(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 397 158 A2**

(12) EUROPEAN PATENT APPLICATION

(21) Application number: **90108791.6**

(51) Int. Cl.5: **B30B 9/32**

(22) Date of filing: **10.05.90**

(30) Priority: **11.05.89 IT 2045289**
29.11.89 IT 2253489

(43) Date of publication of application:
14.11.90 Bulletin 90/46

(84) Designated Contracting States:
AT BE CH DE DK ES FR GB GR IT LI LU NL SE

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(54) Machine for crushing cans, tins and similar containers, with separate collection of aluminum ones from white-latten ones.

(57) Can-crushing machine for collecting aluminum cans separately from white-latten ones, constituted by a box-like containment and supporting body (1,101) at the top of which a rotor (6) with a horizontal axis is rotatably mounted; the rotor is externally provided with means for the engaging of a can (7a, 7b,7c,7d); a vertical contrast plate (11) is arranged tangent to the rotor so as to allow each can, fed by gravity by loading means (15), to be engaged and then crushed between the rotor (6) and the plate (11) until it is flattened and allowed to fall vertically in a tangent direction toward rotating means (19) provided with magnetized cores adapted to retain only white-latten flattened cans, allowing aluminum ones to fall freely into a underlying container (24), the white-latten cans being then dragged until they are against a fixed stop (21) element capable of making them fall into an other container (23).

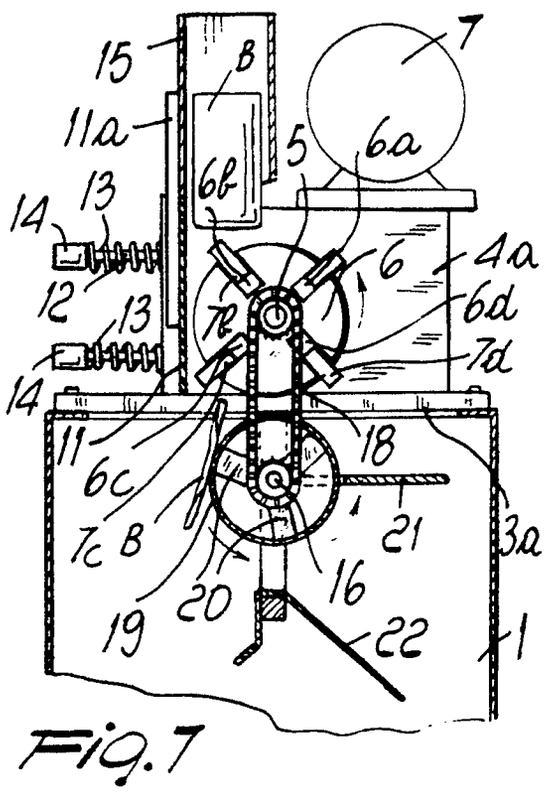

Fig. 7

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MACHINE FOR CRUSHING CANS, TINS AND SIMILAR CONTAINERS, WITH SEPARATE COLLECTION OF ALUMINUM ONES FROM WHITE-LATTEN ONES

The present invention relates to a machine for crushing cans, tins and the like with automatic operation, provided with means for sorting and separately collecting the aluminum cans or tins from white latten cans or tins, these two types of cans or tins for beverages being generally currently commercially available.

Various kinds of sorting and crushing machines for allowing the general separate collection of the aluminum cans of beverages from the white latten of tins and containers for various food products are known.

Besides high-capacity machines, used in waste collection centers, small-capacity machines which can be used at the private level, i.e. operated by private users, are also commercially available.

Some kinds of can-crushing machines are also provided with token-box devices which can distribute prize tokens to the users which total a given number of aluminum cans separately from the number of white-latten cans.

Can-crushing machines usable by private operators normally provide the introduction of the cans into an openable tray or the like, then sorting by means of magnetic-attraction means which deflect sheet-metal cans with respect to aluminum ones, and then the crushing of the cans thus separated by means of a compression which is exerted axially thereto so as to deform the cylindrical body and move the opposite bottoms mutually closer. The crushing of the cans is such as to considerably reduce their initial volume and therefore such as to reduce the containers of the crushed bodies, facilitating their transport.

These kinds of machine with axial can crushing are in practice structurally complicated, especially due to the fact that they require devices for guiding and keeping the individual cans in a vertical position, for deflecting the cans under the crushing piston only when the piston itself is at its upper stroke limit position, since the piston has a reciprocating motion, and finally cam devices or the like to impart strokes in alternated directions to the piston. In these known machines, the use of plastic bags or the like for the separate collection of the two kinds of crushed cans can furthermore entail accidental breakages of said bags especially during transport in the plants suitable for reusing the cans.

The aim of the present invention is to provide a machine for crushing cans of beverages in general and cans of other food products, structured so as to obviate the disadvantages and limitations of known machines and most of all capable of subjecting the cans to such a deformation and crushing as to convert them into flattened and thin bodies, with the advantage of offering a greater surface to the magnetic forces which perform sorting and separate collection.

An object of the invention is to provide a can-crushing machine which is structurally very simple and highly reliable, has a small bulk and requires no preliminary operation for opening or preparing the can loading duct.

A further object of the invention is to provide a machine of the above specified type which can operate in a fully automatic manner and is also such as to expel any foreign bodies intentionally or accidentally introduced into the machine itself.

Not least object of the invention is to provide a can-crushing machine which has a high crushing speed and is provided with means for automatically adjusting the degree of crushing according to the dimensions and thicknesses of the cans to be crushed.

This aim, these objects and others which will become apparent from the following description are achieved by a can-crushing machine with manual feeding, which is constituted, according to the present invention, by a box-like containment and supporting body, a rotor being rotatably mounted at the top of said box-like body, said rotor having a horizontal axis and being peripherally provided with teeth in the shape of longitudinal wings which retract into the rotor body in opposition to pre-loaded springs, a vertical contrast plate being located tangent to said rotor so as to allow each can, fed by gravity feed by loading means, to be engaged by said teeth and then crushed between the rotor and the plate until it is flattened and allowed to fall vertically in a tangent direction toward rotating means provided with magnetized cores adapted to retain only white-latten flattened cans, allowing aluminum ones to fall freely into a first underlying container, the white-latten cans being then carried until they are against a fixed stop element capable of making them fall into a second container.

More particularly, said vertical contrast plate is mounted so as to be movable on horizontal guides and in opposition to return springs so that it can be spaced from the crushing rotor in the case of presence of foreign bodies or of cans with dimensions and thickness which differ from those normally provided for in crushing.

Said loading means are furthermore constituted by a tube with a vertical axis which is rigidly mounted at the top of said vertical contrast plate in order to ensure in any case the correct feeding of the cans between the plate and the crushing rotor.

Further characteristics and advantages of the present invention will become apparent from the following detailed description of a preferred but not exclusive practical embodiment thereof, given with reference to the accompanying drawings, which are given only by way of non-limitative example and wherein:

figure 1 is a perspective view of a can-crushing machine executed according to the invention, illustrated with its door open;

figure 2 is an enlarged-scale, lateral and partially sectional view of the upper part of the machine of figure 1;

figure 3 is a view from the side which is opposite, i.e. rearward, to the one which bears the door;

figure 4 is a plan view of the machine of the preceding figures;

figures 5 to 8 are views of the machine according to the invention in four consecutive operating steps and specifically in the loading step, in the crushing step, in the step of attracting a can on the part of the rotating magnetic means, and in the step of final sorting of the crushed cans; whereas

figures 9 and 10 are respectively a perspective view and a longitudinal sectional view of the structure of the crushing rotor.

figure 11 is a perspective view of a different embodiment of the crushing machine shown with the door open;

figure 12 is a partially sectional side view of the upper part of the machine according to figure 11;

figure 13 is a view taken from the opposite side with respect to the view of figure 12;

figure 14 is a plan view of the machine;

figure 15 is a view of the step of introducing a can into the crushing machine;

figure 16 is a view of the step of crushing a can;

figure 17 is a schematic view of the step of sorting the can;

figure 18 is a view of the step of releasing a can into one of the containers arranged inside the machine;

figure 19 is a perspective view of the crushing rotor.

With reference to figures from 1 to 10, and in particular to figures 1 to 4, the machine according to the invention is constituted by a supporting and containment framework 1 in the shape of a cabinet which is open upward and is frontally provided with a swinging door 2. Above the cabinet 1 there are two parallel transverse bars 3-3a on which a quadrangular box-like body 4 is fixed; said body is constituted by four uprights to which two mutually opposite vertical containment plates 4a-4b are connected.

A shaft 5 with a horizontal axis is mounted between the two parallel plates 4a-4b, and a cylindrical rotor 6 with a particular profile, driven by an electric motor 7 by means of pulleys 8 and 9 and a related transmission belt 10 (figures 3 and 4), is keyed on said shaft.

The rotor 6 is constituted by a cylinder which is peripherally provided with four quadrangular longitudinal grooves 6a, 6b, 6c and 6d (figure 9) which are mutually at 90° and within which rod-like wings or teeth 7a, 7b, 7c and 7d are arranged; said wings are quadrangular and are mounted so as to radially retract into the grooves 6a, 6b, 6c and 6d, and each wing is fixed to the bottom of said grooves by means of a rod 8a, 8b, 8c and 8d (figure 10) which has its own head 9a, 9b, 9c and 9d in abutment within a recess provided in said wing and its opposite end screwed into the bottom of the related groove 6a, 6b, 6c and 6d. A pre-loaded spring 10a, 10b, 10c and 10d (figure 10) tends to keep the wing in a position which is external to the rotor and at the same time allows said wing to retract and disappear into its own groove when it is radially pressed, as will become apparent hereinafter.

Two rod-like elements 25-26 and 27-28 are furthermore interposed between each opposite pair of wings, i.e. between the wings 7a-7c and the wings 7b-7d, as shown in figure 10, and are arranged parallel and slidable in a diametrical direction inside the rotor 6. The ends of the rod-like elements 25-26 are accommodated within recesses provided in the opposite teeth 7a-7c, whereas those of the other two rods 27-28 are arranged at 90° with respect to the first ones and their ends are accommodated within recesses provided in the other two wings 7b-7d.

Said four rod-like elements are arranged mutually offset with respect to the axis of rotation O-O of the rotor 6 (figure 10) and their function is to constitute extraction devices capable of extracting a tooth from its own groove when the opposite tooth is pushed so as to disappear into its own groove; when a tooth makes contact with a contrast means, advantageously constituted by a contrast plate 11, the extraction device in fact forces the opposite tooth to exit from its own groove even if said tooth is locked in the groove or its spring has failed.

The vertical contrast plate 11 is located on the left open side of the box-like body constituted by the two facing plates 4a-4b (figures 1-2 and 5 to 8) and is movably mounted on four horizontal cylindrical rods 12 in contrast with cylindrical return springs 13; said rods 12 are rigidly associated with the vertical edges of the plates 4a-4b and have, at their free ends, a nut 14 for adjusting the loading of the springs 13. Said contrast plate 11 is located proximate to the outer cylindrical profile of the rotor

6 so as to leave, between said rotor and said plate, a space which is preset and adjustable, i.e. suitable to allow the crushing and the passage of one can at a time, as will become apparent hereinafter; at the same time, the plate's possibility of moving away from the rotor allows to preserve the integrity of the rotor in case of an arrival of solid foreign bodies larger than a crushed can between the rotor and the plate 11.

A tubular sleeve 15 is furthermore rigidly associated with said contrast plate 11 by means of a vertical arm 11a and constitutes the means for the gravity loading of one can at a time. The position of the loader 15 is provided so that every can is able to reach the rotor 6 and can be guided against the contrast plate 11.

A shaft 16 is located below the crushing rotor 6 and is rotatably mounted between two opposite arms 17 which are rigidly associated with the horizontal crosspieces 3-3a with an axis of rotation which is parallel to that of the shaft 5 of the rotor.

The rotary motion of the shaft 16 is drawn from that of the shaft 5 by means of two gears, which are rigidly associated with the two shafts 5 and 16, and of a transmission chain 18. A roller 19 is keyed on said shaft 16, and permanently magnetized cores 20 are arranged inside it; their function is to engage and retain white-latten cans after they have been crushed between the rotor and the contrast plate 11. In order to facilitate the attraction of the flattened cans which are freely falling vertically after expulsion from the rotor 6, the diameter of the magnetized cylinder 19 is provided so as to be slightly smaller than that of the rotor 6. In this manner each flattened can A (figure 6) arrives tangent to the magnetized cylinder 19 and, if it is made of aluminum, continues downward, since it cannot be attracted by the cylinder 19; if instead it is made of white latten, as indicated by B in figure 7, it is attracted and kept coupled to the roller until said roller, after a rotation of approximately 90°, moves the can to collide against a stop plate 21, thus forcing it to separate and fall onto an inclined plane 22 which conveys it into a second rigid container 23. The flattened aluminum cans are instead collected by gravity within a first rigid container 24; the two containers 23 and 24 are located within the cabinet 1.

The operation of the above described can-crushing machine therefore comprises a series of operating steps which are illustrated in figures 5 to 8. Figure 5 in fact illustrates an empty aluminum can A which is inserted in the loader tube 15 while the machine is running; by gravity it rests on the surface of the moving rotor 6, is then dragged by a tooth 6a against the plate 11 and then, while the tooth retracts into the rotor, said can is crushed against the contrast plate 11 as shown in figure 6; after crushing (which reduces it substantially to the shape of an elongated flat plate as indicated by A in figure 6), the can, which is made of aluminum, is not attracted by the magnetized cylinder 19 so that it continues and falls into the container 24.

If the empty can B loaded as in figure 7 is instead made of white latten, it is crushed between the rotor 6 and the plate 11 and is then attracted by the magnetized cylinder 19, as illustrated in figure 7, then dragged against the stop plate 21 (figure 8) which forces it to separate from the cylinder 19 and to then fall onto the inclined plane 22 and then into the container 23.

The rotation rate of the rotor 6 and of the magnetized cylinder 19 is very high, so that its capacity is also high; the degree of flattening of the cans (ratio between final volume and volume before crushing) is furthermore very high and the flattened shape assumed by each can after crushing ensures a firm grip of white-latten cans on the part of the magnetized cylinder.

The above described machine is furthermore provided with a device capable of automatically expelling from the crushing rotor 6 any solid foreign body of considerable size which, if dragged between the rotor and the contrast plate, would lead to the jamming of rotation, shorting the motor or in any case severely damaging the entire machine.

Said device is constituted by a device (not illustrated in the figures) for reversing the direction of rotation of the motor, provided with an appropriately adjusted timer, capable of rotating the rotor 6 in a reverse direction for a preset time so as to transfer the foreign body into the region above the stop plate 21, from which it can then fall by gravity into the white-latten crushed can container, according to the path indicated by the arrow F in figure 6, or can fall laterally to the longitudinal sides of said stop plate 21. If by chance a tooth 6a, 6b, 6c or 6d remains locked in its groove, the corresponding diametrical rods 25-26 extract it when the opposite tooth retracts into its own groove against the contrast plate 11.

Finally, a pedal which supplies power to the motor while it is kept pressed, as well as an ordinary button to be actuated manually by the user, or other optical means or the like, controlled by the passage of the cans within the loading tube 15, can be provided for starting the machine.

Said machine can be provided with light-emitting indicators for indicating the condition of power being supplied to the motor or for other requirements.

With reference to figures from 11 to 19, the crushing machine, particularly for collecting cans made of aluminum or other materials, according to the invention, comprises a box-like supporting body

101 which preferably but not necessarily has the shape of a cabinet which is open upward and is frontally provided with a swinging door 102. Two parallel transverse bars 103a and 103b are provided above the body 101, and a body 104, constituted by four uprights to which two mutually opposite vertical containment plates 104a and 104b are connected, is fixed thereon.

A shaft 105 with horizontal axis is mounted between the parallel plates 104a and 104b, and a rotor 106 with a contoured profile, driven by an electric motor 107 by means of pulleys 108 and 109 with related transmission belt 110, is keyed thereon.

The rotor 106 is provided with engagement means constituted by recesses 106a and 106b (figure 19) which are defined on the cylindrical generatrix of the rotor and define two can resting planes 107a and 107b which are flanked by respective mutually parallel raised portions 108a and 108b, each of which is perpendicular to its respective can resting plane.

Said raised portions 108a and 108b in practice provide the means which insert against the can to drag it, whereas the planes 107a and 107b in practice provide the resting of the cans which are fed by gravity.

A contrast means, advantageously constituted by a vertical contrast plate 111 which is movably mounted on four horizontal rods 112 in contrast with cylindrical return springs 113, is arranged on an open side of the body constituted by the adjacent plates 104a and 104b.

Said rods 112 are rigidly associated with the vertical edges of the plates 104a and 104b and each has, at its free end, a nut 114 for adjusting the loading of the springs 113, which in practice defines the crushing pressure for the can.

The plate 111 is arranged proximate to the cylindrical profile of the rotor, in practice tangent thereto, so as to leave a preset space which is suitable for crushing and allowing the passage of one can at a time.

A tubular sleeve 115 is rigidly associated with the plate 111 by means of a vertical arm 111a and constitutes the means for loading by gravity one can at a time. The arrangement of the loader 115 is such that each can is able to arrive on the rotor 106, or rather on the plane 107a or 107b, so as to be guided against the plate 111.

A shaft 116 is arranged below and laterally with respect to the crushing rotor 106 and is rotatably mounted between two opposite arms 117 which are rigidly associated with the horizontal crosspieces 103a and 103b; said shaft has an axis of rotation which is parallel to that of the shaft 105 of the rotor and a direction of rotation which is opposite to the direction of rotation of said rotor.

The rotary motion of the shaft 116 is drawn from that of the shaft 105 by means of a transmission with gears 105a and 116a which are respectively rigidly associated with the shafts 105 and 116.

A roller 119 is keyed on the shaft 116 and has at least regions made of permanently magnetized material which in practice provide the means for sorting the crushed cans.

Once they have been crushed, the cans make contact with the roller 119 and, if they are made of white latten, are attracted and retained by the roller 119 which drags them until they strike against a stop plate 121 which in practice separates the can from the roller 119. The separated can falls into a container 124 for collecting white latten cans.

If the cans are made of aluminum, they are not attracted by the roller 119, so that they in practice are simply deflected toward the inclined plane or slide 122 which is fixed to the arms 117 and directs them toward a first collection container 123. The operation of the above described crushing machine comprises an automatic sequence of operating steps which are illustrated in figures 15 to 18. A can C, inserted in the sleeve 115, falls by gravity onto the rotor 116 and rests on said rotor until it is inserted into the resting plane 107a or 107b and thus remains engaged by one of the raised portions 108a or 108b as illustrated in figure 15. The rotation of the rotor 106, combined with the action of the raised portion, pushes the can against the contrast plate 111, flattening said can as illustrated in figure 16.

Once crushing has been completed, if the can A is made of aluminum, once it is flattened it falls against the roller 119 and is deflected onto the slide 122 which directs it toward the first container 123.

If the can is made of white latten, once crushing is complete and the can is therefore flattened, it falls against the roller 119, which in practice retains it, and is dragged to the stop plate 121 which separates the can which consequently drops into the second container 124.

The rotation rate of the rotor 106 and therefore of the roller 119 is high, so the capacity of the machine is considerably high; the degree of crushing to which the cans are subjected, i.e. the ratio between the volume before crushing and the volume after crushing, is furthermore very high, and the flattened shape of each can after crushing facilitates excellent compaction of the product and easy grip on the part of the roller 119 if said cans are made of white latten.

Advantageously, in order to preserve the integrity of the machine, means are provided for reversing the motion of the rotor if bulky means or such means as to cause its jamming are introduced.

The invention thus conceived is susceptible to numerous modifications and variations, all of which are within the scope of the inventive concept.

All the details may furthermore be replaced with other technically equivalent elements.

In practice, the materials employed, as well as the contingent shapes and dimensions, may be any according to the requirements.

Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly, such reference signs do not have any limiting affect on the scope of each element identified by way of example by such reference signs.

Claims

1. Machine for crushing cans and the like with manual loading, for collecting aluminum ones separately from white-latten ones or the like, characterized in that it is constituted by a box-like containment and supporting body (1), a cylinder or rotor (6) being rotatably mounted at the top of said box-like body, said rotor having a horizontal axis and being peripherally provided with longitudinal teeth (7a,7b,7c,7d) or wings which retract into the rotor (6) body in contrast with pre-loaded springs (10a,10b,10c,10d), a vertical contrast plate (11) being located tangent to said rotor so as to allow each can, fed by gravity by loading means (15), to be engaged by said teeth (7a,7b,7c,7d) and then crushed between the rotor (6) and the plate (11) until it is flattened and allowed to fall vertically in a tangent direction toward rotating means (19) provided with magnetized cores (20) adapted to retain only white-latten flattened cans, allowing aluminum ones to fall freely into a first underlying container (24), said white-latten cans being then dragged until they are against a fixed stop element (21) capable of making them fall into a second container (23).

2. Machine according to claim 1, characterized in that said vertical contrast plate (11) which is arranged facing said crushing rotor (6) is mounted so as to be movable on horizontal guides (12) in contrast with adjustable return springs (13) so that it can be spaced or moved away from said rotor (6) in the presence of cans with dimensions which differ from those normally provided for or of foreign bodies between the rotor (6) and the contrast plate (11).

3. Machine according to claim 1, characterized in that said loading means (15) are constituted by a portion of tube with a vertical axis which is rigidly fixed to the top of said contrast plate (11).

4. Machine according to claim 1, characterized in that said rotating means which comprise magnetized cores are constituted by at least one cylinder (19) which is rigidly associated with a shaft (16) which is moved by the shaft (5) of said crushing rotor (6) by means of gears and of a related chain (18) or the like.

5. Machine according to the preceding claims, characterized in that said rotor (6) has at least four longitudinal wings or teeth (7a,7b,7c,7d) which retract and disappear into the rotor (6) when they are moved into contact with said plate (11) and is moved by a motor (7) by means of pulleys (8,9) and of a transmission belt or similar means.

6. Machine according to one or more of the preceding claims, characterized in that rods (25,26 and 27,28) are arranged between each pair of opposite wings or teeth (7a,7c and 7b,7d), are freely movable radially within the rotor and are arranged mutually offset with respect to the axis of rotation of the rotor (6), said rods (25,26 and 27,28) constituting extraction devices adapted to expel a tooth (7a,7b,7c,7d) from its own groove (6a,6b,6c,6d) when the opposite tooth (7a,7b,7c,7d) is pushed so as to disappear into its groove (6a,6b,6c,6d) when it arrives against said contrast plate (11) while a can is being crushed.

7. Machine according to the preceding claims, characterized in that below said plate (21) for stopping and separating the white-latten cans there is an inclined plane (22) or the like adapted to convey said cans into the respective underlying container (23,24).

8. Machine according to the preceding claims, characterized in that a device for reversing the direction of rotation of said motor and an appropriately adjusted timer are associated with said motor (7) for driving the rotor (6) and the cylinder (19) with magnetized cores (20) and are adapted to allow, by means of the rotation of the motor (7) in reverse direction for a preset time, the expulsion from the crushing region of any solid foreign bodies of considerable dimensions or with a shape not suitable for being crushed between the rotor and the contrast plate.

9. Crushing machine particularly for separately collecting cans made of aluminum or other materials, which comprises a box-like supporting body (101) in which a can-crushing rotor (106) is rotatable, said rotor having a horizontal axis and being peripherally provided with engagement means for cans, a contrast means (111) being arranged tangent to said rotor for crushing the can fed by gravity along a direction which is substantially perpendicular to the axis of said rotor (106), means (119) for sorting the crushed cans being provided after said rotor (106), characterized in that said engagement means comprise at least one recess

(106a,106b) which is defined on the cylindrical generatrix of said rotor (106) and is adapted to provide a region for the accommodation of a portion of a can for gripping it and dragging it between said rotor (106) and said contrast means (111).

10. Crushing machine, according to claim 1, characterized in that said contrast means (111) for the crushing of said can comprises a contrast plate which is movably mounted on fixed horizontal guides (112) in contrast with return springs (113).

11. Crushing machine, according to the preceding claims, characterized in that said springs (113) have means (114) for adjusting the setting of the crushing pressure exerted between said contrast plate (111) and said rotor (106).

12. Crushing machine, according to one or more of the preceding claims, characterized in that it comprises means for the gravity loading of the can (115) constituted by a sleeve which is rigidly fixed to the top of said contrast plate (111) by means of a supporting arm (109).

13. Crushing machine, according to one or more of the preceding claims, characterized in that said means for sorting the crushed cans comprise a roller (119) with at least one portion made of permanently magnetized material which is rigidly associated with a shaft (116) driven by the shaft (105) of said crushing rotor (106) by means of a gear transmission (105a, 116a).

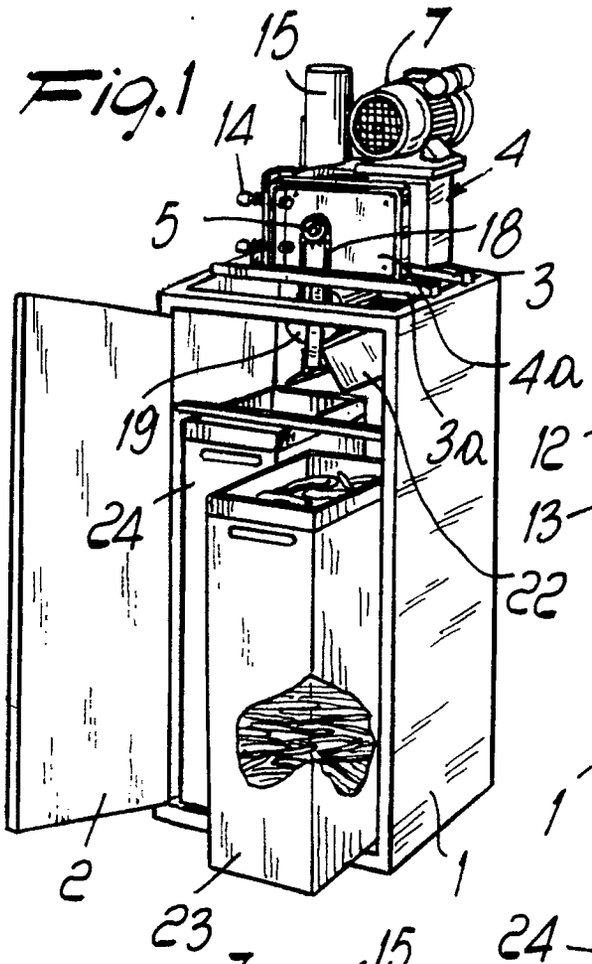
14. Crushing machine, according to one or more of the preceding claims, characterized in that said at least one recess (106a, 106b) has at least one can resting plane (108a,108b) flanked by a raised portion (107a,107b) arranged perpendicular to said plane.

15. Crushing machine, according to one or more of the preceding claims, characterized in that an inclined plane or slide (112) is fixed laterally and below said magnetized roller (119) for conveying flattened cans made of non-ferrous material toward a first container (123).

16. Crushing machine, according to one or more of the preceding claims, characterized in that a stop plate (121) is provided laterally to said magnetized roller (119) on the opposite side with respect to said inclined plane (112) and is adapted to separate the cans which are magnetically attracted by said roller (119) to convey them into a second container (124).

17. Crushing machine particularly for separately collecting cans made of aluminum and cans made of other materials, characterized in that it comprises a box-like supporting body (1,101) in which a can-crushing rotor (6,106) is rotatable, a contrast means (11,111) being arranged tangent to said rotor for crushing a can between said rotor and said contrast means, can sorting means (19,119) being provided for sorting and separately collecting cans made of aluminum and cans made of other materials.

Fig.1



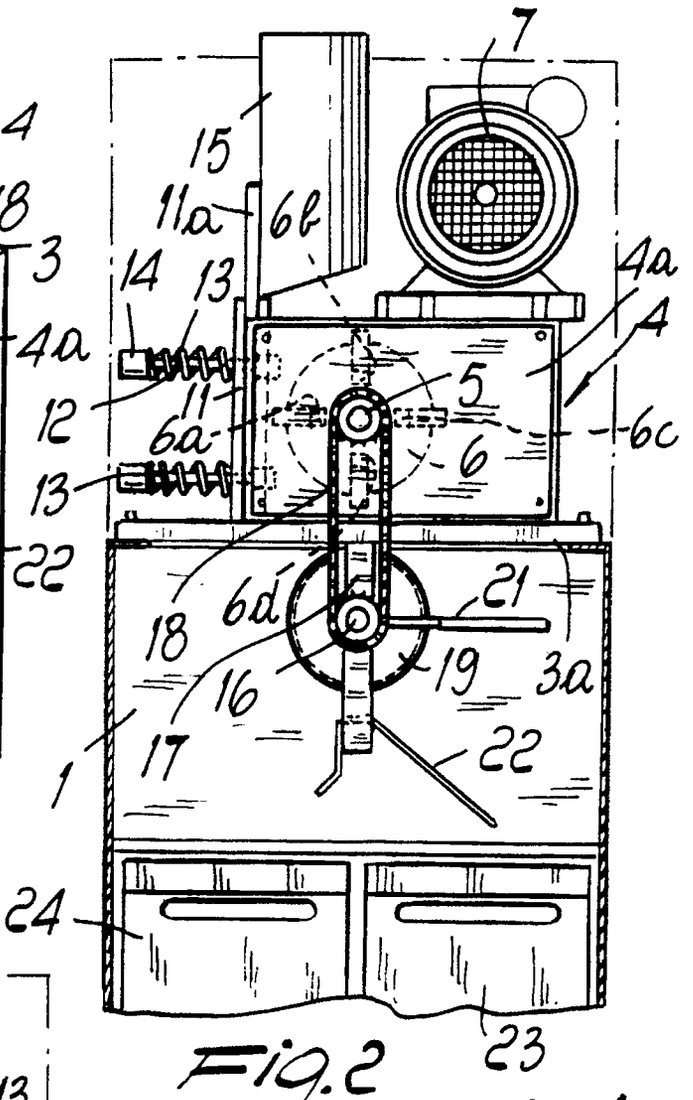


Fig.2

Fig.4

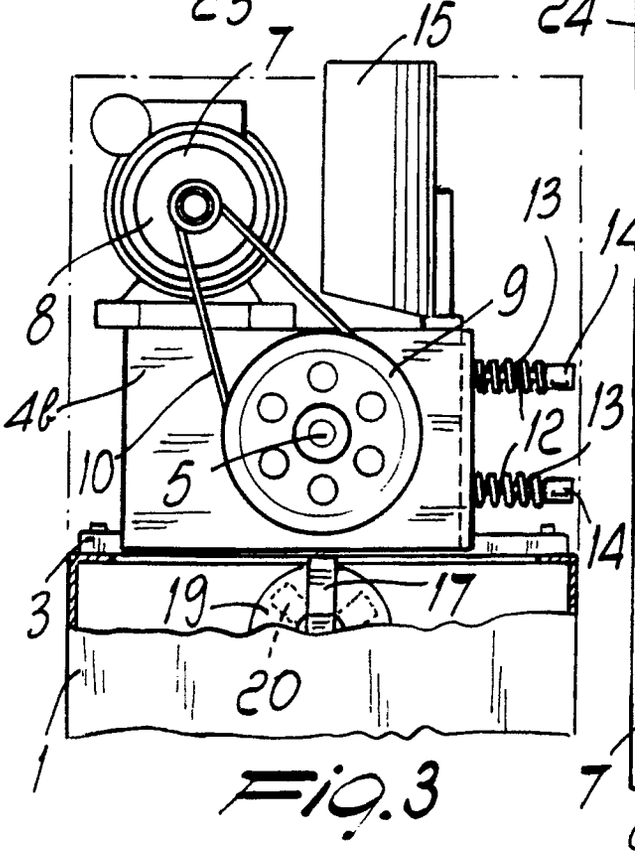
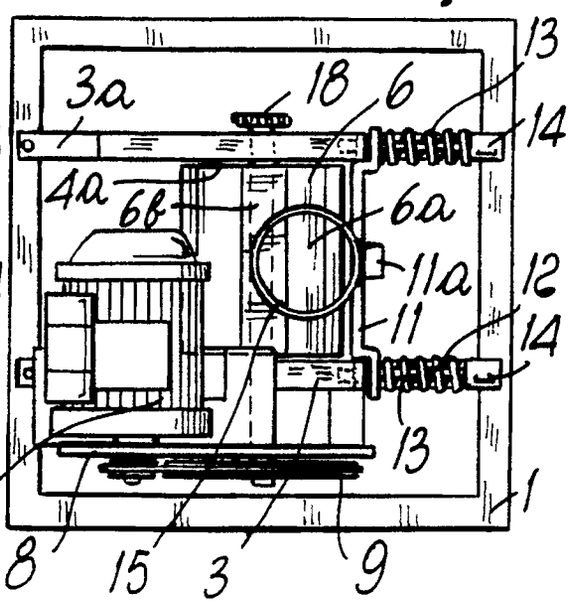


Fig.3



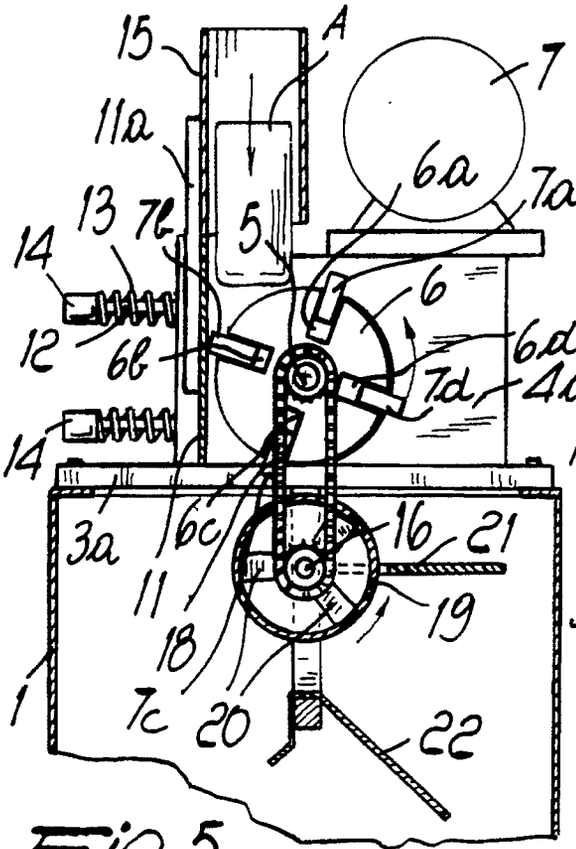


Fig. 5

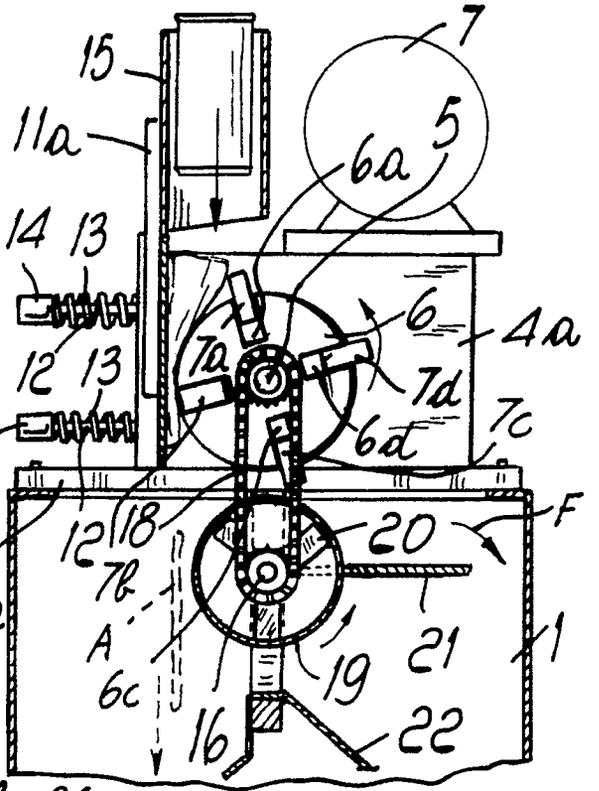


Fig. 6

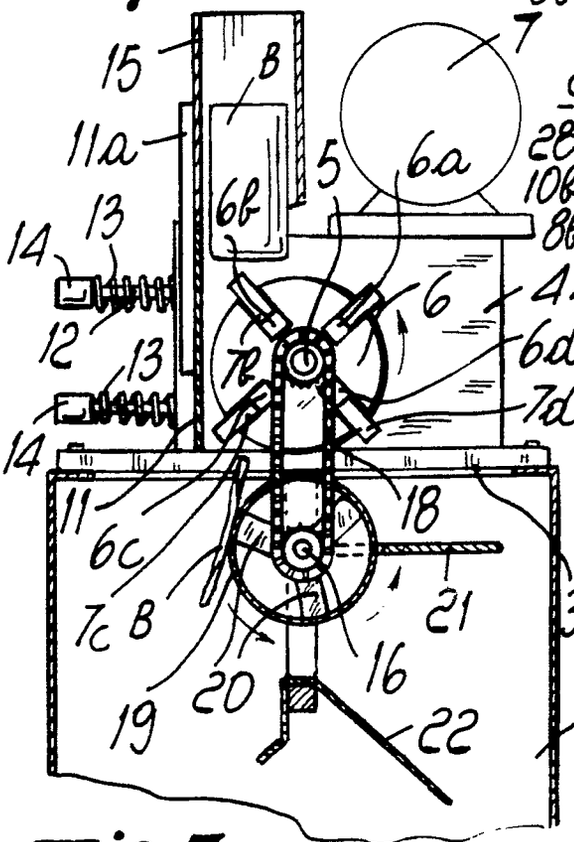


Fig. 7

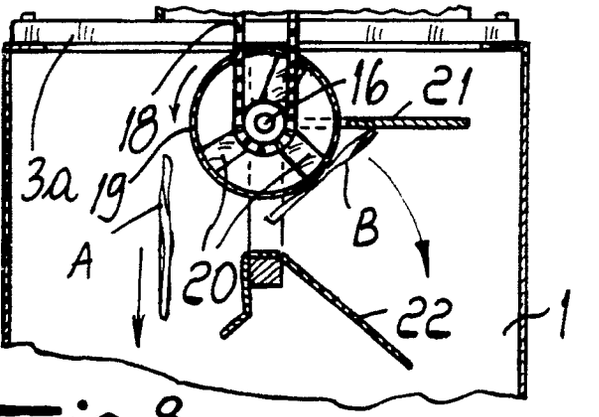


Fig. 8

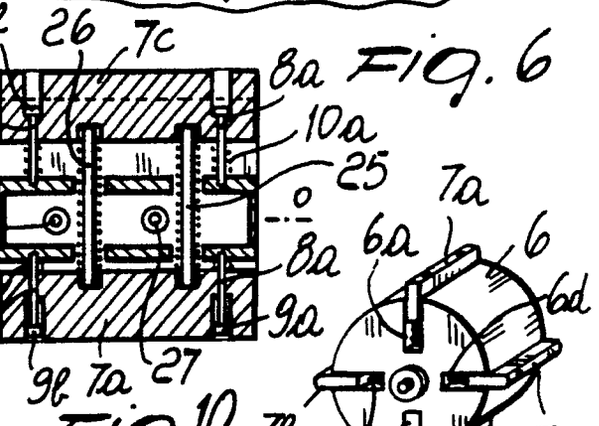
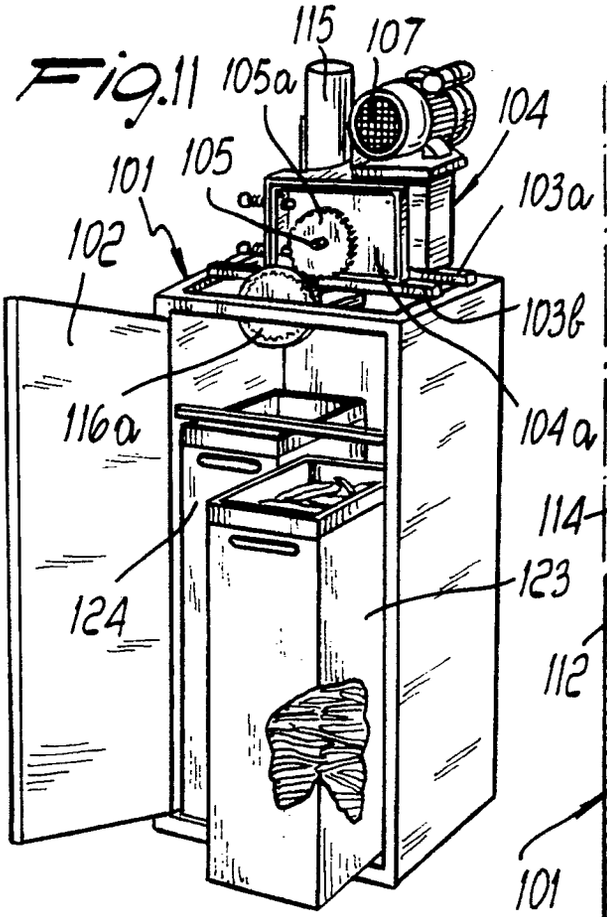


Fig. 10

Fig. 9

Fig.11



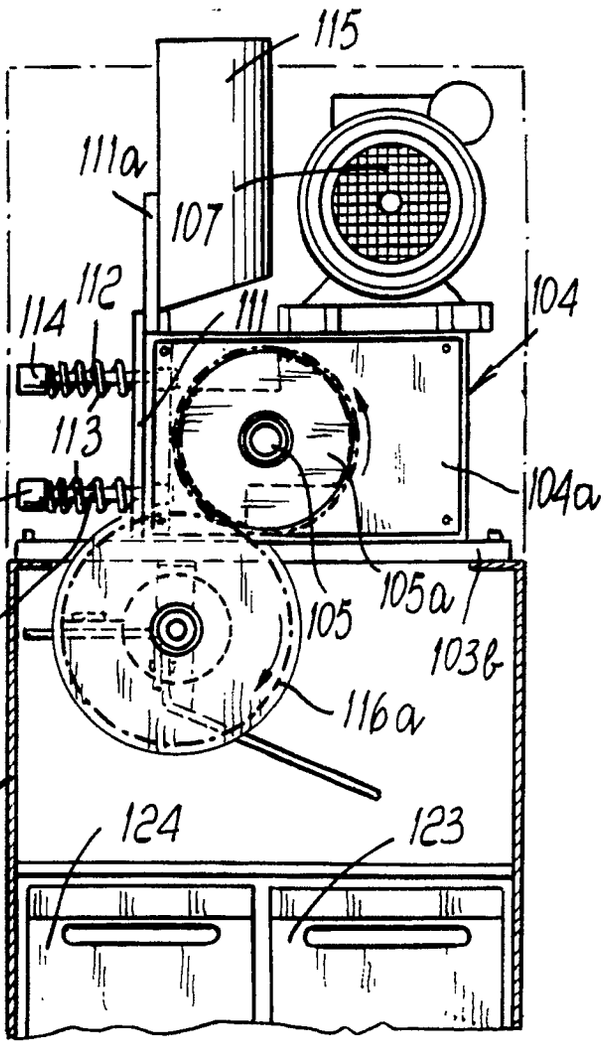


Fig.12

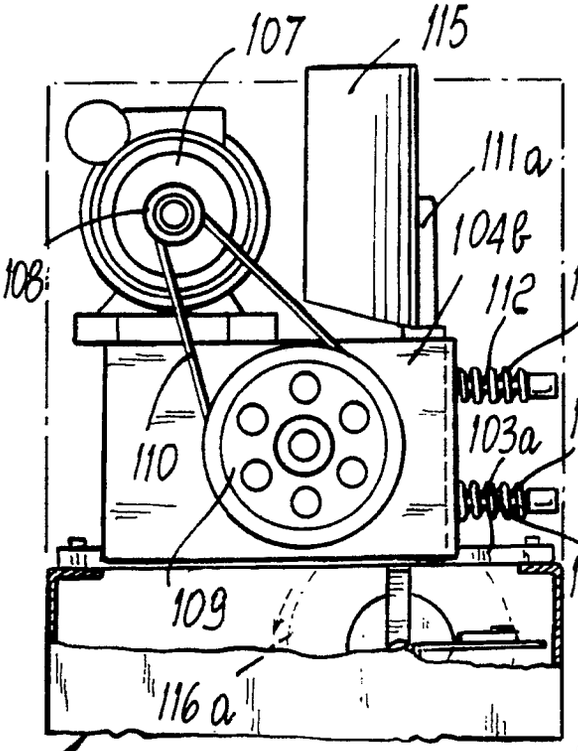
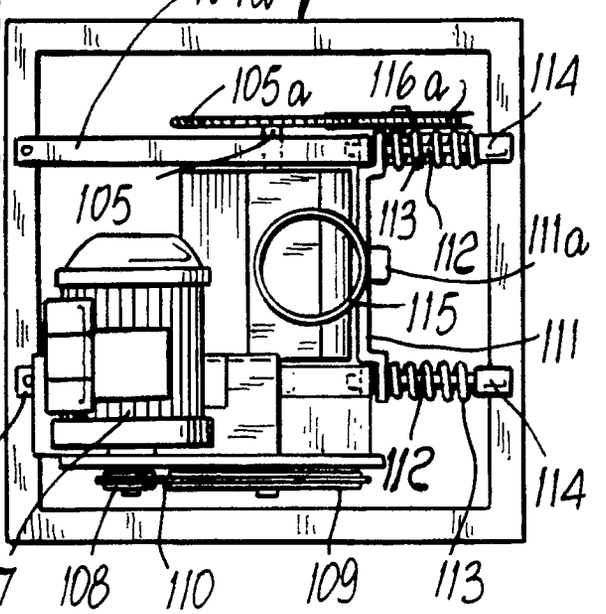


Fig.13

Fig.14



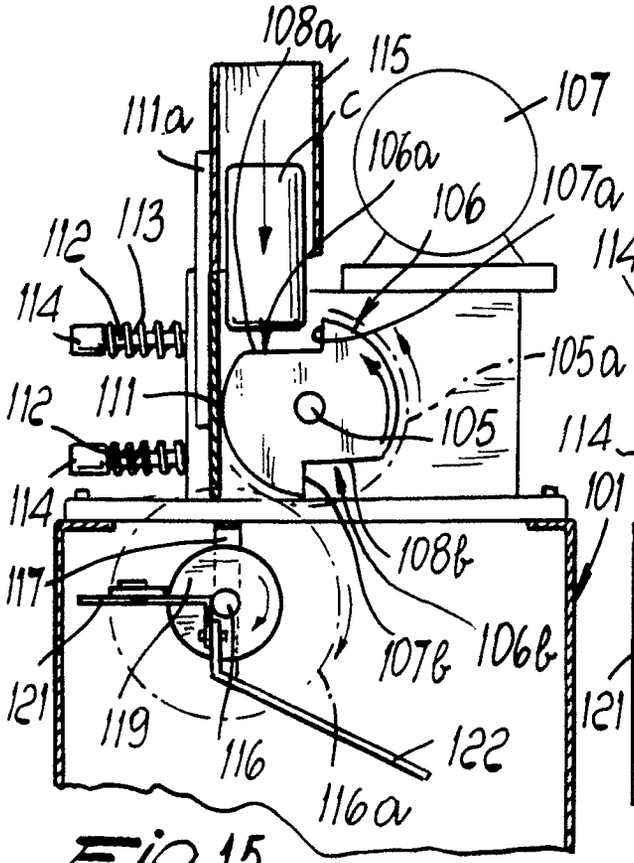


Fig.15

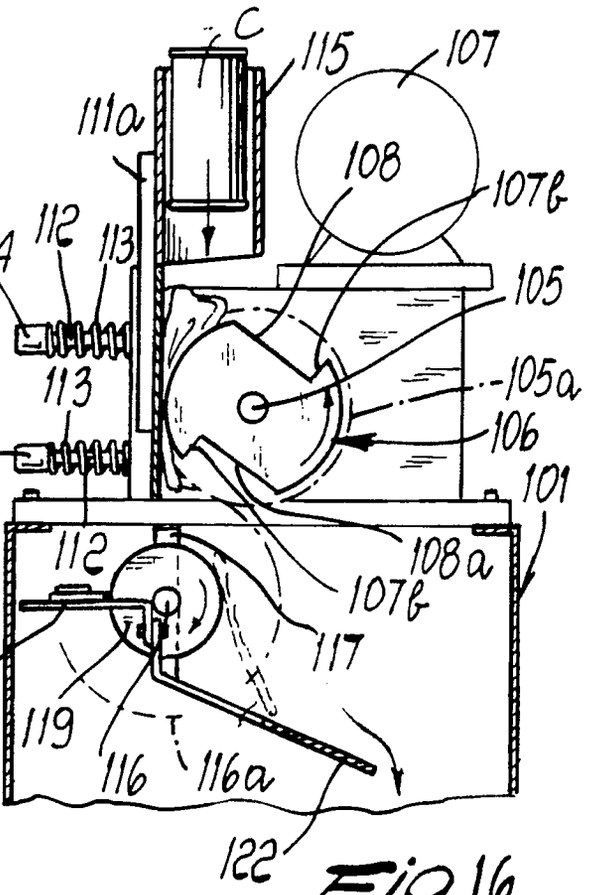


Fig.16

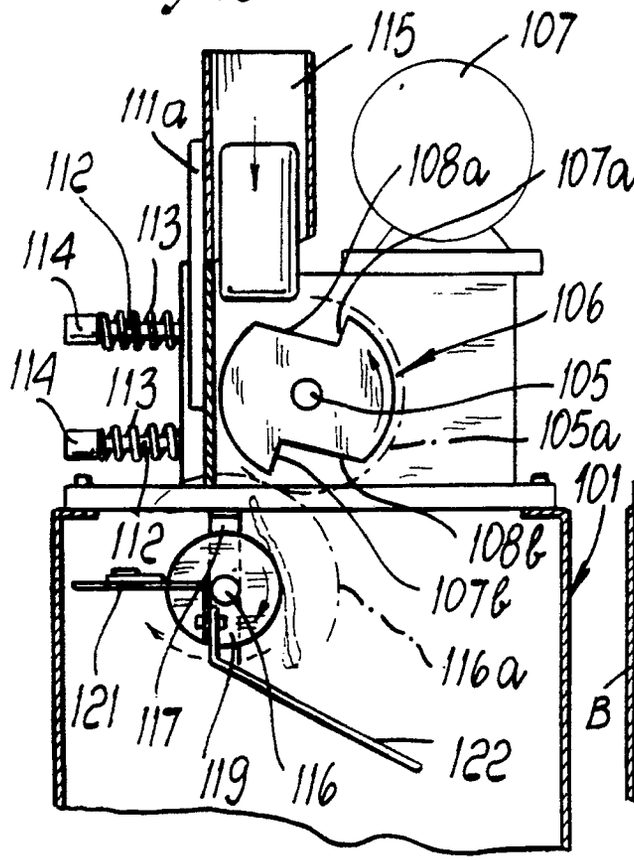


Fig.17

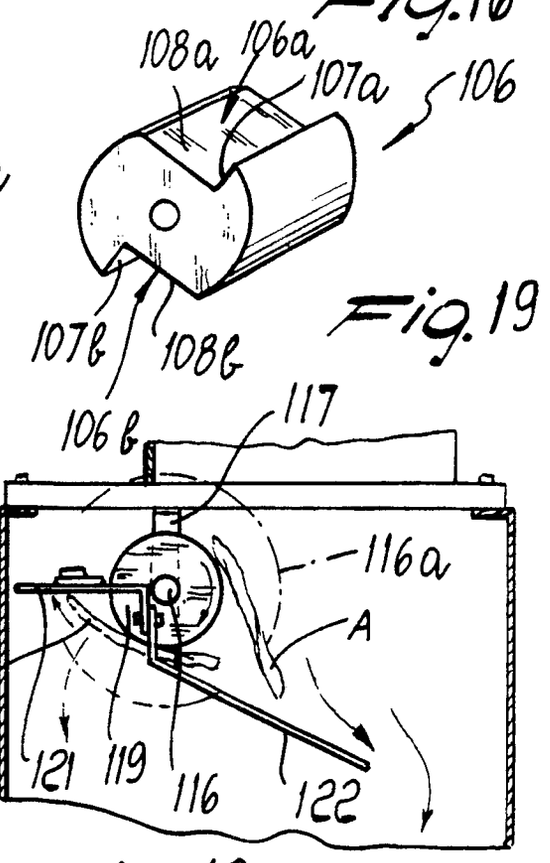


Fig.18

Fig.19