

Separating device for a component

The invention relates to a separating device for at least one
5 component, located in a housing part open on one side, partially
over a housing part opening, in particular a tape reel in a
housing part, comprising a gripping device for the component.

For the reprocessing of cassettes of any type or the recycling of
10 cassettes, it is necessary to separate at least one tape or film
reel from at least one housing part in order either to insert a
new tape or film reel or to separate the plastic material of the
housing from that of the tape or film material in order to carry
out separate recycling.

15 European Laid-Open Application 554 785 discloses for the reuse of
used magnetic tape cassettes opening the cassette housing and
removing the tape reels by punching out or milling out the
cassette housing around the tape reels and punching out the
20 winding hubs. This does not include separating housing material,
reel material and tape material, so material separation still has
to be carried out subsequently for recycling appropriate for the
various materials.

25 German Laid-Open Application DOS 4 137 568 also discloses in the
case of ink ribbon cartridges that after their destruction the
ink ribbon remaining in the lower part of the cartridge is sucked
out by means of an air stream and is passed on for separate
recycling. Such suction removal of the tape is not technically
30 viable for magnetic tape cassettes, in the case of which several
hundred meters of tape are wound up, for reasons of time and
instances of large volumes of tape.

It is therefore an object of the present invention to provide a
35 separating device for components from housing parts, in
particular tape or film reels, in which a cost-effective
separation of the materials of the housing part and of the tape
reels takes place.

40 We have found that this object is achieved according to the
invention with a separating device of the type described at the
beginning if the separating device includes an ejecting device
which comes up against the component through the housing opening
and moves it into the region of the gripping device, which
45 separates the component from the housing part.

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This achieves quick separation of reels and housing part and specifically directed transport of the reels can be achieved by means of the gripping device.

- 5 It is practical for a cover to be arranged on the gripping device behind the component in the direction of the ejecting movement of the ejecting device. As a result, a reliable gripping operation is ensured and the tape reel cannot be pushed away.
- 10 The separating device is expediently provided with a detector device for the state of the component. As a result, for example in the case of tape reels, it can be established specifically and at an early time whether the tape reel is empty or still contains tape, and also which type of tape or film is concerned. As a
15 result, separating of the reels with and without tape is possible.

It is advantageous to use a sensing device, in particular a light sensing device, as the detector device.

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In practice, this sensing device may be provided directly on the gripping device. The relative spatial setup is easily achieved as a result.

- 25 Furthermore, the gripping device may be in connection with a movement-controlling means and the sensing signals from the sensing device may be fed to the movement-controlling means and determine the further transport of the component.
- 30 This has the effect that a separating means can be used to separate different types of components from one another.

Exemplary embodiments of the invention are described below and are represented in the drawing, in which:

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Figure 1 shows a separating device according to the invention in plan view

- Figure 2 shows the separating device from Figure 1 in side view,
40 according to arrows A-A'.

The lower housing part 5 of a video cassette is conveyed along a transporting path (rods 6) in the direction of the arrows T. The lower part 5 contains two tape reels lying next to each other,
45 the left-hand reel 7 with magnetic tape, the right-hand reel 8 without magnetic tape, at most with transparent leader tape.

When the reels 7 and 8 arrive at the separating device, the following instantaneous state exists:

The lower part 5 is clamped by stop 10 and clamping means 11 (and 5 possibly also 12) in a defined position, in which the lower part openings 13 are located centrally over the ejecting devices 14 (in Figure 2 14A in the state of rest, 14B in the operating state).

10 In the position of the gripper on the right, the grippers 15 are located over each reel 7 and 8, the upper covers being designed as metal plates 16A and B.

If the pistons of the ejecting devices 14 are triggered, each 15 reel 7, 8 is pushed into the gripper 15, and the jaws of the same close laterally around and over the reel 7, 8, cf. the gripper 15' in the closed position.

The reels 7 and 8 are located, as can be seen in Figure 2, (reel 20 8') above the lower part 5 in the gripper 15.

In this position, the sensing means 17 comes into action, said means preferably being a reflection light sensor on each gripper 15 (model WT5-Pl12 of the company Sick GmbH, Waldkirch) which is 25 respectively directed radially at the hub 18 of the nearest reel 8.

If there is no magnetic tape or only the transparent leader tape present, the hub 18 appears light (since the reel hubs in video 30 cassettes are for the most part identified as "light" since they are white or transparent). If there is even only one turn of magnetic tape present, the hub 18 appears dark. The light sensor thus receives reflection signals of different intensity and generates corresponding different sensing signals, which can be 35 used for controlling the further transport of the reels 7, 8.

Apart from this magnetic tape yes or no decision, it is also possible, for example, with a suitably sensitive light sensor to distinguish between tape colors, such as for example iron oxide 40 tape (brown), chromium dioxide tape (black), metal coated tape (metallic), and on this basis to control corresponding transporting and separating steps by characteristic sensing signals.

45 In the Example presented, after the gripping and drawing back of the ejecting devices 14A and 14B, the reel 7 detected here, with magnetic tape, is controlled in such a way, by means of a

corresponding 90° rotation of the gripper 15 and a further 90° rotation in the direction of the arrow M, that, after opening of the gripper 15, the reel 7 drops into the container C, which is able to be covered, for example by means of a swivel mechanism S, or which may also be a conveyor belt to a magnetic tape reel collecting point, which conveyor belt may also be capable of being switched over to another conveyor belt by means of the swivel mechanism S.

- 10 In the example, the right-hand reel 8 is without tape and the gripper 15 has already been swiveled along the arrow OM into the position 15' by means of the sensing signal of the light sensor 17, so that a container D or conveyor belt for reels without magnetic tape is ready to receive it. In the converse case in
15 which tape is present on the reel 8, the reel 7 can be conveyed into the container D for empty reels and the full reel 8 can be conveyed into the container C for it. It is also possible (if such a case occurs) for two empty reels or two full reels to be conveyed into the respective containers C or D.

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- After removal and separation of the reels 7 and 8, the lower part 5 is transported further and the small parts still on it, for example the braking means 19 shown, are removed. Thereafter, the lower part can itself be fed itself [sic] to a collecting
25 container by means of correspondingly suitable gripping means or the like. (Although not shown, the devices described above for the reels can also be used correspondingly for this.)

- The individual devices described above may include the following
30 suitable driving means or mechanisms:

The ejecting devices 14 are operated by means of pneumatic or hydraulic cylinder units P.

- 35 The grippers 15 include an operating mechanism and drive unit, denoted by 20. It is also possible to use an industrial robot, which essentially comprises a manipulator (the actual robot) and a control unit, it being possible for the latter to be supplied by a personal computer with the program of movements.

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The positioning and clamping means 11 is likewise operated by means of a pneumatic or hydraulic cylinder unit P. The swivel mechanisms S may include a swivel drive.

- 45 All the means may be controlled with respect to the sequence in space and time of the reel separating operation by a central or else coupled individual control means CO, indicated in Figure 2

and connected to the operating and drive units W of the grippers 15. This control means CO may expediently include a microprocessor which determines the program of movements of the control means.

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The following modifications of the configuration of the separating device described above are also possible.

Gripper 15

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It is possible in principle to use a 3-finger outer gripper for the upper reel support, if there is one, or an inner gripper for flangeless hubs, for the seizing and/or lifting out of the reels.

- 15 If the reels have upper flanges without openings, a suction gripping means may also be used for the seizing and/or lifting out of the reels.

- Parallel to the covering plates 16A, B, the grippers 15 may have
20 lower attachments for engaging under the lower reel flange, if there is one, so that the jaws partially have a U-shape.

Ejecting devices 14

- 25 The pistons are expediently designed with an arbor 21, which engages in the central opening of the reels 7, 8, and a holding plate 22 arranged thereunder.

Sensing device 17

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It is possible in principle to use instead of a normal light sensor an infrared (IR) light sensor.

- The separating device described above was tested and produced the
35 following favorable results, the few wrong decisions being tolerable.

- Reels 7, 8 of different diameter (from empty to full) were fed to the gripper 15. The reaction of the sensor 17 was correct with
40 very few exceptions. The only error which occurred was that of an empty reel being identified as full, and not the converse case. An empty reel with a black tape clip was always declared full if the clip pointed in the direction of the sensor 17. The wrong decision was also made in the case of an empty, red reel, on
45 account of the relatively dark color, whereas an empty yellow reel with a large hub diameter was correctly identified. Black tape clips and colored reels are relatively rare, however. The

case in which half a turn of magnetic tape on the side opposite the sensor causes errors cannot occur on account of the position of the sensor and the winding direction of the tape. The transparent leader tape did not cause any problems for the
5 identification process.

Use of the separating device according to the invention in an automatic magnetic tape or film cassette disassembly installation is very advantageous and it contributes to cost-effective use
10 thereof, in particular for recycling installations.

A separating device for at least one component of a housing part includes a gripping device, an ejecting means and, if necessary, a sensing device for identifying the component. The separating
15 device is expediently able to be used for installations for disassembling cassettes for audio, video, data and film applications.

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We claim:

1. A separating device for at least one component (7, 8),
5 located in a housing part (5) open on one side, partially
over a housing opening (13), in particular a tape reel,
comprising a gripping device (15) for the component, wherein
the separating device includes an ejecting device (14), which
comes up against the component through the housing opening
10 (13) and moves it into the region of the gripping device
(15), which separates the component (7, 8) from the housing
part (5).
2. The separating device as claimed in claim 1, wherein a cover
15 (16A, B) is arranged on the gripping device (15) behind the
component (7, 8) in the direction of the ejecting movement of
the ejecting device (14).
3. The separating device as claimed in claim 1 or 2, wherein a
20 detector device (17) for the state of the component (7, 8) is
provided.
4. A separating device for at least one tape reel from a housing
part, as claimed in claim 1 and one or more of claims 2 and
25 3, wherein the state as to whether a full or empty tape reel
(7, 8) is present is established by means of a sensing device
(17) as the detector device.
5. The separating device as claimed in claims 1 and 4, wherein
30 the sensing device (17) is provided on the gripping device
(15).
6. The separating device as claimed in claim 5, wherein the
35 gripping device (15) is in connection with a
movement-controlling means (CO) and the sensing signals from
the sensing device (17) are fed to the movement-controlling
means (CO) and determine the further transport of the
component (7, 8).

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