Jan. 12, 1954 S. KAWA 2,665,632

ARTICLE CRUSHING APPARATUS

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FIG. 1.

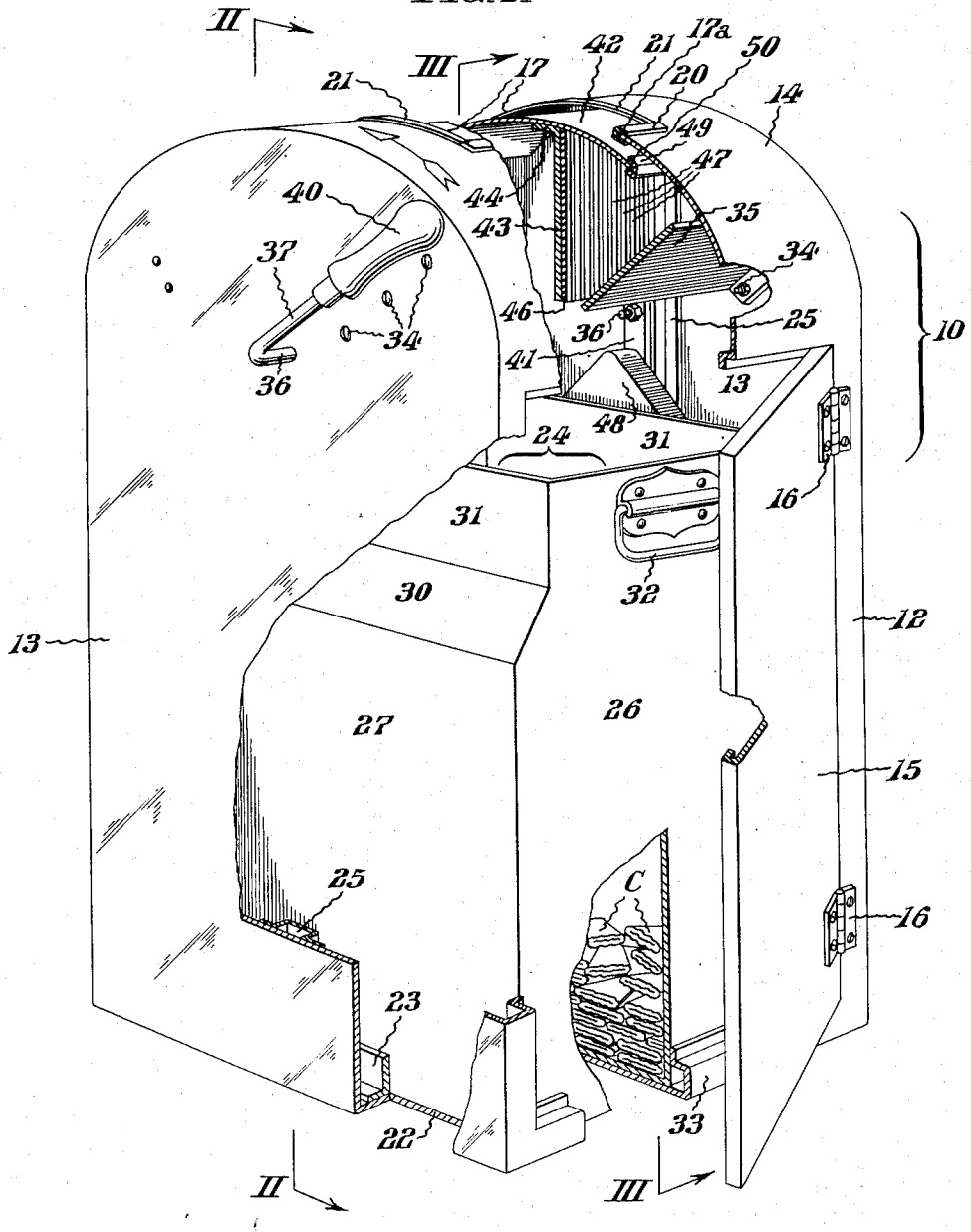

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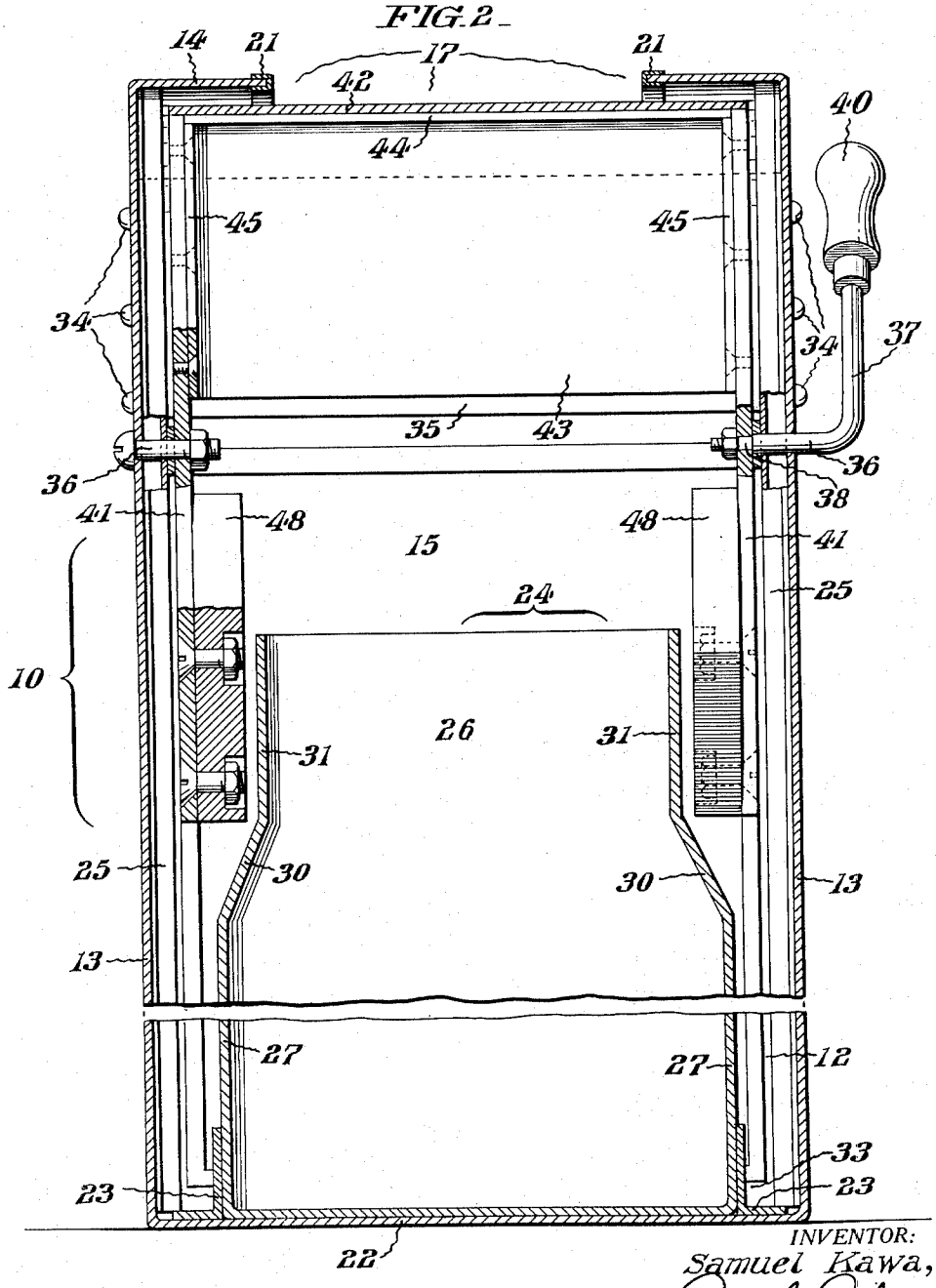
FIG. 2



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ARTICLE CRUSHING APPARATUS

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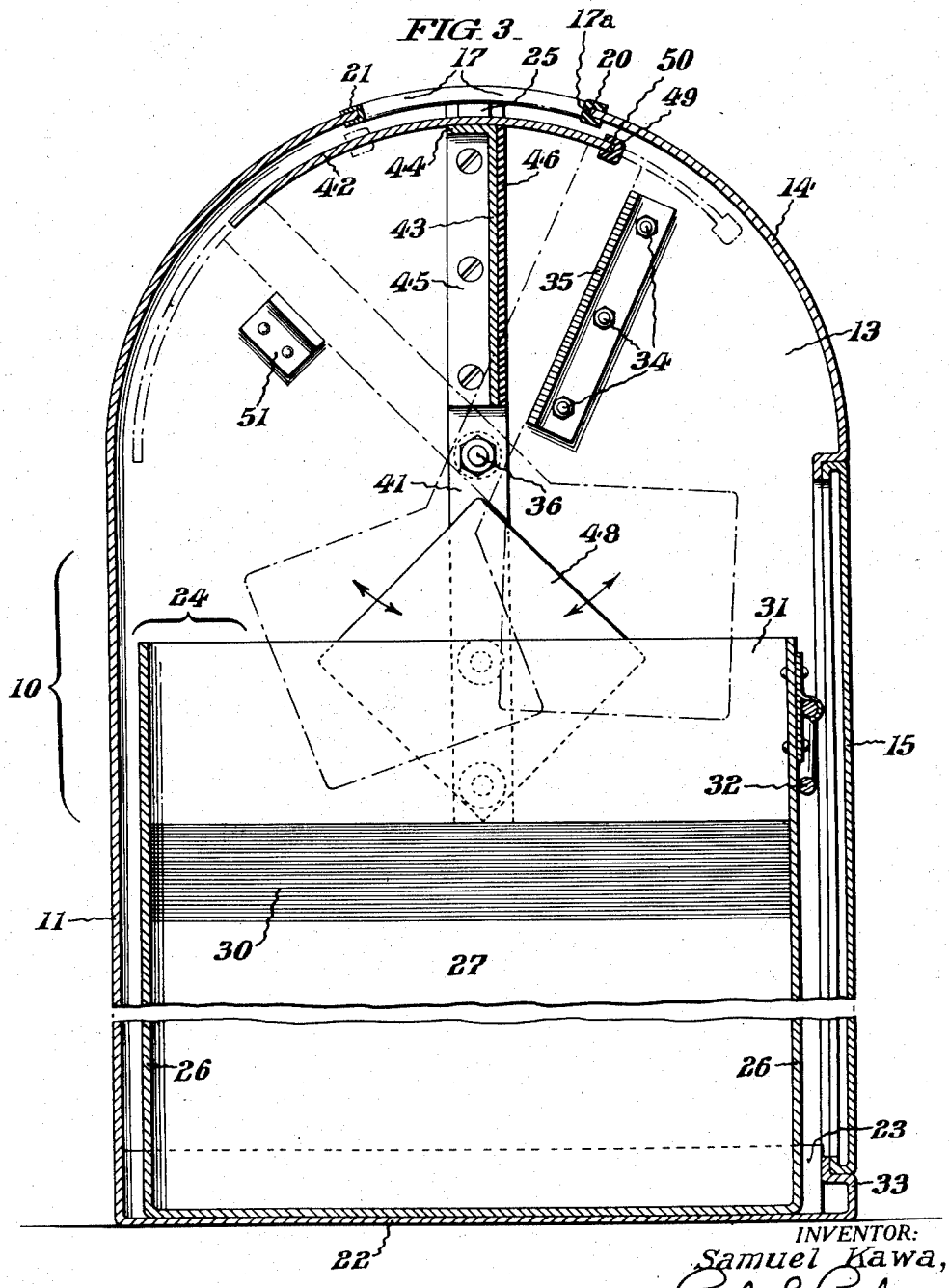
FIG. 3.



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ARTICLE CRUSHING APPARATUS

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FIG. 4.

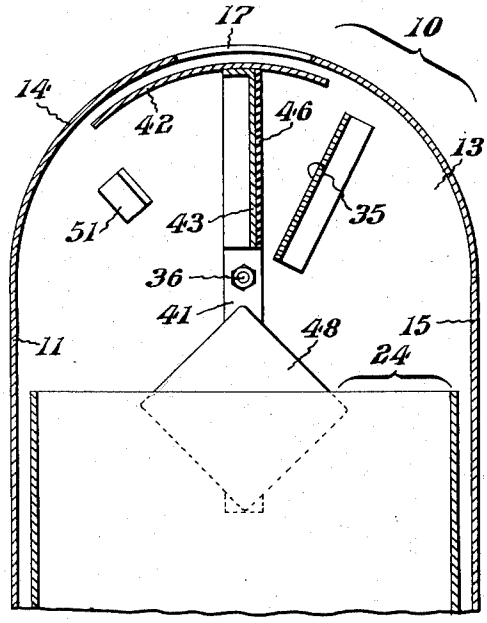


FIG. 5.

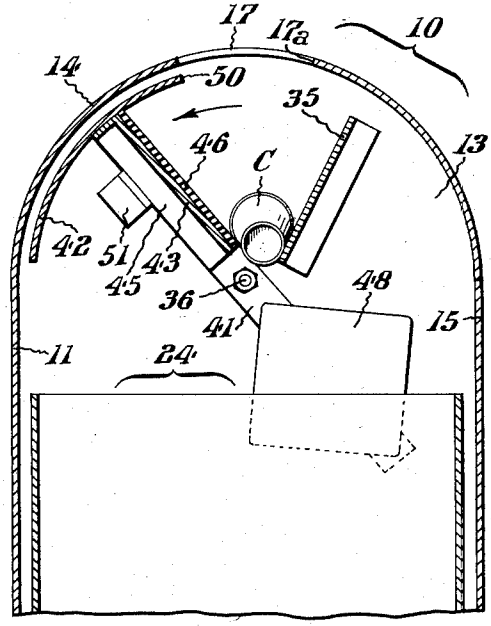


FIG. 6.

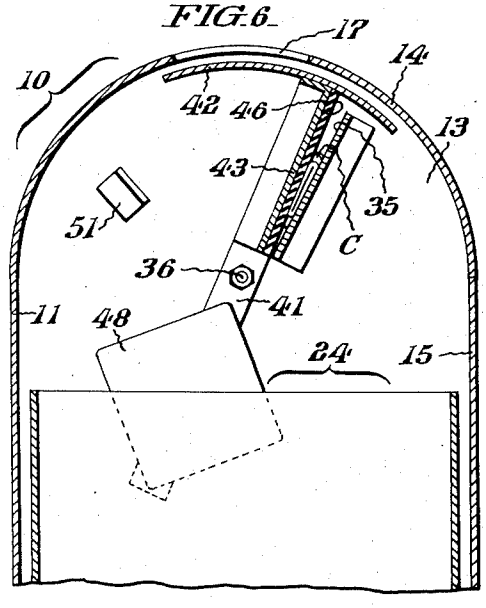
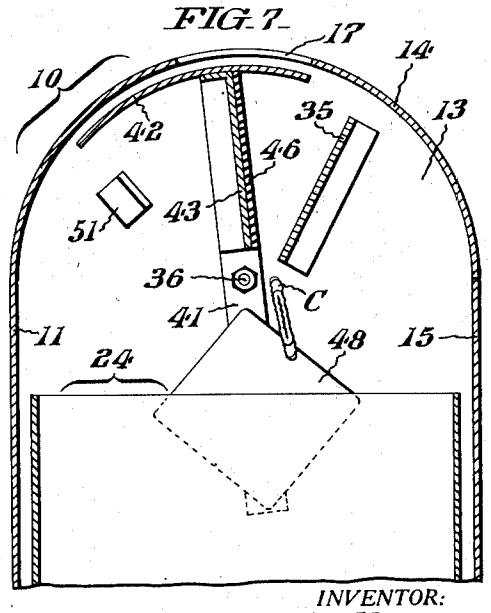


FIG. 7.



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Patented Jan. 12, 1954

2,665,632

UNITED STATES PATENT OFFICE

2,665,632

ARTICLE CRUSHING APPARATUS

Samuel Kawa, Philadelphia, Pa.

Application November 16, 1951, Serial No. 256,732

3 Claims. (Cl. 100—233)

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This invention relates to an article crushing apparatus, and more particularly concerns a receptacle into which relatively bulky or voluminous crushable objects such as paper cups, for example, may be inserted, such apparatus including automatic means for crushing the articles or objects as an incident to their insertion into the receptacle.

Conventional receptacles, particularly those receptacles adapted for storing paper objects such as cups and the like, are subject to the objection that their capacity is limited and they are accordingly rapidly filled up when relatively voluminous crushable objects are inserted therein. Paper cups are ordinarily of conical or frusto-conical form and when deposited at random into a receptacle they occupy a very large volume.

It is accordingly one object of this invention to provide apparatus for storing in a relatively small space a plurality of relatively voluminous crushable objects such as paper cups or the like. Another object is to provide apparatus including a receptacle for crushable objects in combination with automatic means for crushing said objects as they are deposited into the receptacle. Still another object is to provide means for increasing the storage capacity of a receptacle adapted to contain crushable objects such as paper cups or the like.

It has previously been proposed to provide crusher devices for paper cups, wherein a first paper cup is received and crushed as an incident to manipulation of a lever or linkage, and retained in the crusher device until the next time the lever or linkage is manipulated. However, this is subject to the objection that the subsequent manipulation of the apparatus does not always free the first cup crushed, and the presence of the first cup sometimes interferes with the ultimate crushing of the second cup, and may in certain instances jam or clog the crusher elements of the device.

It is another object of this invention to provide an apparatus which in one cycle of operation receives, crushes and discards a crushable object inserted therein.

It is a still further object of this invention to provide a substantially enclosed receptacle for paper and other crushable objects having a door or other closure which may be manipulated to open the enclosure and deposit a crushable object therein, together with automatic means for crushing said object and depositing it into the receptacle as an incident to the opening and closing of the enclosure.

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Other objects and advantages of the invention, including the simplicity and economy of the same as well as the efficiency of arrangement of the parts of the apparatus, will appear in further detail hereinafter and in the drawings, whereof:

Fig. 1 represents a view in perspective showing an apparatus which constitutes one specific embodiment of this invention;

Figs. 2 and 3 represent sectional views taken as indicated by the lines and arrows II—II and III—III, respectively, which appear in Fig. 1; and

Figs. 4–7 represent fragmentary diagrammatic sectional views substantially similar to Fig. 3, showing the positions assumed by certain parts of the apparatus at successive stages in its operation.

Turning now to the drawings, and specifically to Figs. 1–3 thereof, the number 10 designates an enclosure having a front wall 11, back wall 12 and side walls 13. The enclosure includes a rounded hood element 14 at the top thereof. A door 15 is mounted on hinges 16 on the back wall 12 of the enclosure 10.

The number 17 represents an opening formed centrally at the top of the hood element 14 through which crushable objects such as paper cups and the like may be inserted. Along the front edge 17a of the opening 17 is a rubber channel 20, while metal channels 21 are disposed around the back and side edges of the opening 17. The number 25 represents a pair of vertical stiffener channels which are mounted substantially centrally on the inner face of each enclosure side wall 13.

Formed along the bottom side edges within the enclosure 10, and affixed to the floor 22, are angle irons 23 serving as guide track means coacting with the floor 23 to guide and support a receptacle 24 which is open at the top and movable into and out of the enclosure 10 through the rear door 15. The receptacle 24 is constructed and arranged with its open top directly below the opening 17 in the enclosure 10, and serves as a storage container for the crushable objects, such as the crushed cups C shown in Fig. 1, within the enclosure 10.

The receptacle 24 has front and back walls 26, lower side walls 27, angled side walls 30 which form shoulders on the receptacle, and upper side wall portions 31. Upper side wall portions 31 are spaced closer to one another than the lower side wall elements 27. The number 32 represents a handle on the receptacle 24 facilitating its removal from the enclosure 10, whereby the receptacle 24 may be lifted over the retainer flange 33 formed along the lower edge of the back wall

12 of enclosure 10. While the drawings disclose such a retainer flange 33 which has the advantages of strength and rigidity as well as positive retention of the receptacle 24 within the enclosure 10, it will be appreciated that in instances where strength and positive retention are not primary factors the retainer flange 33 may be eliminated and the rear door 15 extended downwardly to the floor 22, thereby facilitating removal of receptacle 24 from enclosure 10 without lifting.

Fixed by means of screws 34 to the side walls 13 is a resilient fixed crusher plate 35 which is disposed at an angle to the vertical and spaced somewhat rearwardly of the center of the enclosure 10. A pair of pivot pins 36 extend through the stiffener channels 25, such pivot pins 36 having a common axis disposed substantially in a plane common to the plane of the fixed crusher plate 35. One of the pivot pins 36 carries a lever 37 and a handle 40. Fixed to this pivot pin 36, by means of a square joint 38, is a vertical arm 41 which has capacity to swing within the enclosure 10 about the axis of pivot pin 36. Another similar vertical arm 41 is pivoted to the other pivot pin 36. A door 42, affixed to the top of each arm 41, is curved to conform with the curvature of the hood element 14. The door 42 is disposed immediately adjacent the inner face of hood element 14 and the opening 17 therein. It has capacity to swing through an arc immediately adjacent said opening 17 to open and close the opening. A movable crusher plate 43 has a top flange 44 and end flanges 45 which respectively secure the movable crusher plate 43 to the door 42 and to each of the arms 41. Affixed to the face of the movable crusher plate 43 which faces the fixed crusher plate 35 is a rubber facing 46 having vertical ribs 47. The number 48 represents a pair of pendulum weights each of which is fixed to one of the arms 41 below the axis of pivot pin 36. Each pendulum 48 is disposed in a space between the upper portion 31 of the side wall of receptacle 24 and the corresponding side wall 13 of enclosure 10.

The door 42, see particularly Fig. 3 of the drawings, has a greater arcuate length than the side edge of opening 17, and normally overlaps the inner wall of hood element 14 at both the front and back boundaries of the opening 17 when the pendulum structure including the arms 41 and pendulum weights 48 assumes its normal vertical rest position. The number 49 represents a rubber channel strip formed at the front edge 50 of the door 42, while the number 51 represents a pair of stops which are affixed to the side walls 13 and disposed in the path of movement of the arms 41 and the movable crusher plate 43. The stops 51 are disposed at a greater angle to the pendulum rest position than is the fixed crusher plate 35.

The operation of the device will be apparent, having particular reference to Figs. 4–7 of the drawings. Assuming the apparatus is initially in its normal rest position as shown in Fig. 4, with the arms 41 maintained in a vertical position by the action of gravity on pendulum weights 48, a person desiring to discard a crushable object such as the paper cup C grasps the handle 40 and swings it through an arc in the direction indicated by the arrow in Fig. 5 until the movable arms 41 and end flanges 45 contact the stops 51. Concurrently with the swinging of handle 40, the door 42 swings to the position shown in Fig. 5 wherein its front edge 50 is substantially in alignment with the back edge of

the opening 17. Also the pendulum weights 48 swing upwardly through an equal angle to the position shown in Fig. 5. At this point each arm 41, and the movable crusher plate 43, is disposed at a greater angle to the vertical than is the fixed crusher plate 35. The cup C is then dropped through the opening 17 and is caught between the fixed and movable crusher plates 35, 43 which are disposed at angles to one another and spaced apart from one another at the lower extremities thereof. By reason of the spacing and angular relation of the crusher plates a conical or frusto-conical cup C is cradled between the crusher plates with its curved side walls in contact with the crusher plates, as indicated in Fig. 5.

The handle 40 is then released, whereupon the pendulum weights 48, under the influence of gravity, swing the door 42 to the closed position shown in Fig. 6, concurrently swinging the movable crusher plate 43 through and beyond the vertical position into sudden contact with the fixed crusher plate 35, thereby crushing the cup C. It is important to observe that, at the instant the cup C is crushed the door 42 is in position to close the opening 17. This is of importance from a standpoint of safety and also retains any liquid that may be liberated as a result of the cup being crushed within the confines of enclosure 10.

By reason of the momentum and resiliency of the crusher plates 35, 43 as well as the rubber facing 46, the movable crusher plate 43 rebounds from fixed crusher plate 35 after completing the crushing operation. Such rebound carries the movable crusher plate 43 through and beyond the vertical position to the position shown in Fig. 7, thereby increasing the spacing between the respective crusher plates at the bottom extremities thereof. This provides free space through which the crushed cup C readily falls. The crushed cup C is received in the removable receptacle 24, and the action of gravity on pendulum weights 48 ultimately returns the elments of the apparatus to the position shown in Fig. 4, whereupon the next crushable object may be received and processed in the manner described.

It will be appreciated that, while I have shown crusher elements in the form of plates having flat faces, other crusher elements performing the same function are equivalent thereto. For example, I have found that one crusher plate may be provided with apertures and the other crusher plate with spikes or other perforating means arranged in alignment with said apertures. The perforating means are adapted to penetrate through the apertures when the crusher plates are brought together. In accordance with such construction, the spike or perforating elements penetrate through the opposed side walls of a paper cup as it is crushed, locally deforming said walls and crimping the deformed portions together to such an extent that the walls of the paper cup are held together after the crushed cup is released from the crusher elements. This is of great advantage in that it minimizes the tendency of the cup walls to move apart after crushing, which is their normal tendency by reason of their inherent elasticity. The number of cups stored in a receptacle of given volume is materially increased as a result of this construction, whereby the volume of each crushed cup is maintained at a minimum.

It will further be appreciated that in instances where the retainer flange 33 is eliminated, the

hinged door **15** may be replaced by a slidable door, such slidable door preferably being fixed directly to the back wall of the removable receptacle **24**.

It will be appreciated that while I have shown and described pendulum means having a normally vertical rest position, the invention also embraces the use of weight means having a non-vertical inoperative position, such weight means being supported on a stop element or equivalent device. For example, for convenience and economy of manufacture, the arms **41** may extend at an angle upwardly into the hood element **14** at an angle to the vertical, thereby providing additional storage space for the crushed objects. Under such conditions a conventional rectangular receptacle may be substituted for the receptacle **24**.

Although I have described in considerable detail one example of my invention, it will be appreciated that the apparatus is capable of a wide variety of applications and uses and that certain features thereof may be used to advantage without the use of other features. It is to be understood that the specific mechanisms referred to and claimed herein are intended to comprehend all mechanical equivalents and reversals of parts which function in a similar manner to accomplish the same result.

Having thus described my invention, I claim:

1. Article crushing apparatus comprising crusher plates one movable toward and away from the other, pendulum means fixed to the movable crusher plate, said pendulum means having a normally vertical rest position, manually operable means for separating said crusher plates to admit the article therebetween, said crusher plates having retainer portions which retain the article between them when they are thus separated, said manually operable means also swinging said pendulum means away from the vertical whereby the pendulum means has capacity upon release of said manually operable means to move the movable crusher plate under gravity action toward the other crusher plate to crush the article therebetween, and resilient means operable when the crusher plates come together to cause the movable crusher plate to rebound away from said other crusher plate after crushing the article, whereby free space is provided between the retainer portions of said crusher plates immediately below the crushed article through which the crushed article may fall.

2. A paper cup crusher comprising a housing having an opening at the top thereof, an arm pivotally mounted for swinging movement about a pivot point in said housing, a door fixed on said arm with capacity to reciprocate adjacent said opening, said door including extension elements extending beyond the boundaries of said opening immediately adjacent the inner face of said housing, a weight fixed on said arm, a fixed crusher plate fixed inside said housing below said opening, and a movable crusher plate fixed on said arm, said weight and said movable crusher plate being secured to said arm on opposite sides of said pivot point whereby said movable crusher plate has capacity to move toward said fixed crusher plate under the sole influence of said weight to crush said cup as an incident to swinging said door to close said opening, and a resilient facing on one of the crusher plates causing said movable plate to rebound away from said fixed plate after crushing the cup.

3. Article crushing apparatus comprising a housing having an opening therein, a pendulum pivotally mounted below said opening, said pendulum having a normal rest position, means for swinging said pendulum about its pivot, a dynamic crusher plate fixed on said pendulum for swinging movement through an arc about said pivot, a static crusher plate disposed in the path of swinging movement of said dynamic crusher plate at one side of the rest position of said pendulum, and stop means adapted to limit the movement of said dynamic crusher plate at a definite stop point at the opposite side of said rest position, said stop point being at a greater arcuate angle from the rest position than is said static crusher plate, said stop also being so positioned that the opening between the separated crusher plates is wider than the crushed article but of less width than the article before crushing.

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