Bottom cup holder 22 (Figs. 3-5 and 13) includes a bottom wall 22a, side wall 22b and top perimeter edge 22c having a plurality of annularly spaced recesses 22d which may align with and engage protrusions 16e of bottom cup 16 when placed therein. Bottom cup holder 22 fits within the complementary shaped center recess 24a of rotator base element 24 (see also Figs. 9 A and 9B). Rotator base element 24 includes a lower wall segment 24b which is radially spaced from a center stem 24c having a plurality of annularly spaced vanes 24d extending radially outwardly therefrom (see Fig. 9B). Bottom cup holder 22 includes a plurality of annularly spaced rib elements 22e which may align with and engage a like plurality of annularly spaced openings 24e formed along the lip 24f and extending partly down the side wall 24g thereof (see Fig. 9A). As such, bottom cup holder 22 is rotationally fixed to rotator base element 24.

Rotator base element 24 may be rotationally fixed to a second base element 26 via vanes 24d aligning with and fitting within respective walled slots 26b which radially extend from center aperture 26a (see Figs. 4, 9B and 10A). Second base element 26 includes a lower annular wall segment 26c defining a center bore 26d (see Fig. 10B). A third base element 36 (see Figs. 4, 5 and 12) includes a center stem portion 36c which telescopes into center bore 26d of second base element 26. As seen best in Fig. 12, third base element 36 further includes a ring element 36a which lies concentrically radially outwardly of center stem portion 36c which forms an annular channel 36d therebetween. With center stem portion 36c inserted into center bore 26d, annular wall segment 26c resides within annular channel 36d (see Fig. 4).

Third base element is seen to further include a shoulder portion 36b and stem portion 36e having a center bore 36g into which the output shaft of a drive motor (not shown) positioned there beneath may extend. Shoulder portion 36b is further seen to taper in a spiral fashion from a minimum width portion 36b' to a maximum width portion 36b" which forms a step 36b'" for reasons explained below.

A first axial translation element 30 having internal threads 30a, terminating on both ends at thread ledges 31a and 31a' (Fig. 11), and external splined surface 30c (see Figs. 4, 5 and 11) is fixed to second base element 26, e.g., via screws passed through holes 30b which align with respective holes 26f (see also Fig. 10B). A second axial translation element 34 is provided having threads 34a on the outer wall surface thereof and terminating in a ledge portion 34b (Fig. 14) at one end and at a stop portion 34d (Fig. 5) at the opposite end. The lower surface 34c is seated against shoulder portion 36b of third base element 36 (Fig. 12) with ledge portion 34b abutting step 36b' ". Second axial translation element 34 resides within first axial translation element 30 with threads 30a engaging threads 34a (see Fig. 4).

Third base element stem portion 36e extends into a center bore 40a of a housing mount 40 with stem clips 36f (Fig. 12) engaging and fixing third base element 36 to mount 40. Shoulder portion 36b is thus seated upon ledge 40b of housing mount 40. First axial translation element 30, second base element 26, second axial translation element 34, and third base element 36, when connected accordingly (discussed above) define a cup holder fixture.

A chip guard 50 (Figs. 4 and 5) is provided which encircles the nesting cups 16, 18 within machine 10. In Fig. 4, cups 16, 18 are not shown for the sake of clarity, but would reside in the space "S" between top cup holder 20 and bottom cup holder. The juncture of the cup perimeters wherein gap "G" is formed (Fig. 8) would reside in area indicated by reference arrow SG in Fig. 4. With chip guard wall segment 50a located radially outwardly of space SG, any pill fragments "F" which could otherwise escape through this area are physically blocked by the chip guard.

In a preferred embodiment, chip guard 50 has a length extending from top cup holder base wall 20a to a position along rotator base element outer side wall 24e. A ring element 52 is provided which attaches to chip guard 50 via clips 50b integrally formed in the chip guard 50. One or more spring loaded plunger elements 54 connect ring 50 to second base element 26 at holes 26'. As such, spring loaded plunger elements 54 act to bias ring 52 and hence also chip guard 50 toward and against top cup holder base 20a. If desired, one or more notches 50c may be provided adjacent the top edge 50d which provide open access to the nested cups. In an alternate embodiment, plunger elements 54 may be electronically controlled whereby they may be signaled to retract when desired which acts to pull ring 52 and chip guard 50 down (toward housing base 13). The retracted position of chip guard 50 would provide access to the cup sitting in bottom cup holder 22.

In yet another embodiment, chip guard 50 may be fixed to and move together with lid 14 such that when lid 14 is opened, chip guard 50 is lifted away from bottom cup holder 22. Likewise, when lid 14 is closed in preparation for pill crushing operation, guard 50 is lowered into its physical blocking position adjacent gap G.

To crush one or more pills, bottom cup 16 is placed in bottom cup holder 22. Pills "P" are placed inside bottom cup 16 and a top cup 18 is placed (nested) inside bottom cup 16 with the pills P located therebetween (Fig. 8). Lid 14 is closed and latched at 15 (Figs. 3A-3D). The motor (not shown) is activated which rotates third base element 36 as described above. Referring to Fig 12, rotation of third base element 36 in a clockwise direction "CW" causes step 36b" to push against ledge portion 34b which causes rotation of second axial translation element 34 in the same direction. First axial translation element 30 is prevented from rotating

with second axial translation element 34 due to one or more prongs 31 which extend from ledge 40b of housing mount 40.

As seen best in Fig. 14, each prong 31 includes a radially inward extension 3 la which terminates in a splined face 31b. Splined face 31b meshes with the splined surface 30c of first axial translation element 30 and, since the splines extend in a longitudinal direction (parallel to housing axis X-X), first axial translation element 30 is prevented from rotating while splined face 31b is in meshing engagement with splined surface 30a. However, since first axial translation element 30 is threadedly engaged to second axial translation element 34 as explained above, first axial translation element 30 will ride along the threads in an upward, axial direction toward lid 14 until thread ledge 31a' releasably engages stop portion 34d to apply a brake. And since bottom cup holder 22 is rotationally fixed to second base element 26, which in turn is rotationally fixed to rotator base element 24, which in turn is rotationally fixed to bottom cup holder 22, they too will all rotate together with bottom cup holder 22 while translating in the same upward, axial direction. This axial translation presses bottom cup 16 up against top cup 18 (which itself is biased toward bottom cup 16 by spring loaded plunger 21 as described above).

Spring 56 extends between rotator base element 24 and second base element 26 to provide additional biasing force of bottom cup holder 24 in the upward direction toward lid 14. This upward, linear force may act to first crack pills P located between the nesting cups. Once splined surface 30a is clear of splined face 31b, first axial translation element 30 is free to rotate together with second axial translational element 34. With bottom cup holder interconnected with first axial translation element 30, it too will rotate and cause bottom cup 16 to rotate since they are rotationally fixed together.

As discussed above, top cup 18 remains rotationally fixed via engagement of protrusions 18e with recesses 20a in lid 14. As such, bottom cup 16 rotates against and with respect to top cup 18 which provides a crushing and grinding action upon the pills P located therebetween. As seen in Figs. 8A and 8B, while the crushed pill particles are allowed to migrate in a radially outward direction, and potentially also up between the side walls 16b, 18b of the top and bottom cups, any pill chip fragments "F" (Fig. 8A) are physically blocked from escaping through gap G by chip guard 50 in the manner explained above. Of course as the pills are being ground into ever smaller particles, the cups begin to move closer together due to the bias forces discussed above. Fig. 8B illustrates the cups very close together at a point near or at the end of the pill crushing operation. The side wall spacing "SWS" between the nesting cups tapers outwardly in a direction toward the cups' top perimeters with the fine

What is Claimed is:

1. Pill crushing apparatus for use with first and second nestable cups, said apparatus comprising:

a) a first cup holder configured to removably hold said first cup;

b) a cup holder fixture axially aligned with said first cup holder;

c) a ~~rotatable base part~~ rotator base element axially aligned with said cup holder fixture opposite said first cup holder, said ~~rotatable base part~~ rotator base element operably engaged with said cup holder fixture such that said cup holder fixture and said ~~rotatable base part~~rotator base element may translate linearly with respect to each other;

d) a second cup ~~mounting surface~~ holder axially alignable with said first cup holder opposite said cup holder fixture and configured to releasably engage said second cup; and

e) a chip guard adapted to encircle the perimeters of said nestable cups;

whereby, upon rotation of said ~~rotatable base part~~ rotator base element, said cup holder fixture translates said first cup holder into engagement with said second cup ~~mounting surface~~ holder thereby causing said cup holder fixture to rotate with respect to said second cup ~~mounting surface~~holder and thereby imparting a grinding force against pills held between said first and second cups, and wherein said chip guard prevents ground pill material from escaping through a gap formed at the juncture of said nestable cup~~s~~ perimeters.

2. The apparatus of claim 1 and further comprising a spring between said cup holder fixture and said first cup holder, said spring becoming gradually compressed as said cup holder fixture moves toward and engages said first cup holder.

3. The apparatus of claim 1 and further comprising a drive shaft connected to and operable to rotate said ~~rotatable base part~~ rotator base element.

4. The apparatus of claim 1 and further comprising a housing and a lid movable between an open and closed position with respect to said housing, said second cup ~~mounting surface~~ holder

located on said lid and axially aligned with said first cup holder when said lid is in said closed position.

5. The apparatus of claim 1 wherein:

a) said cup holder fixture further includes a first set of threads;

b) said ~~rotatable base part~~ rotator base element further includes a second set of threads which mesh with said first set of threads on said cup holder fixture such that said cup holder fixture and said ~~rotatable base part~~ rotator base element may translate linearly with respect to each other; and

c) a brake releasably ~~connected~~ applied to said cup holder fixture~~, said brake operable between an engaged position wherein said cup holder fixture cannot rotate and is thereby forced to translate linearly along said rotatable base part when said rotatable base part is rotating, and a released position wherein said cup holder fixture may rotate with said rotatable base part~~;

whereby, upon rotation of said ~~rotatable base part~~ rotator base element and when said brake is ~~in said engaged position~~applied to said cup holder fixture, said cup holder fixture translates linearly along said rotatable base part toward said first cup holder moving said first cup holder into engagement with said second cup ~~mounting surface~~holder and causing said brake to ~~move to said released position~~release and thereby ~~allowing~~ allow said cup holder fixture to rotate with respect to said second cup ~~mounting surface~~holder and thereby impart~~ing~~ a grinding force against pills held between said first and second cups.

~~6. Pill crushing apparatus for use with first and second nestable cups, said apparatus comprising:~~

~~a) a first cup holder configured to removably hold said first cup;~~

~~b) a cup holder fixture axially aligned with said first cup holder, said cup holder fixture including a first set of threads;~~

~~c) a rotatable base part axially aligned with said cup holder fixture opposite said first cup holder, said rotatable base part including a second set of threads which mesh with said first set~~

~~of threads on said cup holder fixture such that said cup holder fixture and said rotatable base part may translate linearly with respect to each other;~~

~~d) a second cup mounting surface axially alignable with said first cup holder opposite said cup holder fixture and configured to releasably engage said second cup; and e) a brake releasably connected to said cup holder fixture, said brake operable between an engaged position wherein said cup holder fixture cannot rotate and is thereby forced to translate linearly along said rotatable base part when said rotatable base part is rotating, and a released position wherein said cup holder fixture may rotate with said rotatable base part;~~

~~whereby, upon rotation of said rotatable base part and when said brake is in said engaged position, said cup holder fixture translates linearly along said rotatable base part toward said first cup holder moving said first cup holder into engagement with said second cup mounting surface and causing said brake to move to said released position and thereby allowing said cup holder fixture to rotate with respect to said second cup mounting surface and thereby imparting a grinding force against pills held between said first and second cups, wherein said first cup has an upper wall segment having an outwardly curved surface and a lower wall segment having an inwardly curved surface and said second cup is smaller than said first cup so as to be nestable within said first cup, said second cup having a perimeter flange, an upper wall segment and a lower wall segment with the lower wall segment adapted to interface closely with said lower wall segment of said first cup so as to promote said grinding force and wherein said upper wall segment of said first cup and said upper wall segment of said second cup create a gap which tapers outwardly in a direction toward said perimeter flange.~~

~~7. The apparatus of claim 6 wherein said outwardly curved surface of said first cup has a radius of about 1.380 mm, said inwardly curved surface of said first cup has a radius of about I.662 mm, said upper wall segment of said second cup extends at an angle of about 100° with respect to said perimeter flange, and said lower wall segment of said second cup extends at an angle of about 170° with respect to said upper wall segment of said second cup.~~

~~8. The apparatus of claim 6 and further comprising a spring between said cup holder fixture and said first cup holder, said spring becoming gradually compressed as said cup holder fixture moves toward and engages said first cup holder.~~

~~9. The apparatus of claim 6 and further comprising a drive shaft connected to and operable to rotate said rotatable base part.~~

~~10. The apparatus of claim 6 and further comprising a housing and a lid movable between an open and closed position with respect to said housing, said second cup mounting surface located on said lid and axially aligned with said first cup holder when said lid is in said closed position.~~

~~I I . The apparatus of claim 6 and further comprising a chip guard adapted to encircle said nestable cups, said chip guard adapted to prevent said ground pill material from escaping said nestable cups.~~

~~12. Pill crushing apparatus for use with first and second nestable cups, said apparatus comprising a first cup having an upper wall segment having an outwardly curved surface and a lower wall segment having an inwardly curved surface; and a second cup smaller than said first cup so as to be nestable within said first cup, said second cup having a perimeter flange, an upper wall segment and a lower wall segment with the lower wall segment adapted to interface closely with said lower wall segment of said first cup so as to promote a grinding force against pills held between said first and second cups, and wherein said upper wall segment of said first cup and said upper wall segment of said second cup create a gap which tapers outwardly in a direction toward said perimeter flange.~~