantages described above to be solved, and is suitable to satisfy a plurality of requirements that to date have still not been addressed. The machine tool 1 is therefore suitable to represent a new and original source of economic interest thanks to the particular simplicity of its structure and outfit. It is therefore apparent that an equipment such as the machine tool 1 is capable of modifying the current sector of disposal of packaging material and, in particular, of implementing an easy method to confine the packaging strap and similar web material to minimum volumes.

## Claims

1. Method for treating packaging material (M), so as to facilitate disposal operations thereof, said method being **characterised in that** said material (M) comprises tape (N) of the elastic type tending to assume a rectilinear configuration if there is no load acting on it, similarly to the packaging strap; said method presenting a first phase of reducing said tape (N) into slices (T) substantially identical to each another in a cutting station (20) through a shortening unit (22); a phase of eliminating each said slice (T) at a discharge station (40) through actuating means (221).

2. A method according to claim 1, **characterised in that** said first phase of reducing said tape (N) into slices (T) is preceded by a phase of feeding an end free portion (P) of said tape (N) towards said cutting station (20) along a given direction (D) of feed; a phase of dragging said tape (N) in said cutting station (20) through gripping means (220) designed so as to interact with a respective face (SF) of said free portion (P).

3. A method according to claim 1 or 2, **characterised in that** each said slice (T) presents a substantially rectangular conformation, with a length which presents a measure of the same order of magnitude as a width of said tape (N).

4. A method according to claim 1, or 2, or 3, **characterised in that** said phase of feeding each said slice (T) to said discharge station (40) comprises a phase of engraving progressively said tape (N) transversally starting from said face (SF) through at least one cutting member (224), a phase of definitively separating a said slice (T) from said tape (N) by means of said cutting member (224) followed by a phase of projecting said slice (T) to said discharge station (40).

5. A method according to claim 4, **characterised in that** said phase of projecting said slice (T) is followed by a phase of collecting each said slice (T) inside a container (50) through guiding means (60).

6. A method according to any one of claims 2 to 5, **characterised in that** said container (50) comprises, alternatively or in combination, a sack member (54) or a box-shaped member (56) and **in that** the guiding means (60) comprise a protective shield (62) for protecting said shortening unit (22).

7. A method according to any one of claims 2 to 6, **characterised in that** said phase of dragging said tape (N) in said cutting station (20) is preceded and conditioned by a phase of evaluating said tape (N) through sensing means (70) arranged upstream from the cutting station (20) according to the given direction (D) of feed, in such a way that said slices (T), to be fed to said discharge station (40), are of homogeneous nature.

8. A method according to claim 7, **characterised in**

**that** said phase of evaluating said tape (N) comprises a phase of analysing chromatically said tape (N), which can be performed through at least one colour sensor (74).

**9.** A method according to claim 7, **characterised in that** said phase of evaluating said tape (N) comprises a phase of analysing said tape (N) through at least one transparency sensor (73).

**10.** A method according to claim 9, **characterised in that** said transparency sensor (73) comprises a photoelectric sensor (73).

**11.** A method according to claim 9 or 10, **characterised in that** said phase of evaluating said tape (N) is simultaneous with a phase of detecting a presence of said tape (N) upstream from said cutting station (20) through at least one proximity sensor (72).

**12.** Machine tool (1) comprising a frame (10) provided with an operating station (20) for cutting a given material (M); said operating station (20) being arranged between a feeding station (30) and a discharge station (40) for discharging said cut material (M); dragging means (220) being provided to feed said material (M) to said operating station (20) along a given direction (D); cutting means (22) being arranged in said operating station (20) to perform the stepped cut of said given material (M) is such a way as to produce slices (T) of given dimensions; **characterised in that** said material (M) presents a substantially elastic nature, similarly to the packaging strap, and is shaped in the shape of a tape (N); the cutting means (22) comprising a shortening unit (22) suitable to cut said tape (N) in a stepped manner so as to produce substantially rectangular slices (T), each of which presenting a width substantially identical to that of said tape (N), so as to facilitate disposal operations of said material (M).

**13.** A machine tool according to claim 12, **characterised in that** said shortening unit (22) comprises a cut plane (24) integral with said frame (10) and at least one cutting member (220) carried by said frame (10) in a freely rotatable manner around an axis (222) of rotation perpendicular to said given direction (D) above said cut plane (24) and provided with at least one cutting edge (224); rotary actuating means (221) being connected to said cutting member (220) so as to cause a motion of rotation around said axis (222); said cutting edge (224) and said plane (24) being spaced from each other by an adjustable length so as to be slightly less than a thickness of said tape (N), in order transversally to cut said tape (N).

**14.** A machine tool according to claim 13, **characterised in that** each said cutting member (220) comprises a cutter (220) presenting a plurality of peripheral cutting edges (224) arranged in a uniform stepped manner; the dragging means (220) comprising said cutter (220); each said cutting edge (224) being substantially transverse to said tape (N) so as to bend said tape (N) towards said cut plane (24), progressively to engrave said tape (N) transversally, to feed said tape (N) during engraving until the final separation of a said slice (T) from said tape (N); to project said slice (T) to said discharge station (40) along said given direction (D).

**15.** A machine tool according to any one of claim 12 to 14, **characterised by** comprising control means (70) arranged between said feeding station (30) and said operating station (20) so as to interact with said tape (N) and said actuating means (221) in such a way as to condition the operation thereof.

**16.** A machine tool according to claim 15, **characterised in that** said control means (70) comprise an electronic control station (80) electronically connected to said actuating means (221) to commutate said actuating means (221) from an idle position to a motion position based upon an information value detected by said control means (70).

**17.** A machine tool according to claim 16, **characterised in that** said control means (70) comprise at least one proximity sensor (72) arranged between said feeding station (30) and said operating station (20) in order to inform said control station (80) about the local presence/absence of said tape (N).

**18.** A machine tool according to claim 16 or 17, **characterised in that** said control means (70) comprise at least one colour sensor (74), which can be used to inform said control station (80) about the nature of said slices (T) which can be fed to said discharge station (40) and to allow the operation of said actuating means (221) only by feeding tape (N) of given colour, so as to obtain said slices (T) of homogeneous composition.

**19.** A machine according to claim 17 or 18, **characterised by** comprising a plurality of cutting members (220) arranged flanking each other so as to allow cutting of a corresponding plurality of said tapes (N) of given composition and collecting slices (T) of homogeneous material.

**20.** A machine tool according to claim 18 or 19, **characterised in that** each said cutting edge (224) is inclined by an angle (·) of a width comprised between 0° and 30° relative to said given direction (D) in said feeding station (30) so as to cut gradually said tape (N) starting from a respective side longitudinal portion.

**21.** A machine tool according to claim 20, **characterised in that** said angle (·) presents a width approximating 20°.

**22.** A machine tool according to claim 20 or 21, **characterised in that** said cutter (220) presents a number of said cutting edges (224) comprised between 12 and 30, so as to combine an action of gripping and dragging said tape (N) and an action of feeding said slices (T) towards said discharge station (40) along said given direction (D).

**23.** A machine tool according to claim 22, **characterised in that** said cutter (220) presents approximatively 12 of said cutting edges (224).

**24.** A machine tool according to any one of claims 12 to 23, **characterised by** comprising a conveying member (26) arranged transversally to said axis (222) of rotation in said feeding station (30) facing said shortening unit (22) in order to channel said given tape (N) towards the cutting edges (224) according to said given direction (D).

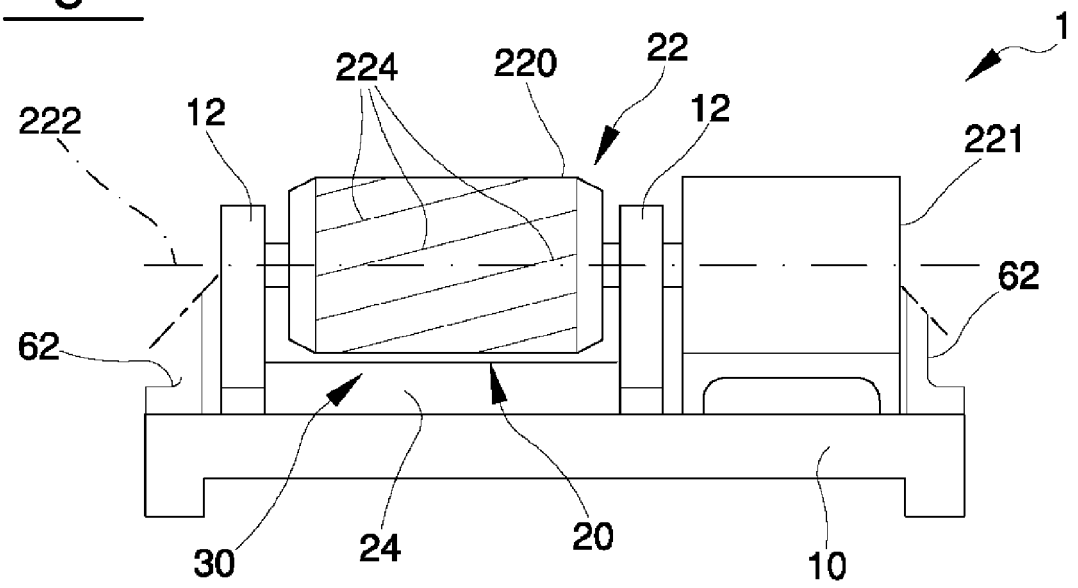
**25.** A machine tool according to claim 24, **characterised in that** said conveying member (26) comprises a curved duct (26) and presents an entrance mouth (260) designed for said tape (N) and delimited by a feeding mouth (262) of the convergent type facing said cutter (220).

**26.** A machine tool according to any one of claims 12 to 24, **characterised in that** said discharge station (40) is provided with a support (42) for a container (50) for each cutting member (220); each said container (50) comprising, alternatively or in combination, a sack member (54) or a box-shaped member (56) and **in that** the guiding means (60) comprise a protective shield (62) for protecting said shortening unit (22) suitable to channel said slices (T) towards said container (50).

**27.** A machine tool according to any one of claims 12 to 26, **characterised in that** said axis (222) is substantially horizontal.

**28.** A machine tool according to any one of claims 12 to 27, **characterised in that** said axis (222) is substantially vertical.

Fig. 1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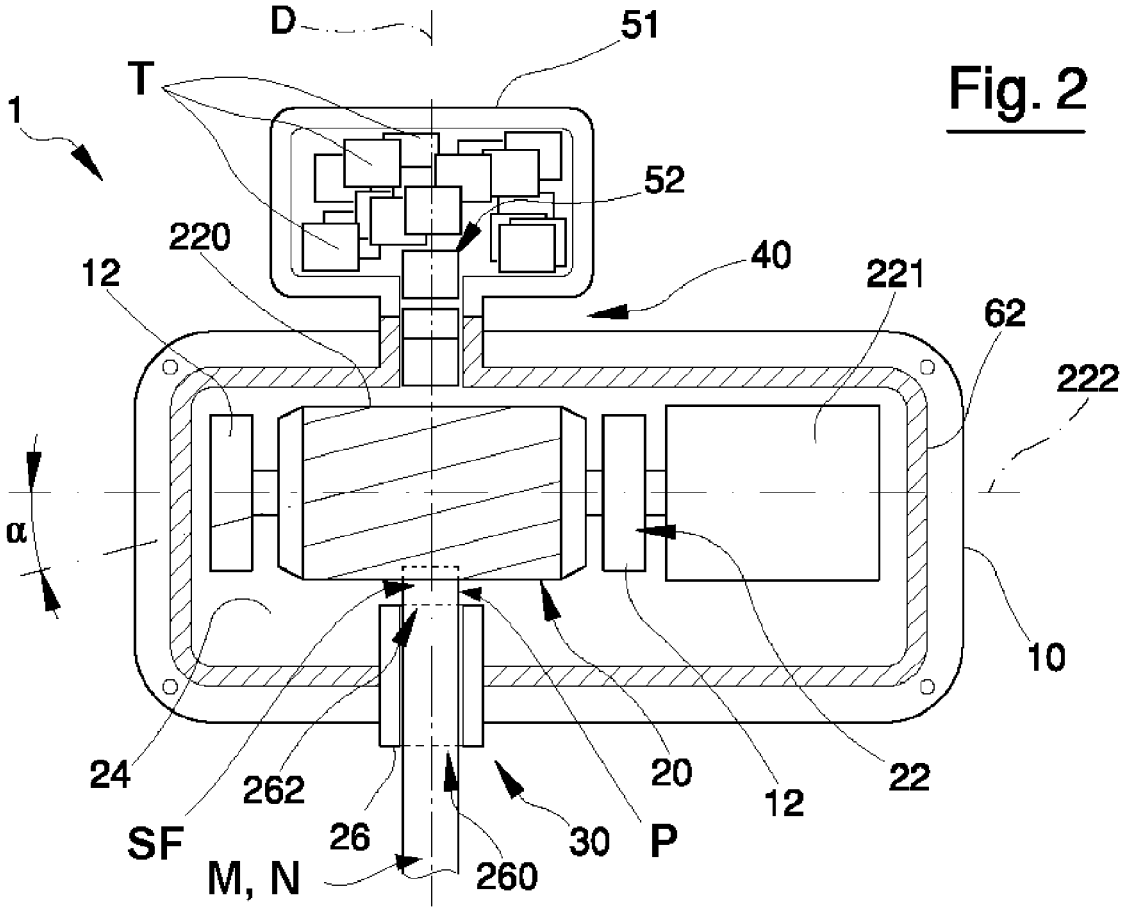
10

Fig. 2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52
220
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Fig. 3

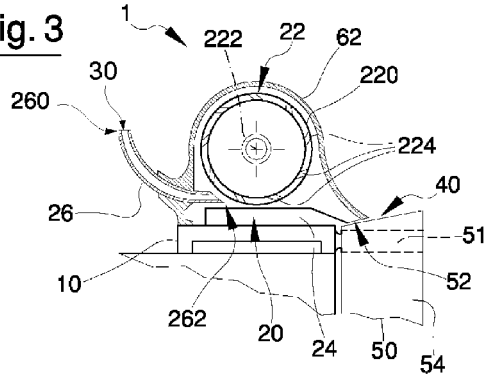
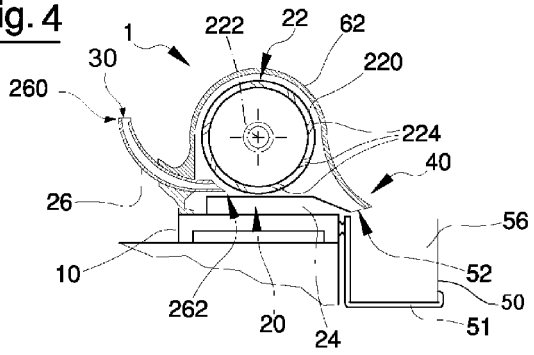



Fig. 4



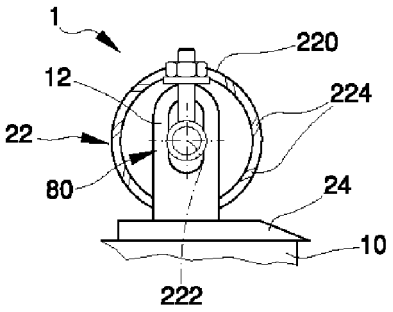




Fig. 5

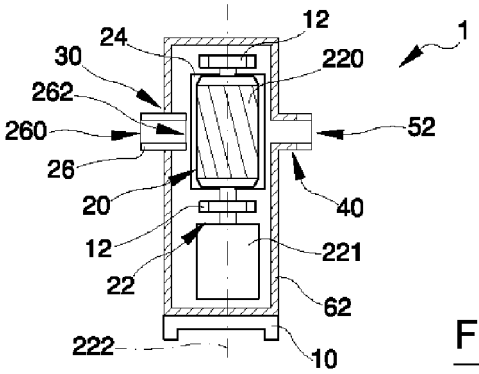
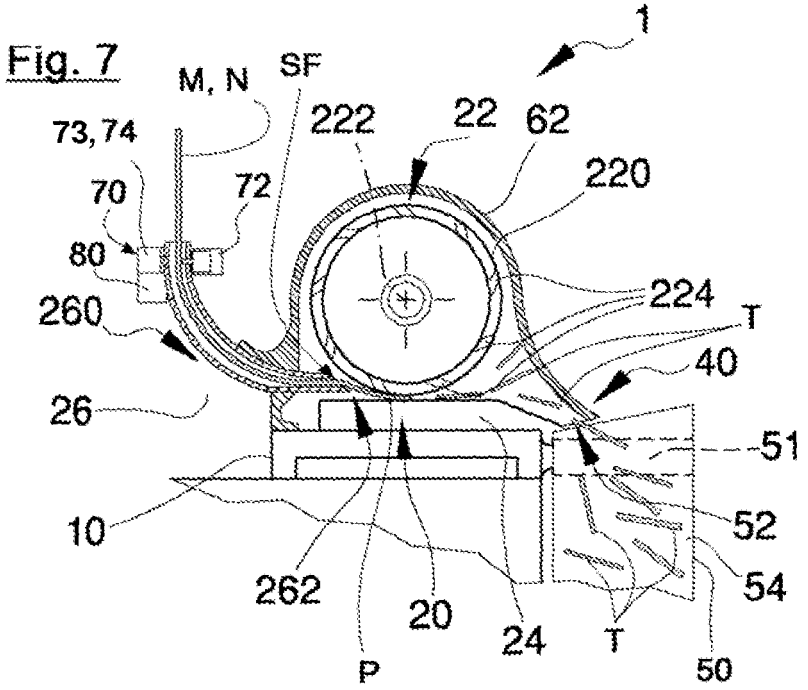



Fig. 6

Fig. 7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222
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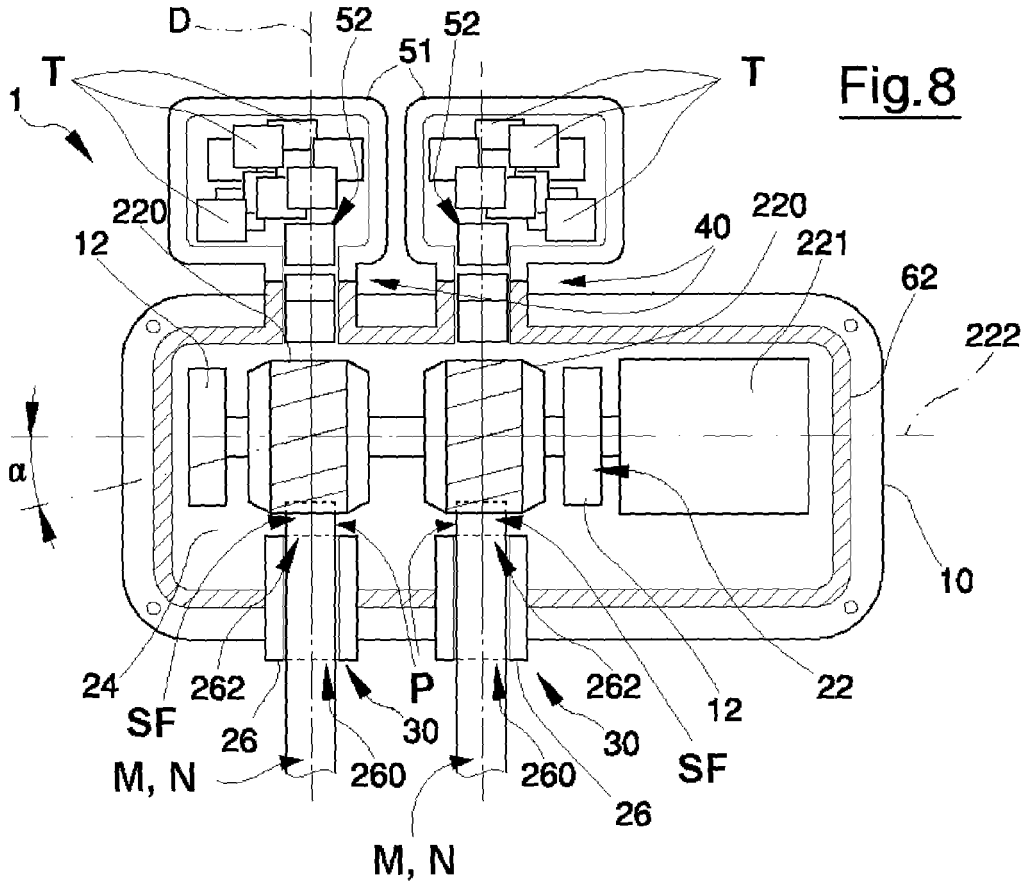
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Fig.8

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# EUROPEAN SEARCH REPORT

Application Number
EP 09 15 5410

## DOCUMENTS CONSIDERED TO BE RELEVANT

| Category | Citation of document with indication, where appropriate, of relevant passages | Relevant to claim | CLASSIFICATION OF THE APPLICATION (IPC) |
|---|---|---|---|
| X<br>Y | US 2006/266859 A1 (ROBERTS STEVEN L [US]) 30 November 2006 (2006-11-30)<br>* paragraphs [0002], [0003], [0022]; figure 1 *<br>----- | 1,12<br>2-6, 13-17, 20-28 | INV. B02C18/14 |
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The present search report has been drawn up for all claims

| Place of search | Date of completion of the search | Examiner |
|---|---|---|
| Munich | 31 August 2009 | Kopacz, Ireneusz |

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