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(54) Title: APPARATUS FOR CRUSHING GLASS CONTAINERS

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(57) Abstract: An apparatus for crushing glass containers, which comprises, in combination, means for insertion and housing of at least one glass container to be crushed, mechanical means for crushing the glass container, and means for collecting the shivers of glass of the glass container.
APPARATUS FOR CRUSHING GLASS CONTAINERS

The present invention relates to the sector of electrical household appliances and in particular regards an apparatus designed to crush mechanically glass containers, which can be installed preferably in the compartment that is commonly located underneath the kitchen sink.

It is known that in a domestic environment or in commercial premises (restaurants or premises for consuming beverages and other foodstuffs), glass-containers, such as for example water bottles or wine bottles, once they have been emptied, are accumulated before being thrown into the purposely provided refuse bin.

Irrespective of the place in which the empty containers are accumulated, whether inside or outside a building, the drawback is that said containers present a considerable encumbrance, even though they are empty.

A further drawback is represented by the fact that the bins are rapidly filled by said empty containers and, consequently, the various operations of collection of the glass containers, of transport, and of subsequent storage are not facilitated.

The main purpose of the present invention is to overcome the above drawbacks by providing an electrical household appliance for crushing glass containers that will reduce their volume by approximately 90%.

According to the invention, the above has been obtained by providing an apparatus that comprises, in combination, means for housing at least one glass
container to be crushed, means for crushing said container, and means for collecting the pieces of glass.

A better understanding of the invention will be obtained from the ensuing detailed description with reference to the attached drawings, which illustrate, merely by way of example, some preferred embodiments.

In the drawings:

Figure 1 is a front view of a first embodiment of the apparatus for crushing glass containers forming the subject of the invention;

Figure 2 shows a longitudinal section of the apparatus of Figure 1, housed in which is a glass container;

Figure 3, similar to the previous one, shows the glass container that is reduced to shivers, which will be made to drop into an underlying collection drawer;

Figure 4A is a partially sectioned front view of the apparatus with a glass container to be crushed inside, resting on a purposely provided rotating support or cradle;

Figure 4B, similar to the previous one, shows the glass container reduced to shivers;

Figures 4C and 4D, which are similar to Figure 4A, show, respectively, the rotating support with the shivers of glass that drop by gravity into the collection drawer of the apparatus, and the support at its top end-of-travel position;

Figures 5A and 5B, which are similar to Figure 4A, show in sequence the movement of return of the support as far as its bottom end-of-travel position ready for
receiving another glass container to be crushed;

Figure 6A is a perspective view of the collection
drawer of the apparatus;

Figure 6B is a front view of the collection drawer
of Figure 6A;

Figure 6C is a sectioned side view of the collection
drawer of Figure 6A that contains shivers of glass;

Figure 7A shows a detail of the apparatus of Figure 1 representing a punch;

Figure 7B is a front view of the punch of Figure 7A;

Figure 8 shows a detail of the apparatus of Figure 1 representing the motor-driven rotating support or cradle for the glass container;

Figure 9 is a front cross-sectional view of the detail of Figure 8;

Figure 10 is a front view of a second embodiment of the apparatus;

Figure 11 is a top plan view of a detail of the apparatus of Figure 10, which is provided with a further rotating lateral support for receiving, in series, a plurality of glass containers to be crushed.

With reference to Figures 1 to 9, in the first-embodiment that is described, an apparatus for crushing glass containers is provided, comprising:

- means for insertion and housing of at least one glass container to be crushed;

- mechanical means for crushing the glass container;

- means for collecting the shivers of glass of the
glass container; and
- means for actuation of said mechanical crushing means.

According to the invention, said means for insertion and housing of at least one glass container to be reduced into shivers of glass are substantially constituted by a loading compartment B, provided in which are rotating means for supporting and centring said container during crushing and which are designed to be rotated after the container has been reduced to shivers to cause said shivers of glass to drop by gravity into the collection means.

The loading compartment B is provided with an opening/closing element 12, preferably a shutter element.

The means for supporting and centring the glass container comprise a rotating support or cradle 5, having a substantially semicylindrical shape designed to support and keep said container in a horizontal position. In other words, said rotating support 5 is nothing more than a semitubular element on which the container to be crushed rests.

In particular, said support 5 is designed to perform a first axial rotation through 180°, in which the support 5 passes from an initial position, in which the concavity faces upwards- and in which it remains until the container is reduced to shivers, to a final position, in which the concavity faces downwards to cause all the shivers of glass to drop downwards, and a second axial rotation through 180°, preferably opposite to the previous one, in which the support 5 returns
into the initial position to be able to receive another container to be crushed.

During carrying-out of the first rotation of the support 5, the shivers of glass start to drop downwards and end up into the collection means until the support 5, having reached its final position, is completely empty.

The support 5 turned preferably by an electric motor E.

In particular, in order to turn said support 5 about its longitudinal axis of rotation, provided at the rear is an axial pin rendered fixed with respect to the electric motor E and provided at the front are circular guides, arranged in the proximity of the opening/closing shutter element 12.

The opening/closing element 12 is provided with an actuation handle or knob.

It is preferable for the access opening of the loading compartment B to be provided with a diaphragm 13 with purposely shaped radial notches, made of rubber or bristle, to prevent accidental exit of shivers of glass upon insertion of another glass container to be crushed.

The mechanical crushing means are substantially constituted by a self-propelled box-shaped body A, which is designed to be lowered for applying pressure on the glass container and comprises a plurality of automatic punches 2, set preferably longitudinally, each of which is provided with at least one adjustable-tension spring, provided inside it, and a retractable tip P that comes out of said box-shaped body A so as to
facilitate breaking of the container before said box-shaped body A reduces it to shivers.

In other words, thanks to the descending movement of the box-shaped body 1, the tips P of the punches 2 first rest upon the outer surface of the glass container, and the springs begin to undergo compression, loading until they are suddenly released causing the tips P of the punches 2 to impact violently against the container, breaking it; the container is then reduced to shivers by the box-shaped body A, which continues to descend as far as its own end-of-travel position.

The breaking force varies according to the type of springs present within the punches 2.

The geometry of the tips P of the punches 2 varies according to the requirements of the material of which the container to be crushed is made.

It is preferable for each of the tips P of said punches 2 to be pyramidal or conical in shape.

In addition, it is preferable to provide for each tip P of the punches 2 means 11 designed to favour breaking of the glass container in the case where the punch 2 has only perforated and/or partially cracked the container itself, which are fixed with respect to the self-propelled box-shaped body A. In the example described, said means 11 are, for example, pyramidal in shape, preferably with edges in relief, or else conical.

In the example described, the box-shaped body A comprises four punches 2 aligned along the axis of the glass container, which are positioned in such a way as
to be arranged radially above the glass container and act directly on said container favouring breaking thereof before crushing by the box-shaped body A.

The self-propelled box-shaped body A is fixed to the structure of the apparatus by means of purposely provided slide guides 10.

According to the invention, the box-shaped body A is moved vertically via an electric motor M, fixed to the load-bearing structure of the apparatus and provided with a gear 4 fitted on its own shaft, which meshes with a vertical rack 3, fixed with respect to the box-shaped body.

The means for collecting the shivers of glass are substantially constituted by a drawer C, preferably extractable, which is set underneath the rotating support 5.

The drawer C is equipped on its top edges with purposely provided shaped guides 16.

It is preferable to provide in a side wall of the apparatus, preferably in a position corresponding to the drawer C, a gap for enabling housing of a diaphragm 15, which is designed to be inserted horizontally in a purposely provided slit or slot 18 on the front wall of the apparatus for closing at the top the drawer C, which can be extracted in conditions of safety when it contains pieces of glass.

Said horizontal slit 18 is provided with a brush 17 for cleaning the diaphragm 15 in a position-corresponding to the guide 16.

It is also advisable for the front wall of said drawer C to be provided with at least one portion made
of transparent material to enable the user to verify the amount of shivers of glass -that have dropped into the drawer itself, i.e., its level of filling.

The rear wall of the drawer C is provided with a shaped guide 19 to facilitate and guide exit from said drawer of the shivers of glass collected therein and introduction thereof into the purposely provided bin.

In the example described, said guide 19 is provided with a shutter 20 for opening and closing it so as to eliminate any accidental contact by the user with the shivered (and hence sharp) glass.

The drawer C is provided on its front wall with a handle.

The entire operating cycle is kept under control by an electronic board, which, by means of appropriate sensors and/or end-of-travel elements 21 (for example micro-switches) set, for example, at the end of the box-shaped body A and of the loading compartment B or in other strategic positions, maintains the apparatus in conditions of safety.

The means for actuation of the mechanical means for crushing the glass container comprise an electrical wiring system and at least two pushbuttons set on an outer-wall of the electrical household appliance:

- a main ON/OFF switch;
- a switch for start of the crushing cycle.

In the example described, said pushbuttons are positioned on the front wall of the apparatus.

In a second embodiment shown in Figures 10 and 11, the apparatus comprises a further rotating support or cradle 5' for enabling housing in a horizontal position.
of a further glass container to be crushed.

In the example described, said further support is set laterally with respect to the support previously described, and is connected thereto by means of an inclined surface or slide to enable said further container to slide or roll in the support once the latter is empty in its initial position ready for a new crushing cycle.

Advantageously, in said second embodiment, it is possible to introduce a plurality of further glass containers to be crushed so as to form a stack of containers, in which only the one positioned at the bottom of said stack rests directly on the further support or cradle.

In this way, the support can be loaded automatically with a further glass container to be crushed once the cycle of crushing of the container previously described is completed.

In order to move said further support or cradle, a further electric motor is purposely provided, designed to be operated when the first support is empty and in its initial bottom position.

In order for a glass container resting on the further cradle to roll into the cradle when the latter is empty, means are provided for detecting the presence of a container on the cradle, such as for example at least one photoelectric cell or sensor, and sending a signal to the further electric motor when said cradle is empty in such a way that said electric motor will turn the further cradle, thus enabling the container resting thereon to roll along the
inclined surface S.

Said detection means are preferably provided in the proximity of the further cradle 5'.

Obviously, the invention is earthed and is equipped with fuse and all the arrangements required by law.

Advantageously, the apparatus forming the 'subject of the invention enables crushing of all types of glass containers that may be found in a domestic environment or in commercial premises, with a considerable reduction of their volume.

The present invention has been described and illustrated according to some preferred embodiments, but it is understood that any person skilled in the branch may make modifications and/or equivalent replacements, without thereby departing from the sphere of protection of the present industrial patent right.
CLAIMS

1. An apparatus for crushing glass containers, characterized in that it comprises, in combination:
   - means for insertion and housing of at least one glass container to be crushed;
   - mechanical means for crushing the glass container; and
   - means for collecting the shivers of the glass container.

2. The apparatus according to the preceding claim, characterized in that said insertion and housing means are substantially constituted by a loading compartment (B) for introduction of the glass container, which is provided with an opening/closing element (12) and with rotating means for supporting and centring said container during crushing, which are designed to be rotated after the container has been reduced to shivers so as to cause said shivers to drop by gravity into the underlying collection means.

3. The apparatus according to the preceding claim, characterized in that said means for supporting and centring comprise a rotating support or cradle (5) of a substantially semicylindrical shape, which is designed to support and keep said container in a horizontal position.

4. The apparatus according to the preceding claim, characterized in that said rotating support (5) is designed to perform a first axial rotation through 1.80° in which said support (5) passes from an initial position, in which the concavity faces upwards and in which it remains until the container is reduced to
shivers, to a final position in which the concavity faces downwards to cause all the shivers of glass to drop down, and a second axial rotation through 180°, in which the empty support (5) returns into the initial position to be able to receive another container to be crushed.

5. The apparatus according to either Claim 3 or Claim 4, characterized in that it envisages an electric motor (E) for causing rotation of said support (5).

6. The apparatus according to the preceding claim, characterized in that, in order to cause rotation of said support (5) about its longitudinal axis of rotation, provided at the rear is an axial pin rendered fixed with respect to the electric motor (E) and provided at the front are circular guides arranged in the proximity of the opening/closing element (12).

7. The apparatus according to any one of Claims 2 onwards, characterized in that said opening/closing element (12) is a shutter element.

8. The apparatus according to any one of Claims 2 onwards, characterized in that the access opening of the loading compartment (B) is provided with a purposely shaped diaphragm (13), with radial notches, made of rubber or bristle.

9. The apparatus according to Claim 1, characterized in that the crushing means are substantially constituted by a self-propelled box-shaped body (A) designed to be lowered for crushing the glass container,

10. The apparatus according to the preceding claim, characterized in that said box-shaped body (A)
comprises a plurality of automatic plungers or punches (2), each of which is provided with at least one spring with adjustable tension, set inside it, and a retractable tip (P), which comes out of said box-shaped body (A) so as to facilitate smashing of the container before said box-shaped body (A) reduces it to shivers.

11. The apparatus according to the preceding claim, characterized in that, thanks to the descending movement of the box-shaped body (A), the tips (P) of the punches (2) are designed first to come to rest upon the outer surface of the glass container and then cause compression of the springs, which are loaded and then released suddenly causing said tips (P) to impact violently against the container, smashing it, said container then being reduced to shivers by the box-shaped body (A) which continues to descend as far as its own end-of-travel position.

12. The apparatus according to Claim 10 or Claim 11, characterized in that each tip (P) of the punches (2) has a pyramidal or conical shape.

13. The apparatus according to any one of Claims 10 onwards, characterized in that the box-shaped body (A) comprises four punches (2) aligned along the axis of the glass container, which are positioned in such a way as to be arranged radially above the glass container and act directly on said container.

14. The apparatus according to Claim 10 or Claim 11, characterized in that for each tip (P) of the punches (2) means (11) are provided designed to favour smashing of the glass container in the case where the punch (2) has only perforated and/or partially cracked
the container itself.

15. The apparatus according to the preceding claim, characterized in that said means (11) have a pyramidal shape, preferably with projecting sharp edges, or a conical shape.

16. The apparatus according to Claim 10, characterized in that the box-shaped body (A) is fixed to the structure of said apparatus by means of purposely provided slide guides (10).

17. The apparatus according to Claim 10, characterized in that the box-shaped body is moved vertically by an electric motor (M) fixed to the load-bearing structure of the apparatus and provided with a gear wheel (4) fitted on its own axis which meshes with a vertical rack (3) fixed with respect to the box-shaped body (A).

18. The apparatus according to Claim 1, characterized in that the means for collection of the shivers of glass are substantially constituted by a drawer (C) set underneath said means for insertion and housing of at least one glass container.

19. The apparatus according to the preceding claim, characterized in that said drawer (C) is extractable.

20. The apparatus according to Claim 18 or Claim 19, characterized in that said drawer (C) is provided with purposely designed shaped guides (16) on its top edges.

21. The apparatus according to any one of Claims 18 onwards, characterized in that the collection drawer (C) is provided with a gap for enabling housing of a
diaphragm (15) designed to be inserted horizontally in a purposely provided slit or slot (18) on the front-wall of the apparatus for closing the drawer (C).

22. The apparatus according to the preceding claim, characterized in that said slit (18) is provided with a cleaning brush (17).

23. The apparatus according to any one of Claims 18 onwards, characterized in that said drawer (C) is provided with at least one transparent portion on its front wall.

24. The apparatus according to any one of Claims 18 onwards, characterized in that the rear wall of the drawer (C) is provided with a guide (19) shaped so as to facilitate and guide outlet from said drawer of the shivers of glass collected therein and their introduction in a purposely provided bin.

25. The apparatus according to the preceding claim, characterized in that said guide (19) is provided with a shutter (20) for opening and closing it.

26. The apparatus according to Claim 4, characterized in that it comprises a further rotating support or cradle (5') for enabling housing in a horizontal position of a further glass container; said further support (5') being connected to the support (5) by means of an inclined surface or chute (S) to enable said further container to slide or roll into said support (5) when the latter is empty in its initial position; said further support (5') being set laterally with respect to the support (5).

27. The apparatus according to Claim 5,
characterized in that it comprises a further electric motor (D) for moving said further support (5').

28. The apparatus according to the preceding claim, characterized in that means are provided designed to detect the presence of a container on the support (5) and to issue a signal to said electric motor (D) when said support (5) is empty for rotating-the further -support (5'), enabling the container resting on the latter to roll along the inclined surface as far as the support- (5).

29. The apparatus according to any one of the preceding claims, characterized in that the entire working cycle is kept under control by an electronic card, which, by means of appropriate sensors and/or limit switches (21), maintains the apparatus itself in conditions of safety; said sensors (21) being preferably provided at the ends of the box-shaped body (A) and of the loading compartment (B) or in other strategic positions.

30. The apparatus according to Claim 1, characterized in that it comprises- means for actuation of said mechanical crushing means, said actuation means comprising an electric wiring system and at least two push-buttons on the front wall of the apparatus:

- a main ON/OFF switch; an
- a switch for starting up the crushing cycle.
INTERNATIONAL SEARCH REPORT

A. CLASSIFICATION OF SUBJECT MATTER

INV. B02C19/00

According to International Patent Classification (IPC) or to both national classification and IPC:

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols):

B02C  B65F  A47G

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched:

Electronic database consulted during the international search (name of database and, where practical, search terms used):

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

<table>
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<tr>
<th>Category</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No.</th>
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Further documents are listed in the continuation of Box C. See patent family annex.

* Special categories of cited documents:

* A* document defining the general state of the art which is not considered to be of particular relevance

* E* earlier document but published on or after the international filing date

* L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another invention or other special reason (as specified)

* O* document referring to an oral disclosure, use, exhibition or other means

* P* document published prior to the international filing date but later than the priority date claimed

* T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

* X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

* Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

* S* document member of the same patent family

Date of the actual completion of the international search: 15 September 2011

Date of mailing of the international search report: 26/09/2011

Name and mailing address of the ISA:

European Patent Office, P.B. 5818 Patentlaan 2
NL-2280 HV Rijswijk
Tel: (+31-70) 340-2040
Fax: (+31-70) 340-3016

Authorized officer:

Lei Tner, Josef
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This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. □ Claims Nos.: because they relate to subject matter not required to be searched by this Authority, namely:

2. □ Claims Nos.: because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. □ Claims Nos.: because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. □ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. □ As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.

3. □ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

   1-28

4. □ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

□ The additional search fees were accompanied by the applicant’s protest and, where applicable, the payment of a protest fee.

□ The additional search fees were accompanied by the applicant’s protest but the applicable protest fee was not paid within the time limit specified in the invitation.

☒ No protest accompanied the payment of additional search fees.
This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. Claims: 1-8, 26-28

An apparatus for crushing glass containers, comprising in combination; means for inserting and housing of at least one glass container to be crushed; mechanical means for crushing the glass container; and means for collecting the shivers of the glass container, with a loading compartment (B) for the inserting and housing of the glass container, which is provided with an opening/locking element (12) and with rotating means for supporting and centring said container during crushing, which are designed to be rotated after the container has been reduced to shivers so as to cause said shivers to drop by gravity into the underlying collecting means.

2. Claims: 9-17

An apparatus for crushing glass containers as above; where the crushing means are constituted by a self-propelled box-shaped body (A) designed to be lowered for crushing the glass container.

3. Claims: 18-25

An apparatus for crushing glass containers as above; where the means for collecting the shivers of glass are substantially added constituted by a drawer (C) set underneath said means for inserting and housing of at least one glass container.

4. Claim: 29

An apparatus for crushing glass containers as above; where the entire working cycle is kept under control by an electronic card, which, by means of appropriate sensors and/or limit switches (21), maintains the apparatus itself in conditions of safety.

5. Claim: 30

An apparatus for crushing glass containers as above; where means for actuating one of said mechanical crushing means comprising an electrical wiring system and at least two push-buttons on the front wall of the apparatus, a main ON/OFF switch; and a switch for starting up the crushing cycle.

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