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(54) Method and device in the handling of recycling packages, such as bottles and cans.

(57) Method and device in the handling of recycling packages, such as bottles and cans. A recycling package (P) is introduced into the receiving space (A) of the device (10) and is transferred by means of a conveyor device (16) into an identification position and, after the identification, based on the identification, the recycling package is transferred to a plastic-bottle crusher device (D_2) or to a can crusher device (D_1). The press drum (D_1') of the can crusher device is rotated by means of a motor (M_1), and the press drums (D_2',D_2'') of the plastic-bottle crusher device (D_2) are also rotated by means of the corresponding motor drive (M_1).

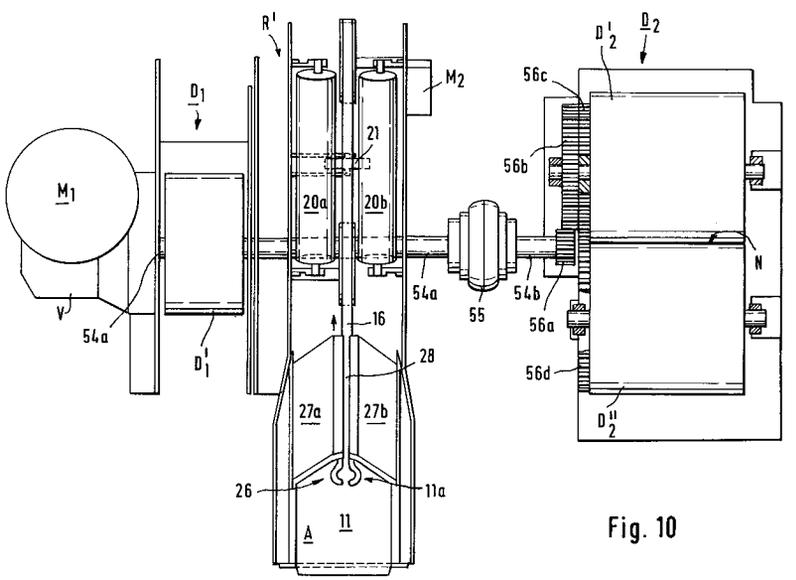

Fig. 10

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The invention concerns a method and a device in the handling of recycling packages, such as bottles and cans.

In the prior art, return automats are known, in which the recycling bottle or can is passed into connection with a scanning reader device, which reads the code label placed on the face of the product and, on its basis, identifies the product and transfers said product to further processing/rejection. The prior-art solutions of equipment have, however, not permitted a versatile acceptance of recycling packages. As a rule, the solutions of equipment have been designed for one recycling product only, such as recycling cans or recycling plastic bottles.

In the present patent application, a novel method and a novel solution of equipment are suggested, wherein the above problem related to the type of recycling package has been solved. In the construction of equipment in accordance with the invention, both recycling cans and recycling bottles are received. The recycling cans are passed to a crusher device of their own, preferably a press, which presses the can into smaller volume. In a corresponding way, the plastic bottles are passed to a crusher device of their own, which presses the plastic bottles into smaller volume. The recycling packages that have been brought into smaller volume are transferred further into gathering storage.

In the solution of equipment in accordance with the invention, the return automat that receives recycling packages, preferably plastic bottles and cans, comprises a frame construction and, in connection with its front panel, a receiving opening, into which the recycling package, such as a bottle or a can, is placed. The receiving space comprises an oblique inclined bottom, onto which the recycling package is placed and on which bottom, being guided by said inclined bottom, the recycling package is positioned against the end wall of the space by the force of gravity.

In the solution of equipment in accordance with the invention, the bottom part is linked so as to pivot on hinge means and, if the weight of the recycling package exceeds a certain maximum weight, a limit switch is switched on. In such a case, the device does not transfer the recycling package further. In this way, the processing of full packages is eliminated. A photocell detects a recycling package in the lifting position. Moreover, a light curtain is placed at the mouth of the receiving space A. When the light curtain does not detect an object, such as the hand of the person who is returning the package, in the receiving space A and when the press switch connected with the bottom part of the space A is not in the closed position, the recycling package is transferred upwards by means of a tray part passing through an opening in the bottom plate. The tray part is fixed to a belt, and the belt is passed over three belt pulleys. By moving the belt, the recycling package is shifted onto two rollers placed side by side, which are rotated so as to read the bar code.

After the central unit has identified the recycling package either as an aluminum can or as a plastic bottle, the receipt or the sum of money corresponding to the identification data is delivered to the returning person, and the recycling package is transferred away from the rollers onto the troughs passing to the plastic-bottle press or to the can press. If the package is not identified, it is passed to rejection. In such a case, the recycling package is brought back to the vicinity of the front panel of the device into the reject opening, from which the returning person can pick up the rejected package. When a plastic bottle is concerned, the package is shifted to the side off the rollers and through the trough to the plastic-bottle processing device, preferably a crusher device, between whose roll wheels the recycling package is flattened into smaller volume.

If the central unit has identified the recycling package as an aluminium can, on the basis of the bar code that has been read, the can is shifted forwards by operating the belt as parallel to the longitudinal axes of the rollers out of connection with the upper ends of the rollers and further into a discharge trough and through it to the can press device, which presses the can into smaller volume.

Thus, the equipment in accordance with the invention comprises a separate press for recycling cans and a separate press for plastic bottles. The equipment comprises one motor, which is fitted to operate both the press drum of the can crusher and the press drums of the plastic-bottle crusher. Thus, two crusher units are operated by means of one motor drive.

The method in accordance with the invention is mainly characterized in that, in the method, the press drum of the can crusher device is rotated by means of a motor, and that the press drums of the plastic-bottle crusher device are also rotated by means of the corresponding motor drive.

The solution of equipment in accordance with the invention is mainly characterized in that the equipment comprises a motor and a motor output, from which both the crusher device for cans and the crusher device for plastic bottles are operated.

The invention will be described in the following with reference to some preferred embodiments of the invention illustrated in the figures in the accompanying drawings, the invention being, however, not supposed to be confined to said embodiments alone.

Figure 1A is an illustration of a solution of equipment in accordance with the invention viewed

from the direction of the front panel.

Figure 1B illustrates the basic constructions of the device in accordance with the invention.

Figure 1C illustrates the movability of the slide frame R' in relation to the base frame R.

Figure 1D is a sectional view taken along the line I-I in Fig. 1C.

Figure 1E is an illustration of principle of a crusher provided for cans.

Figure 1F is an illustration of principle of a crusher for plastic bottles.

Figure 2 is an axonometric illustration of the slide frame and of the related means for the transfer of the package.

Figure 3A is an axonometric illustration of the construction of the space for receiving the recycling packages in the device in accordance with the invention.

Figure 3B is a sectional view taken along the line II-II in Fig. 3A. What is shown is how the recycling package is placed on the bottom part of the receiving space, after which the tray fixed to the belt lifts the package in the direction L_1.

Figure 3C shows the passage of the tray part fixed to the belt through the gap between the end walls of the receiving space through the brush construction fitted in the space between said end walls.

Figure 4A illustrates the transfer of the package onto the rollers.

Figure 4B illustrates the rotation of the package.

Figure 4C is an illustration in the direction K_1 in Fig. 4B.

Figure 4D shows the removal of the recycling package after the rotation, either directly forwards (arrow L_3) being shifted by the conveyor, or to the side (arrow L_2) as diverted by a pivotal wall.

Figure 5 is an illustration in the direction K_2 in Fig. 2. What is shown is an arrangement of equipment for removal of the recycling package off the revolving rollers to one side of the rollers.

Figure 6 shows a solenoid mechanism related to shifting of the side wall in Fig. 5.

Figure 7 shows a sorting arrangement related to rejection of a package.

Figure 8A shows a lifting member fixed to the belt, viewed from above.

Figure 8B is a sectional view taken along the line III-III in Fig. 8A.

Figure 9 i a sectional view taken along the plane IV-IV in Fig. 2.

Figure 10 shows the arrangement of joint operation of a can crusher and a plastic-bottle crusher seen in the direction of the arrow K_3 in Fig. 2, i.e. from above.

Fig. 1A is an axonometric illustration of an equipment in accordance with the invention, viewed from outside. The equipment 10 is suitable for receiving of both recycling plastic bottles and recycling cans, preferably aluminium cans, and also glass bottles. The equipment 10 comprises a receiving space A for the recycling packages, which space A is opened from the plane of the surface of the front panel E of the device into the interior of the device. The front panel Q can be pivoted to the open position on hinge means G_1,G_2.

Besides the receiving space A, the front panel Q also comprises a reject space T, through which a non-accepted recycling package - a can or a plastic bottle or a glass bottle - can be removed. After all the recycling packages have been fed into the device, the receipt knob U_1 is depressed. From the receipt opening U_2, a receipt for the recycled number of packages and/or the sum of money corresponding to said packages is/are received, the returned money coming from the money trough U_3. By pulling by the handles U_4, the storage containers S_1 and S_2 for the crushed packages can be pulled out for further transportation.

Fig. 1B illustrates the different parts of the device in accordance with the invention. The device comprises a crusher D_1 provided for cans, a storage container S_1, which is placed preferably in connection with the press underneath the press and into which the crushed cans, which have been pressed into smaller volume, are gathered. The equipment comprises a second crusher D_2, preferably a press, by whose means the plastic bottles are brought into smaller volume, the storage container S_2 for said crushed packages being placed underneath the crusher D_2.

The equipment comprises a slide frame R', which is mounted on the frame R displaceably and which comprises all substantial means necessary for the transfer of the package to the identification device H. Thus, the slide frame R' can be displaced into a forward position when the front panel E of the device is opened. Thus, for service operations, there is easy access to all essential parts of the device. The equipment further comprises a scanner H in a position above the slide frame R', the bar code being scanned by means of said scanner from the face of the product.

The slide frame comprises frame parts R'_a and R'_b, which define the transfer means in the space between them, such as a transfer member that is passed as a closed endless loop, preferably a conveyor belt or, for example, a chain. The transfer loop is passed over guide pulleys. Preferably, there are three guide pulleys and, thus, the transfer member comprises three runs, a first transfer-member run that runs as upwards inclined, a subsequent second, shorter transfer-member run which runs as slightly upwards inclined in relation to the horizontal plane, and a downwards running

third run.

The transfer conveyor 16 for the transfer of packages is passed as an endless conveyor loop 16' over guide pulleys, such as belt pulleys. The transfer conveyor 16 is preferably a conveyor belt, from which lifting members 19 project, whose function is to lift the recycling package from the bottom onto the rotated rollers, on which the bar code is read. Since the transfer member is a belt, the guide pulleys are belt pulleys, of which one belt pulley is driven by a motor M_2 so as to operate the conveyor belt. The conveyor belt can also be substituted for by a chain or a rope or by an equivalent arrangement of equipment. In such a case, the belt pulleys are substituted for by chain pulleys. However, it is essential that lifting members 19 project from the transfer member, by means of which lifting members the recycling package is lifted forwards.

Fig. 1C shows the slide frame R' of the device, which can be displaced in relation to the stationary base frame R of the device.

Fig. 1D is a sectional view taken along the line I-I in Fig. 1C. In the way shown in the figure, the slide frame R' is displaced in the direction X (Fig. 1A) in a guide formed between the plate parts E_1 and E_2 of the frame R. The flange part E_3, which has been bent to the side of the slide frame R', is guided between the plate parts E_1 and E_2.

Fig. 1E illustrates the principle of operation of the can crusher D_1. The crusher D_1 comprises a crusher drum D_1' and a back-up part F_1. When the drum D_1' is rotated, the dropped can P is shifted into the narrowing gap N between the back-up part F_1 and the crusher drum D_1' rotated by the motor M_1. The final result that is obtained is a flattened can which has been brought into smaller volume.

Fig. 1F illustrates the operation of the plastic-bottle crusher. The recycling bottle P is passed into the gap N_2 between the crusher drums D_2',D_2''. Both of the crusher drums D_2', D_2'' are rotated by means of the drive obtained from the same motor M_1. The final result is a flattened package, which is passed into the storage tank S_2.

Fig. 2 shows the device 10 in accordance with the invention, in whose slide frame R' the main parts of the device are placed. The device 10 for handling of recycling packages comprises a space A for receiving the packages, which space is defined by the bottom part 11 and by the side walls 12. In the area of the inlet opening of the receiving space A, there is a light curtain 13, which comprises a transmitter 13a, a mirror 13b, and a receiving detector 13c. A beam of light is emitted from the transmitter 13a to the mirror 13b, from which it is reflected to the receiving detector 13c. Thus, by means of the light curtain 13, it is detected if a hand or any other obstacle has been removed from the receiving space A and if the transfer of the package further can start. Further, the equipment comprises a bottom part 11 at the lower end 11a, onto which the bottle is transferred by the effect of gravity, a transmitter 14, and a receiver 15. They monitor if a recycling package P is placed in the transfer position on the end 11a of the bottom part 11.

In the way shown in Fig. 2, the equipment further comprises a conveyor band 16, which is fitted to be passed over three belt pulleys 17a, 17b and 17c, whereof the belt pulley 17a, its shaft, is rotated by means of the motor M_2 mounted on the frame R'. The belt pulleys 17a,17b and 17c are mounted to revolve on their shafts on bearing means (not shown) in relation to the slide frame R'.

The conveyor belt 16 comprises three trays 19 or lifting members, which are fitted to be placed against the bottom of the recycling package. By means of the lifting members, the recycling package is lifted upwards along an inclined path, and further onto the rollers 20a,20b. The rollers 20a,20b are rotated at the stage of identification of the bar code while the scanning signal sweeps across the face of the package P that is rotated by means of the rollers 20a,20b. The roller 20a comprises a drum motor in its interior, the roller being rotated by means of the drum motor. The rotation is transferred from the roller 20a to the roller 20b via a slave wheel 21, which is in engagement with the faces of both of the rollers 20a,20b. The shafts of the roller 20a are denoted with the reference numerals 22a,22b, and the shafts of the roller 20b are denoted with the reference numerals 23a,23b. The roller 20a is articulated by their shafts by bearing means (not shown) on the slide frame R'. In a corresponding way, the roller 20b is mounted on its shafts 23a,23b to revolve on bearing means (not shown) in relation to the frame R'. Correspondingly, the slave wheel 21 is mounted to revolve on its shaft on bearing means (not shown) on the frame R'.

At the proximity of the rollers 20a,20b, with their planes parallel to said rollers, there are the walls 24 and 25, which are linked so as to pivot on bearing means G_3,G_4, G_5,G_6. The walls 24,25 are pivoted by means of an actuator in order that it should be possible to carry out the sorting from the top of the rollers in the direction L_2 in the way shown in Fig. 2. A second function of the walls 24 and 25 is to act as guide walls so as to prevent falling off of the package at the scanning stage from the top of the rotated rollers 20a,20b.

Fig. 3A is an illustration of principle of the construction of the package receiving space A. The receiving space for a recycling package comprises side walls 12 as well as end walls 27a,27b. The bottom part 11, which defines the receiving space

A from below, comprises an opening 26, which corresponds to the shape of the lifting member or tray 19 fixed to the belt. In such a case, the lifting member 19 can be shifted through the opening 26 in the bottom part 11 into contact with the bottom face of the recycling package P.

Between the end walls 27a,27b, a gap 28 remains, in which brushes 29a,29b are fitted. The function of the brushes 29a,29b is to prevent a free contact with the belt run. However, the brushes 29a,29b permit a movement of the tray 19, through the gap 28 between the end walls 27a,27b, in the space A.

The end walls 27a,27b have been shaped so that only one recycling package at a time can be fitted in the space between said walls.

Fig. 3B is a sectional view taken along the line II-II in Fig. 3A. The recycling package P is placed into the receiving space A on the bottom part 11, which is placed as inclined in relation to the horizontal plane X, the package being placed against the end walls 27a,27b on the end area 11a of the bottom part by the effect of gravity. By means of a detector device, preferably a photocell receiver arrangement 14 or equivalent, the arrival of a package in the lifting position 11a is monitored. If the press switch 34 does not go into the closed position and if it is ascertained by means of the light curtain 13 that the space A is free, the package P can be lifted by means of the lifting member 19 fixed to the belt 16.

The turning of the bottom part 11 is denoted with the letter J_1. The flap part 30 of the bottom part 11 is provided with a spring 32. The bottom part 11 is linked to pivot on a hinge 31 or equivalent articulated joint means.

Fig. 3C is an axonometric illustration of the brushes 29a,29b in the space 28 between the walls 27a,27b. The lifting member 19 is fitted to be displaced vertically. The brush construction, being a security construction, however, prevents direct unintentional contact with the belt 16.

Fig. 4A illustrates the transfer of a package by means of the belt 16 and the related lifting member 19 onto the rollers 20a and 20b to the scanning position.

Fig. 4B shows a stage in which the rollers 20a and 20b are rotated in the directions indicated in the figure with the arrows, the package revolving in the sense of rotation indicated by the arrow L_4. At the stage concerned, the scanning beam is passed in the direction parallel to the side line of the package, and the bar code on the package is read. After this, based on the identification data, the central unit of the device carries out the sorting of the recycling package. The ends of the rollers 20a,20b at the inlet side are placed lower than the ends of the rollers 20a,20b at the outlet side. Thus, the rollers are placed in a position inclined from the horizontal plane.

Fig. 4C is an illustration viewed in the direction K_1 in Fig. 4B. The roller 20a comprises a drum motor. The slave wheel, preferably a friction wheel 21, is pressed by a force against the rollers 20a,20b. When the roller 20a is rotated, the other roller 20b is, thus, also rotated by means of the roll 21, and the sense of rotation at the roller 20b is also kept as desired. In the figure, the senses of rotation are indicated by arrows.

In the way shown in Fig. 4D, the recycling package is shifted either in the direction L_2, to the side as shown in the figure, in which case the wall 24 shifts a rejected package and also an accepted plastic bottle into the first path placed at the side of the device, preferably a trough 35. A rejected package is shifted, while the pivotal bottom 45 in the initial part of the trough 35 is in the open position, directly into the return path, preferably a return trough 46, and back to the customer. A plastic bottle is passed along the trough 35 to the crusher D_2. If a can is concerned, the can is passed forwards by operating the belt 16, being dropped near the belt pulley 17a into the second path, preferably a trough 36, which is placed near the belt pulley and through which the recycling package is transferred to the can crusher D_1.

Fig. 5 shows the walls 24 and 25 placed alongside the rollers 20a,20b, which walls form a protected space between them, in which space the recycling package can be rotated on the rollers 20a,20b. Thus, before the recycling package is shifted by means of the wall part 24 (arrow L_2) into the first trough 35 or on the belt, off the rollers, into the second trough 36 (arrow L_3), the bar code is read from the face of the rotated product. In the way shown in Fig. 5, the package P has been shifted onto the rollers 20a,20b by means of the thin belt 16 and the related lifting member 19 running in the space between the rollers. The wall 24 is coupled with a first actuator 37, and the second wall 25 is coupled with a second actuator 38. The actuators 37,38 are preferably solenoids, whose push arm 43 is displaced.

When a recycling package, such as a rejected can, is shifted in the direction L_2, the first wall 24 is pivoted in the direction L_2. Before that, the second wall 25 is shifted out of the way for the shifting of the wall 24, likewise in the direction L_2. Thus, when the wall 24 is pivoted and when the package is pushed by means of the wall 24 to the side (in the direction L_2), the second wall 25 does not stand in the way for the shifting.

Fig. 6 shows a construction related to the wall 24. The construction is also the same in the coupling between the actuator 38 and the wall 25. In its upper portion, the wall 24 comprises a square-

section bar 39, which is connected with a lever 39a. The intermediate lever 40 is connected by means of an articulated joint 41 with the lever 39a and by means of an articulated joint 42 with the push arm 43 of the actuator 37, preferably a solenoid. The square-section bar 39 is provided with a circular shaft 39b, which is mounted in a bearing G_n. The other end of the square-section bar 39 is also mounted in a similar way by means of a bearing G_n.

Fig. 7 shows the construction of the recycling trough placed at the side of the rollers 20a,20b. The recycling trough 35 passes a recycling package that has been dropped aside off the rollers 20a,20b to the plastic-bottle crusher D_2. Both rejected packages and identified plastic bottles are passed into the trough part 35. In the case of rejected packages, the bottom part 45 of the path, preferably the trough portion 35, is raised by means of an actuator 44 on hinge means G_{10}, and the bottom part is pivoted into a position (arrow L_5) in which the recycling package is dropped into the third path 46 placed underneath, preferably a trough, which passes the recycling package by the force of gravity back to the customer into the reject opening T. The pivotal bottom part 45 is provided with a coupling between the plate part and the solenoid similar to that illustrated in Fig. 6.

Fig. 8A shows the lifting member 19 as viewed from above. The construction comprises a grasping part 47, on which the recycling package is placed by its bottom. The grasping part 47 is connected with an arm 48, which is branched into a bracket 49a,49b, between which the spring 50 is fitted. Through the brackets 49a,49b, a shaft 51, preferably a cotter pin, is passed. The frame 53 is attached to the belt 16 by means of a collar 52a,52b. The collar 52a,52b is passed around the frame 53 and around the belt 16. When the belt is displaced upwards in the way indicated by the arrow L_1, the recycling package placed on the lifting member 19 is raised. If the process is congested, the grasping part 47 is bent down in the way indicated by the arrow S_1, and the package is dropped back onto the bottom part 11 to await new lifting. The spring 50 returns the grasping part 47 again to its original position.

Fig. 8B is a sectional view taken along the line III-III in Fig. 8A.

Fig. 9 is a sectional view taken along the plane IV-IV in Fig. 2. The belt 16 is passed over the belt pulleys 17a,17b,17c. The belt pulleys are articulated to revolve on their shafts in relation to the frame R' on bearing means not shown. The belt 16 comprises three lifting members 19a,19b,19c. The lifting members are fitted on the belt 16 as in such a way uniformly spaced that the lifting member 19a is placed at the vicinity of the forward end of the roller 20a,20b, the lifting member 19b in a synchronization position at the proximity of the detector 60 on the downward belt run, and the lifting member 19c is placed in the lifting position at the vicinity of the end 11a of the plate 11. Thus, when the belt 16 is at a stop, one lifting member 19 is always placed at the synchronization detector 60.

Fig. 9 shows the curved trough-shaped upper portion 61, from which the recycling package is passed to the rollers 20a,20b, being carried by the belt 16.

Fig. 10 shows the operation of the can crusher D_1 and of the plastic-bottle crusher D_2. From the motor M_1, the drive is passed through the transmission system V directly to the shaft 54a and the press drum D_1' of the can crusher D_1. Similarly, by the intermediate of a coupling 55, the output shaft 54a of the motor M_1 directly operates the shaft 54b and further, by the intermediate of the cogwheels 56a,56b, 56c,56d, the drums D_2',D_2'' of the second crusher D_2, which is provided for plastic bottles. Thus, in a favourable way, a drive both of the drum D_1' of the crusher D_1 and of the drums D_2',D_2'' of the crusher D_2 have been achieved by means of the same motor M_1.

Method and device in the handling of recycling packages, such as bottles and cans. A recycling package (P) is introduced into the receiving space (A) of the device (10) and is transferred by means of a conveyor device (16) into an identification position and, after the identification, based on the identification, the recycling package is transferred to a plastic-bottle crusher device (D_2) or to a can crusher device (D_1). The press drum (D_1') of the can crusher device is rotated by means of a motor (M_1), and the press drums (D_2',D_2'') of the plastic-bottle crusher device (D_2) are also rotated by means of the corresponding motor drive (M_1).

Claims

1. Method in the handling of recycling packages, such as bottles and cans, wherein a recycling package (P) is introduced into the receiving space (A) of the device (10) and is transferred by means of a conveyor device (16) into an identification position (H) and, after the identification, based on the identification, the recycling package is transferred to a crusher device (D_2) for plastic bottles or a crusher device (D_1) for cans, **characterized** in that, in the method, the press drum (D_1') of the can crusher device is rotated by means of a motor (M_1), and that the press drums (D_2',D_2'') of the plastic-bottle crusher device (D_2) are also rotated by means of the corresponding motor drive (M_1).

2. Device in the handling of recycling packages, such as bottles and cans, by means of which device the recycling package (P) is introduced into the receiving space (A) of the device (10) and is transferred by means of a conveyor device into an identification position and, after the identification, based on the identification, the recycling package is transferred to a crusher device (D_2) for plastic bottles or to a crusher device (D_1) for cans, **characterized** in that the equipment comprises a motor (M_1) and a motor output, from which both the crusher device (D_1) for cans and the crusher device (D_2) for plastic bottles are operated.

3. Device as claimed in claim 2, **characterized** in that the output shaft of the motor (M_1) is fitted to rotate both the press drum (D_1') of the crusher device for cans and the press drums (D_2',D_2'') of the crusher device (D_2) for plastic bottles.

4. Device as claimed in claim 2 or 3, **characterized** in that the can crusher device (D_1) comprises a press drum (D_1'), which is rotated by the intermediate of the gearbox (D) of the motor (M_1), the can being fed into the gap between the press drum (D_1') and a wedge-shaped back-up part (F_1) and being flattened into smaller volume, and that the crusher device (D_2) for plastic bottles comprises press drums (D_2',D_2''), which are operated by the intermediate of a transmission system consisting of cogwheels.

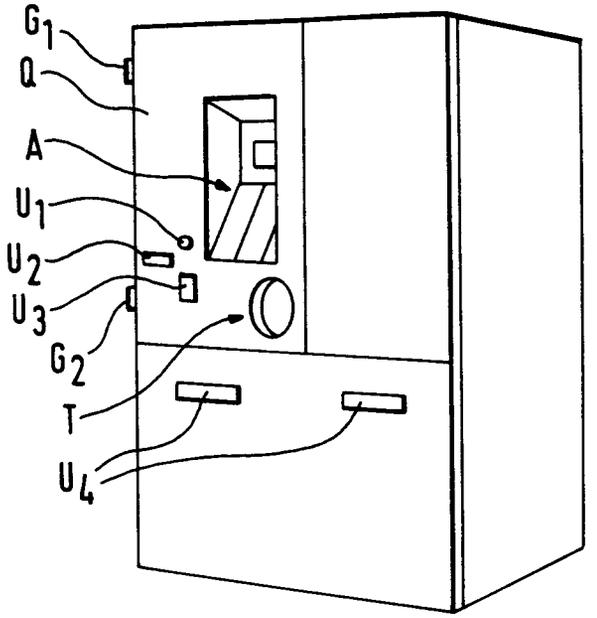
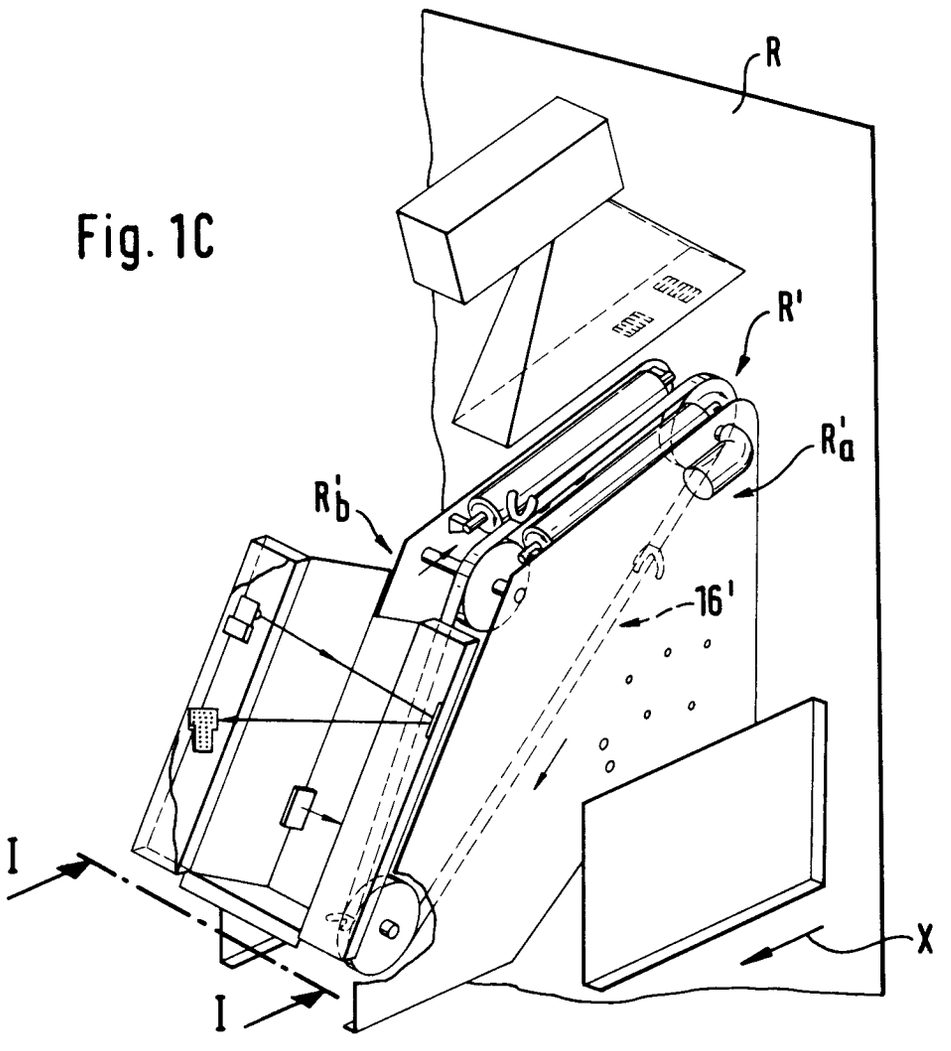


Fig. 1A

Fig. 1C



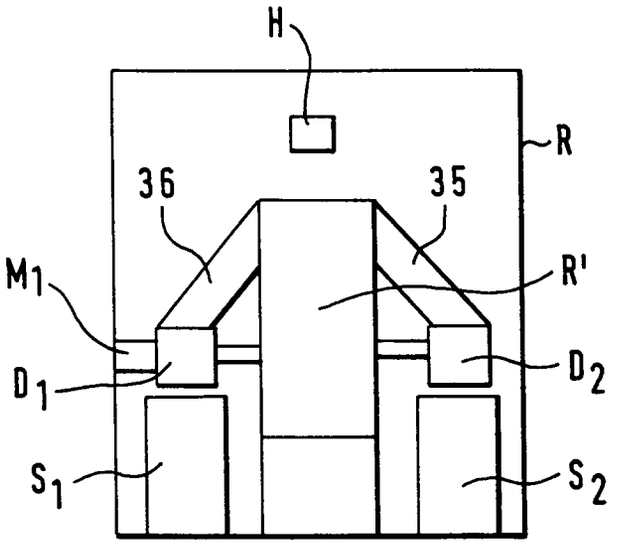


Fig. 1B

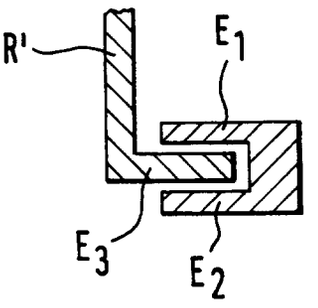


Fig. 1D

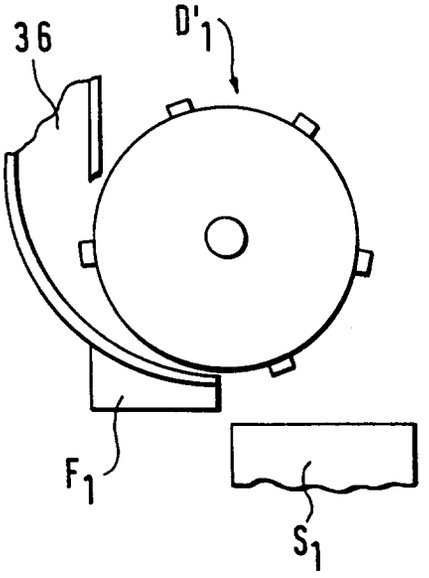


Fig. 1E

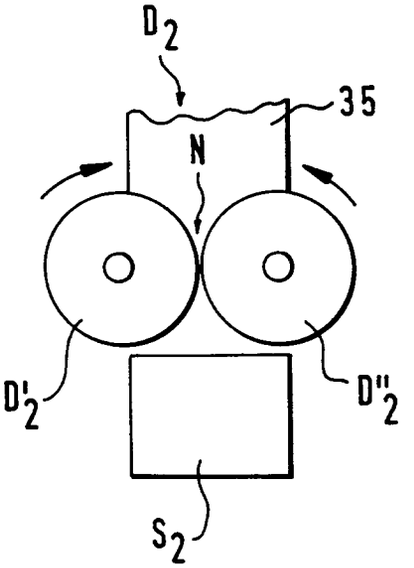
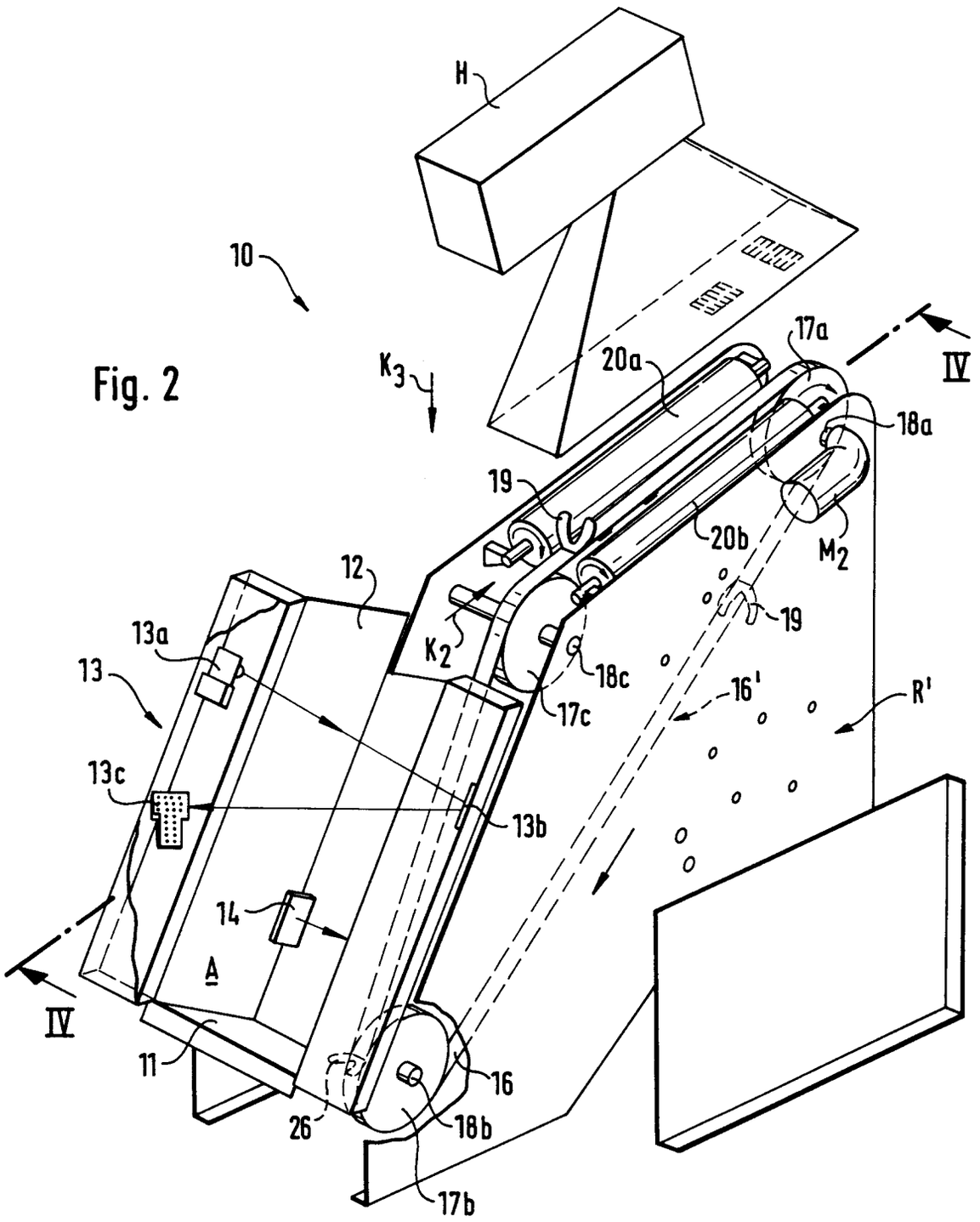


Fig. 1F

Fig. 2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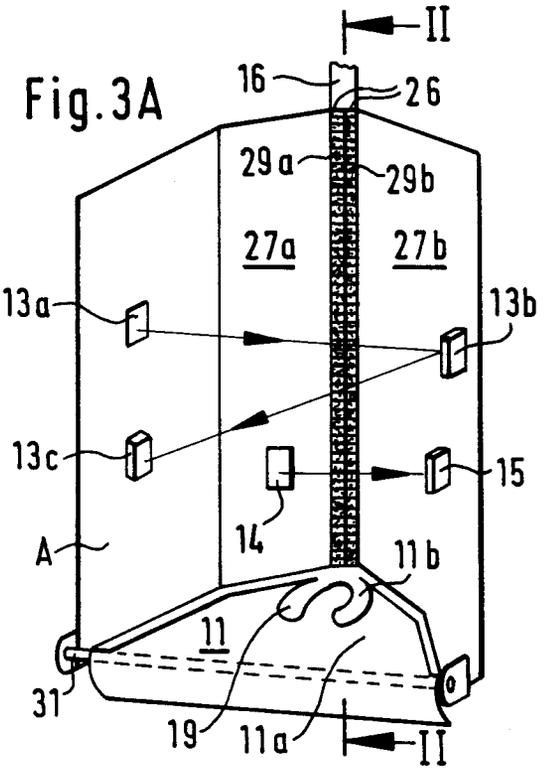
K3
17a
IV
20a
18a
19
20b
M2
12
19
13a
K2
18c
13
16'
R'
17c
13c
13b
14
A
IV
11
16
26
18b
17b

Fig.3A



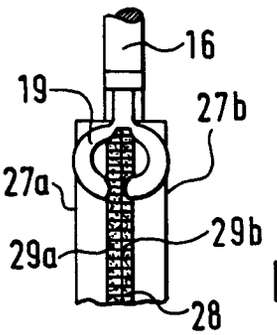


Fig. 3C

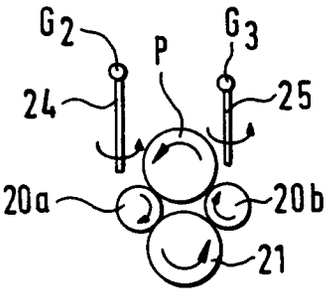


Fig. 4C

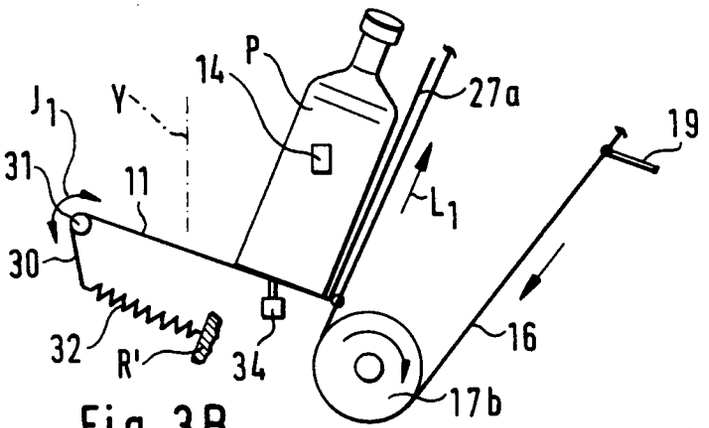


Fig. 3B

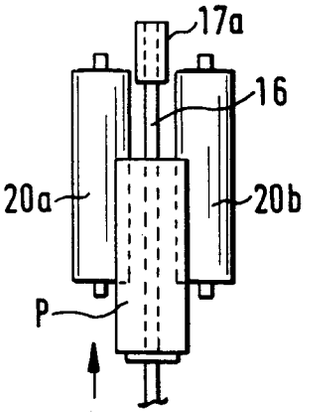


Fig. 4A

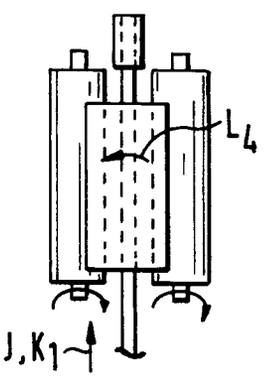


Fig. 4B

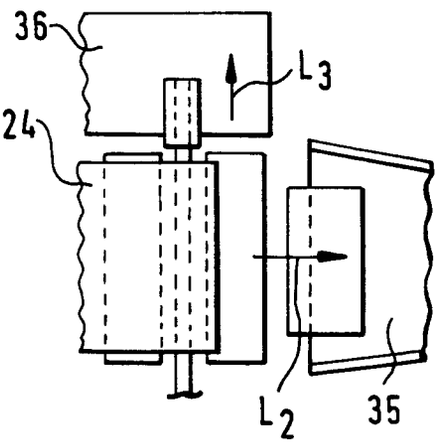
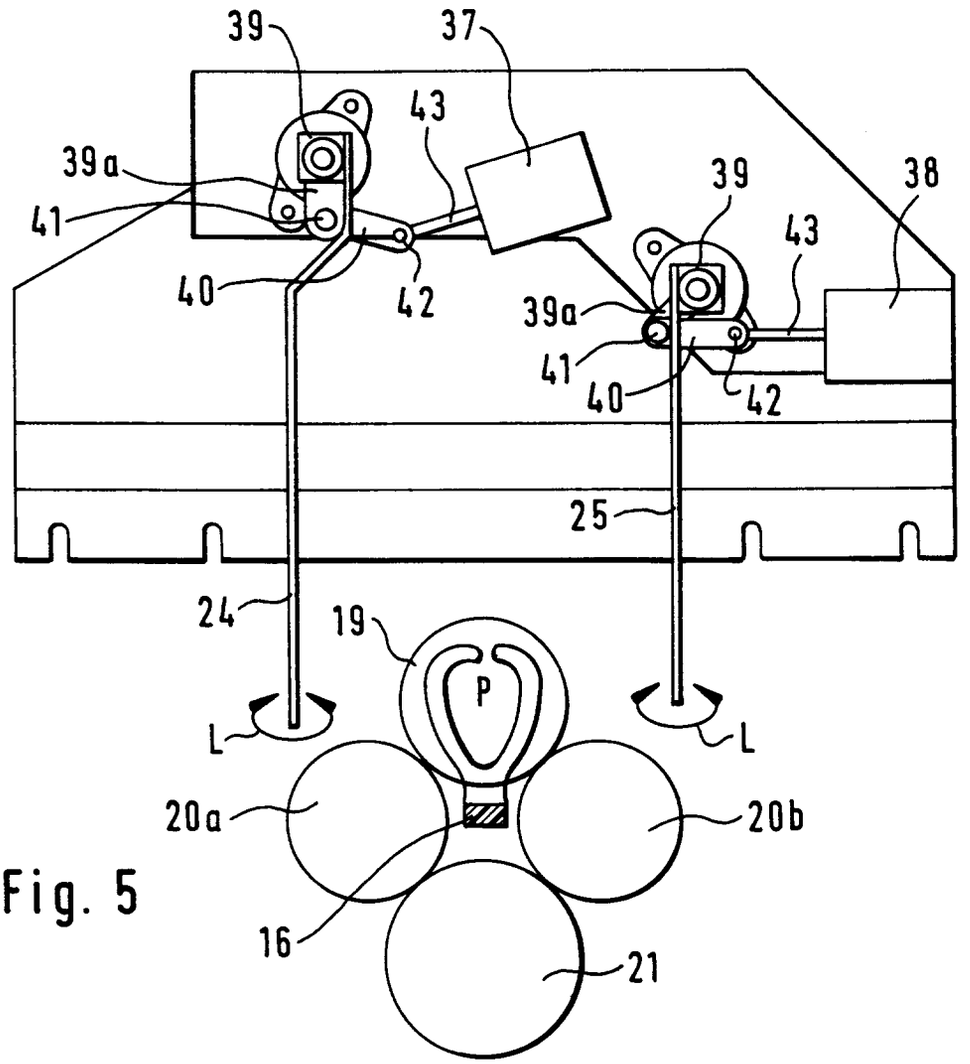


Fig. 4D


39
37
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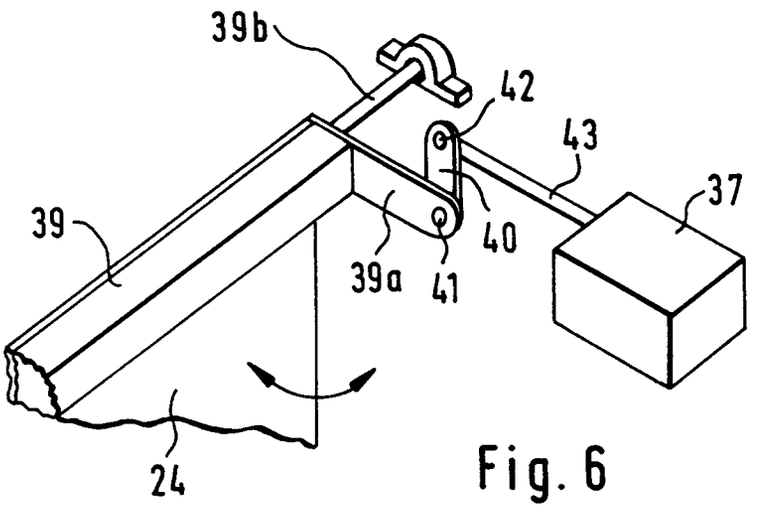
39a
41
40
42
39
38
43
39a
41
40
42
25
24
19
P
L
L
20a
20b
16
21

Fig. 5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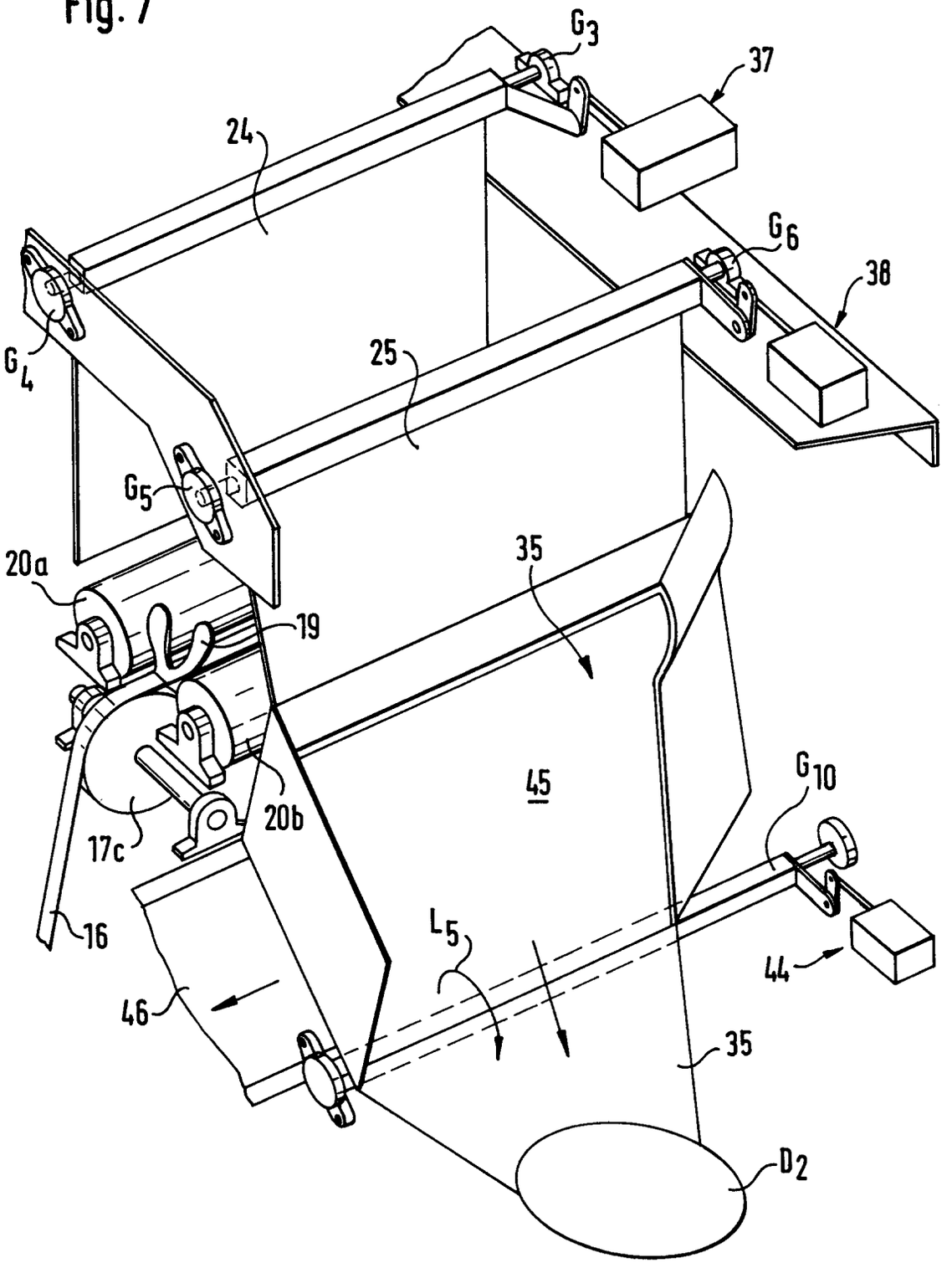
39
40
39a
41
24

Fig. 6

Fig. 7



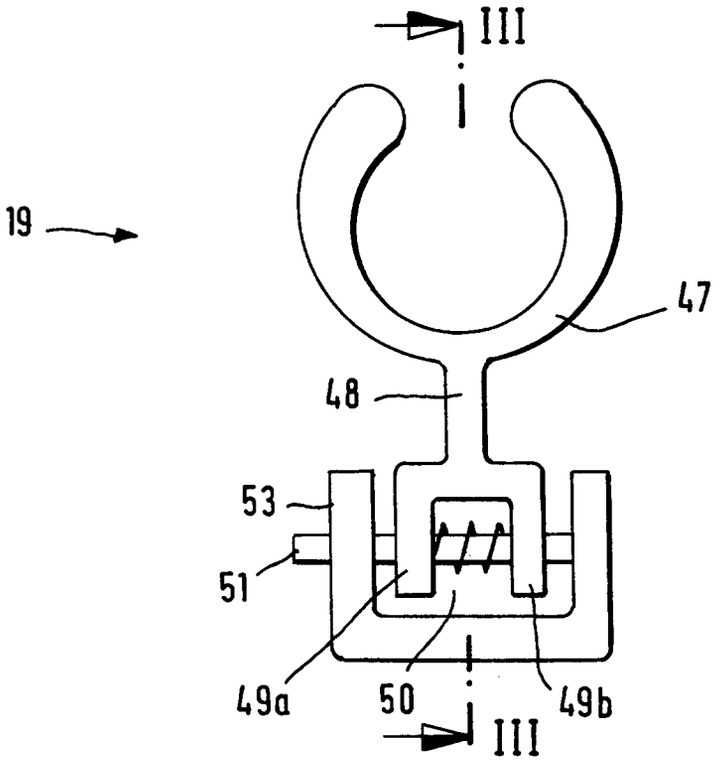


Fig. 8 A

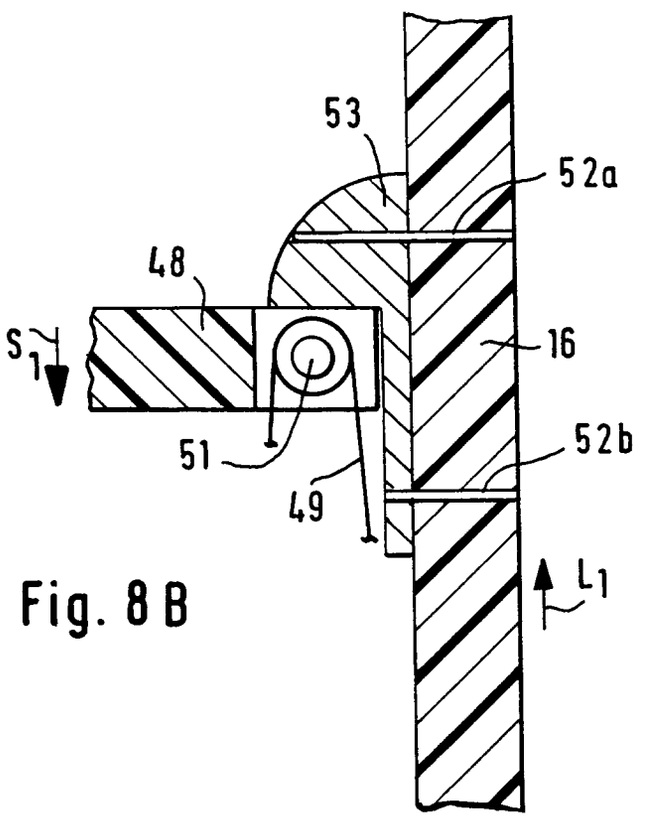


Fig. 8 B

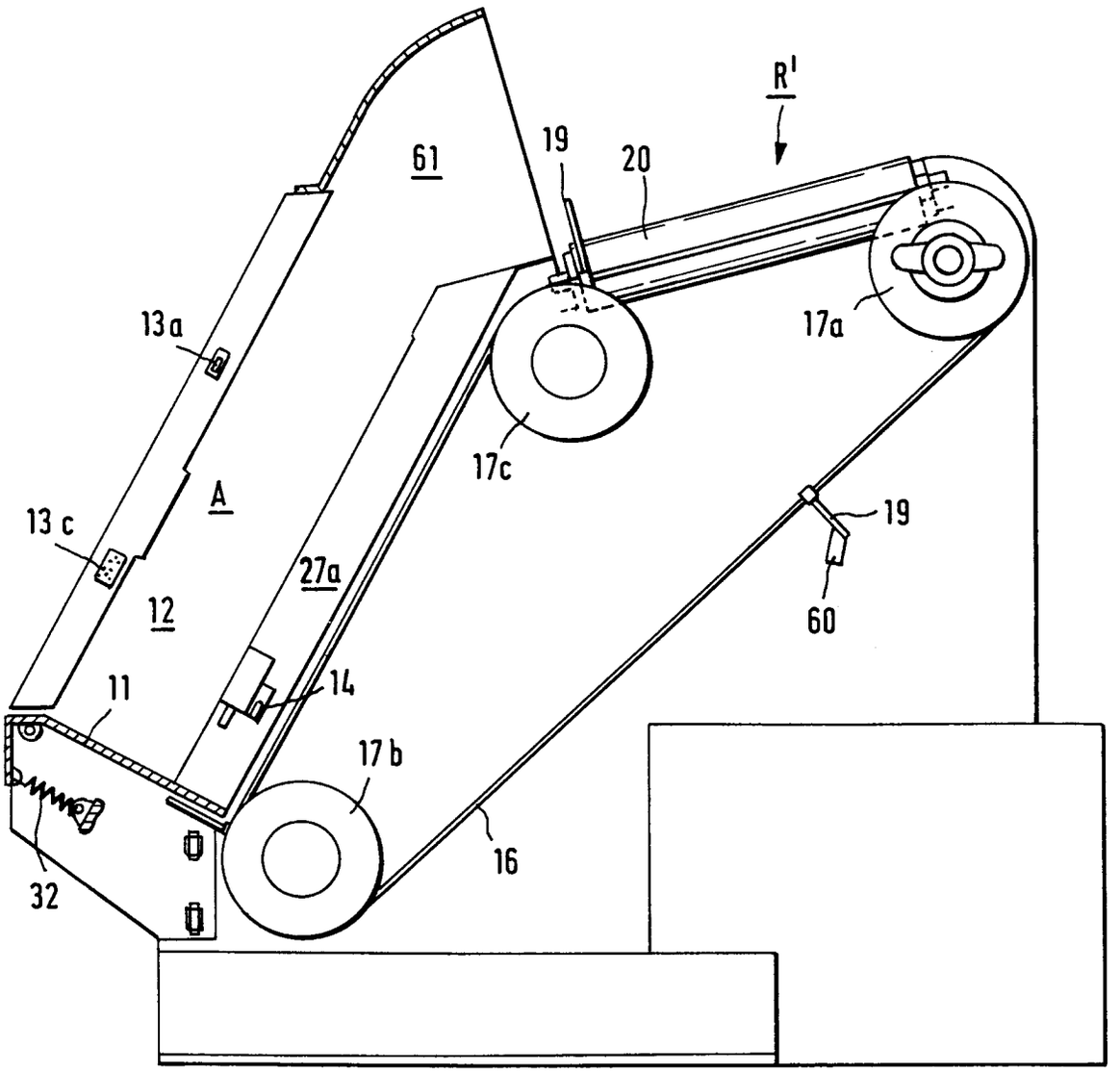


Fig. 9

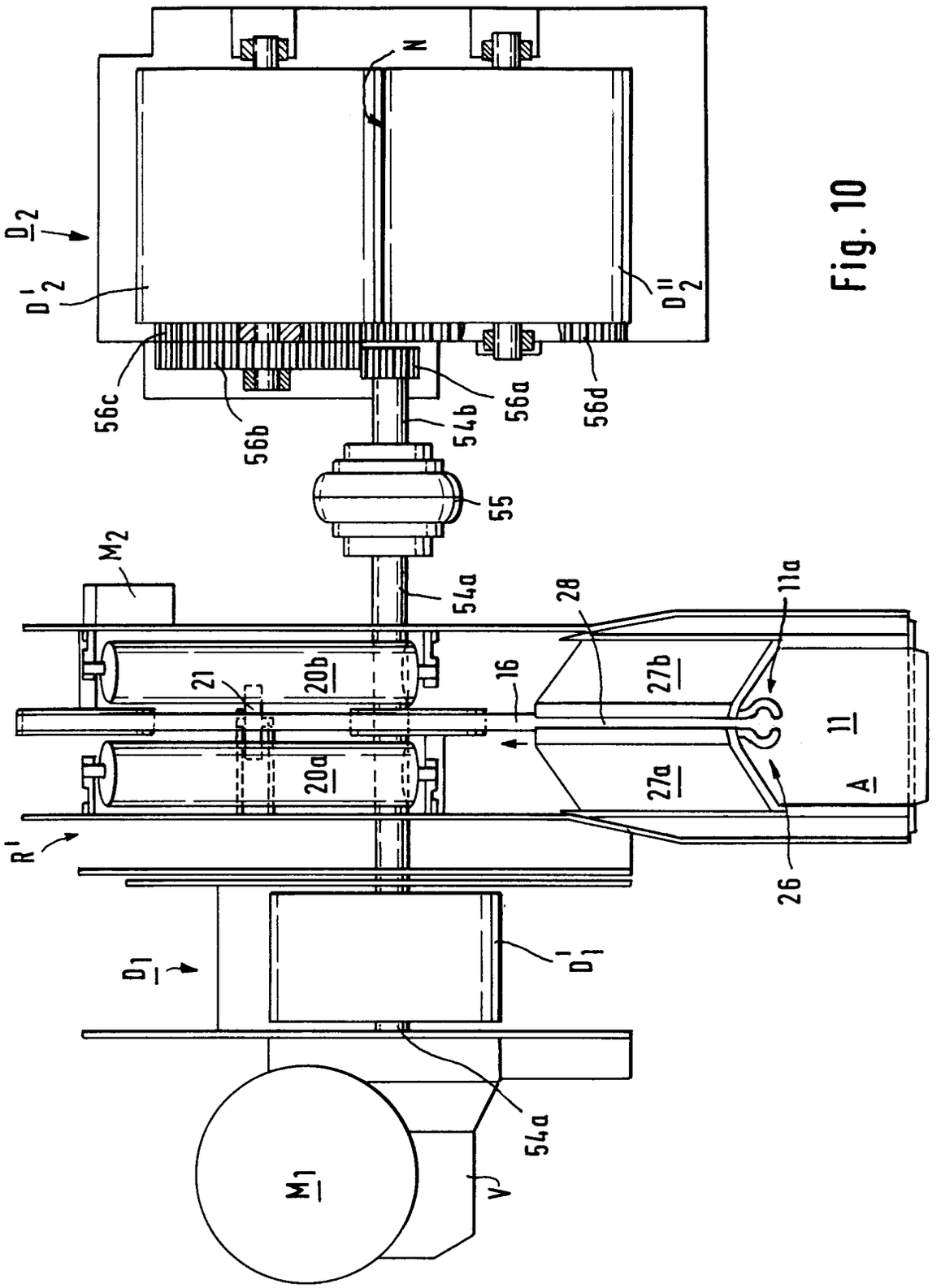

N
D2
D'2
D''2
56c
56b
56a
54b
56d
55
M2
54a
28
11a
21
20b
16
27b
11
20a
27a
A
R'
26
D1
D'1
54a
M1
V

Fig. 10

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

DOCUMENTS CONSIDERED TO BE RELEVANT

EP 94102068.7

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X	PATENT ABSTRACTS OF JAPAN, unexamined applications, C field, vol. 14, no. 131, March 13, 1990 THE PATENT OFFICE JAPANESE GOVERNMENT page 41 C 700; JP-A-02-4 483 (KAZUHIRO NISHII) --	1-3	B 02 C 19/14
A	US - A - 4 537 361 (HEIMERICH) * Column 4, line 6 - column 5, line 66; fig. 2-4 * --	1-4	
A	US - A - 5 042 634 (GULMINI) * Column 2, line 53 - column 5, line 25; fig. 1-6 * ----	1-4	
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			B 02 C B 07 B G 07 F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
VIENNA	15-04-1994	BAUER

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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A : technological background
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P : intermediate document

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E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

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