July 12, 1949. E. B. BANKS 2,476,078

TUMBLING MACHINE

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FIG. 2.

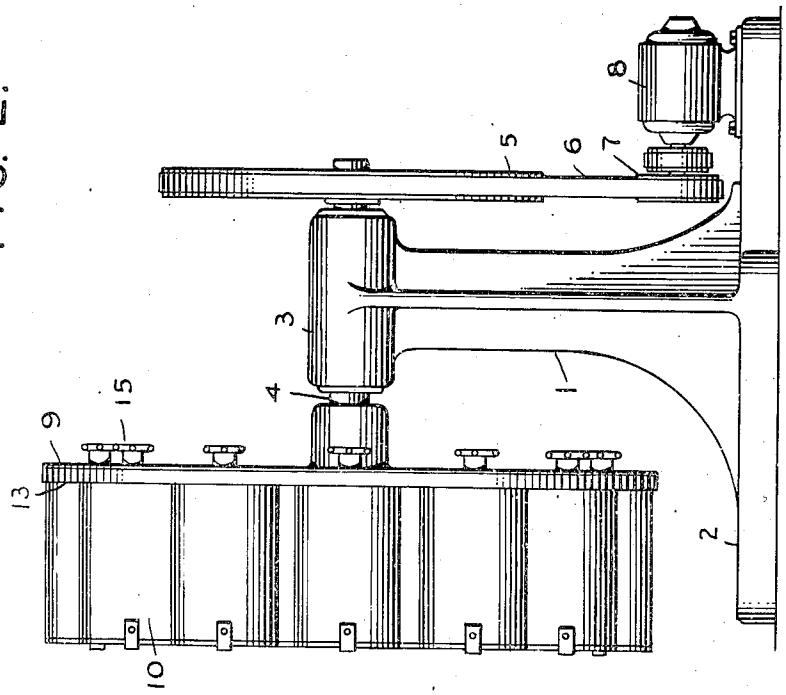
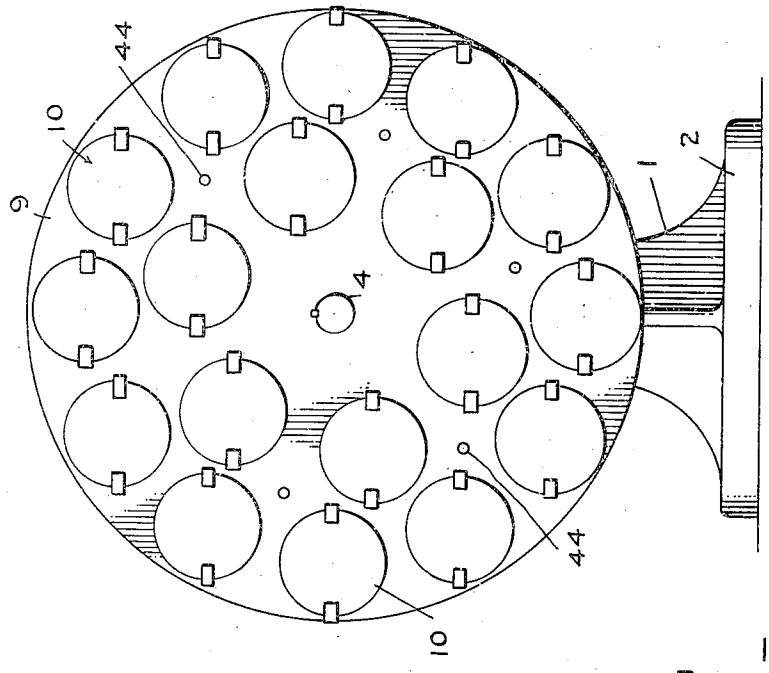



FIG. 1.




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FIG. 3.

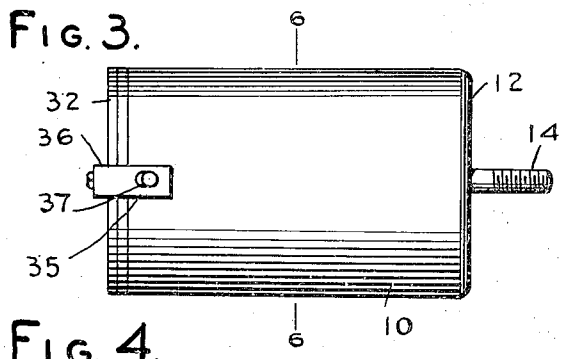



FIG. 6.

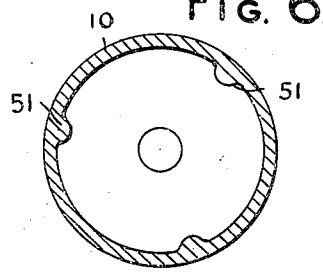



FIG. 4.

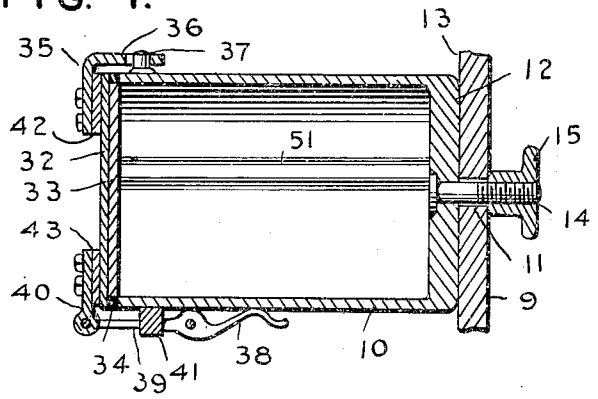



FIG. 8.

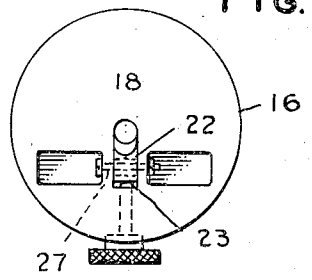
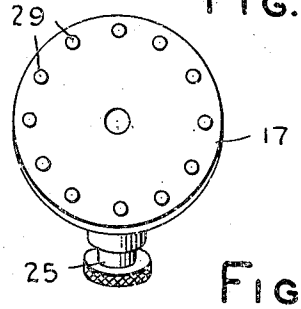



FIG. 9.



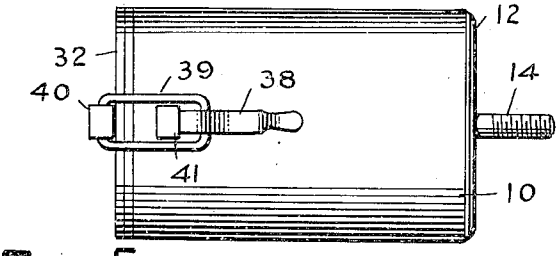




FIG. 5.

FIG. 10.

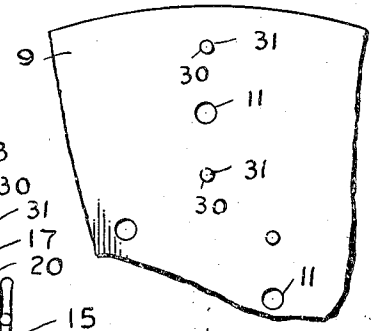



FIG. 7.

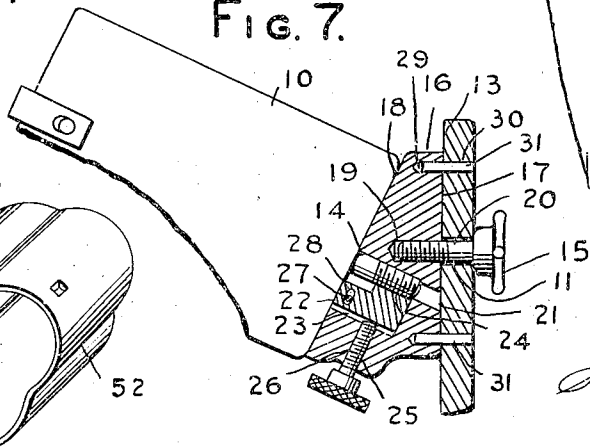
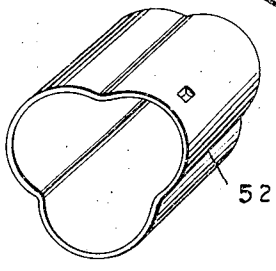



FIG. 11.




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FIG. 17.

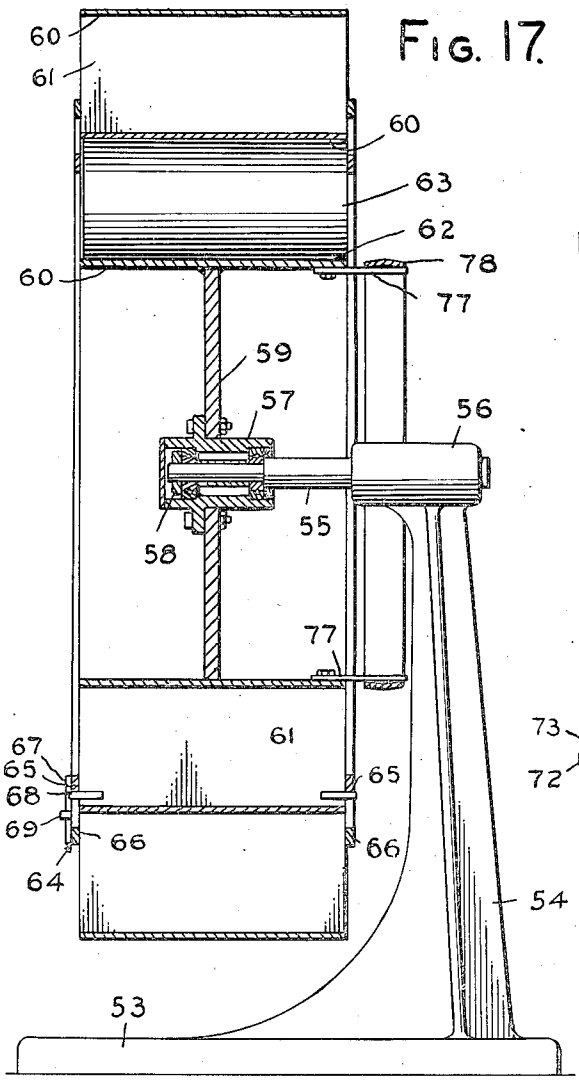



FIG. 18.

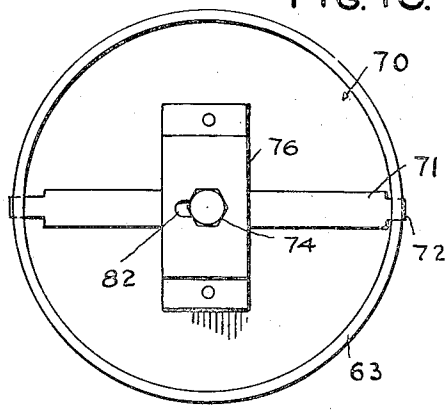



FIG. 19.

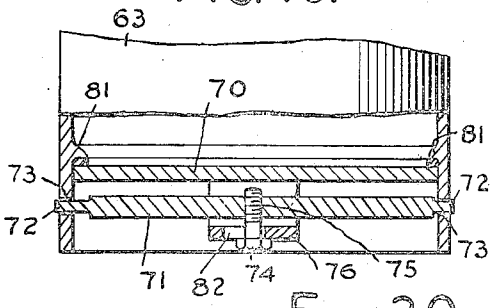



FIG. 20.

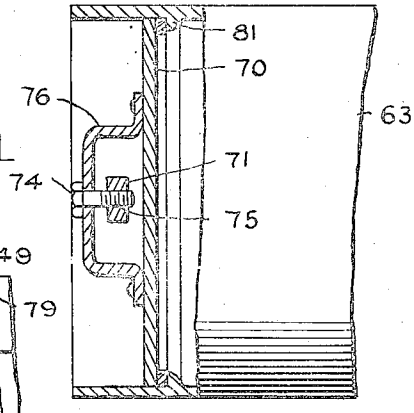
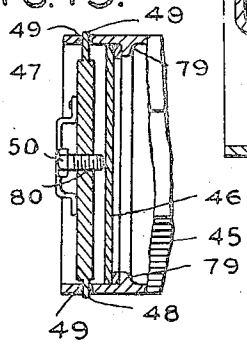



FIG. 13.



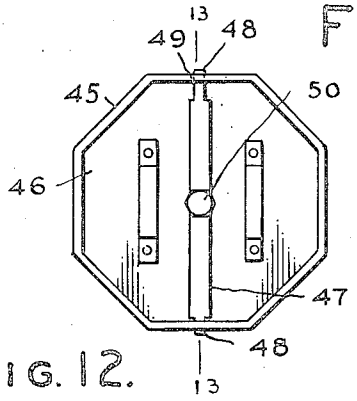




FIG. 12.

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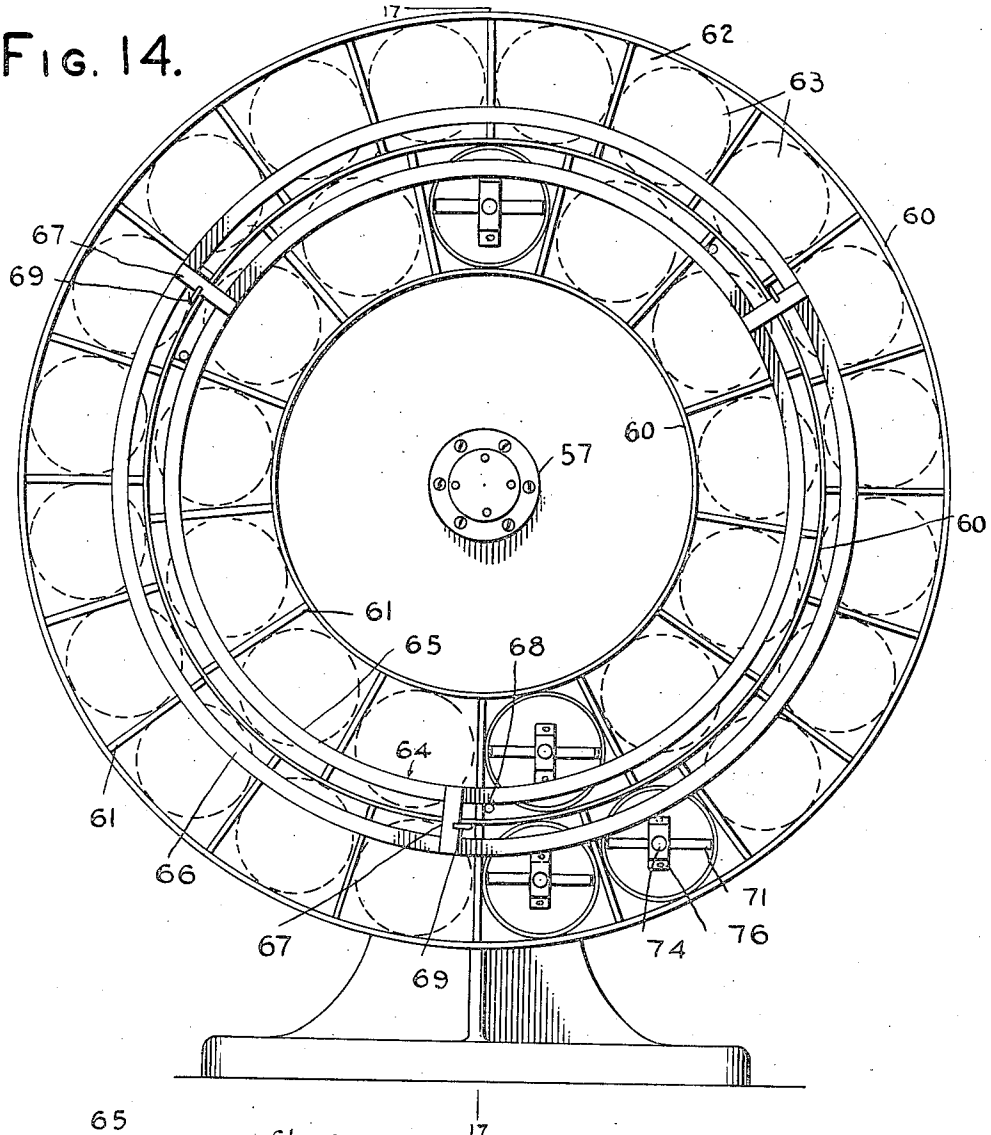
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TUMBLING MACHINE

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FIG. 14.



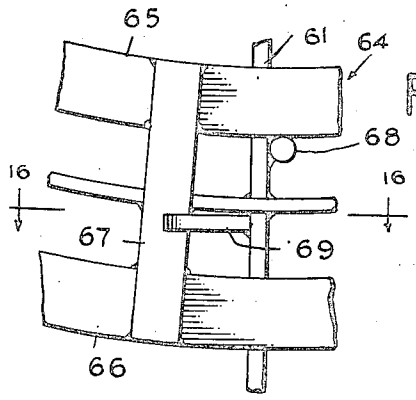




FIG. 15.

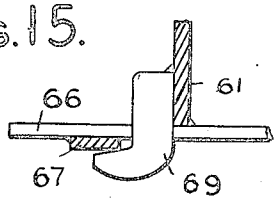



FIG. 16.

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Patented July 12, 1949

2,476,078

# UNITED STATES PATENT OFFICE

2,476,078

## TUMBLING MACHINE

Ernest B. Banks, Elmira, N. Y.

Application March 21, 1947, Serial No. 736,131

13 Claims. (Cl. 51—164)

1

This invention relates to an improved tumbling machine particularly adapted for burring and burnishing objects.

An object of the invention is to provide an improved tumbling machine having a rotary container support of simple construction that will take various shapes and sizes of containers, and in which the containers can be easily positioned upon and removed from the support and readily interchangeable to the ends, that containers of various forms built to suit the particular parts to be operated on can be employed, and all types of parts including frail, slender and long parts, and parts having perforations, especially long slots, can be efficiently deburred and polished without distortion.

Another object of the invention is to provide an improved tumbling apparatus including a tumbling container carrier rotatable about a horizontal axis, and a plurality of individual tumbling containers adapted to be individually applied to and removed therefrom.

Another object of the invention is to provide an improved tumbling apparatus including a tumbling container and a plurality of individual interchangeable selectively removable and replaceable tumbling containers so that one or more or all of the containers may be readily removed from the container carrier and replaced thereon or others substituted therefor.

Another object of the invention is to provide an improved tumbling machine of the character referred to, in which the containers will be easy and fast to load, and which can efficiently and expeditiously handle all types of parts and sizes of load.

A further object of the invention is to provide in a construction of the character referred to, simple, efficient means whereby the containers may be disposed at an inclination to the axis of rotation of the support as well as parallel thereto, and the angular relationship may be varied to obtain different degrees of tumbling action to suit different conditions as regards the particular shape and size of the parts to be operated on.

An important novel characteristic of the invention resides in the special construction and arrangement of the rotary container support on the end portion of a shaft extending horizontally to one side of a standard on which the shaft is mounted, that provides for compactly arranging the containers on the support disposed lengthwise relatively to the axis of rotation of the same, and for easy positioning the containers on the support and the removal of the same from the

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support from one end thereof to empty or refill them and facilitating rapid loading and unloading the machine.

The invention comprehends a container support mounted for rotation about a horizontal axis and having a flat surface at one side thereof disposed at right angles to its axis of rotation, with a container having a flat surface at one end and means for detachably securing the same on the support with its flat end face fitting against the flat face of the support. Another important novel feature of the invention lies in the provision of an adapter block having end faces extending at an angle to each other and adapted to be interposed between the end of the container and the support whereby the container may be disposed at an inclination to the axis of rotation of the support as well as parallel thereto.

Other novel features of the invention reside in the particular means provided for detachably securing the container on the support without the adapter block or member and also with the adapter block or member, and in the provision of means for locking the adapter block in different positions of rotary adjustment about its longitudinal axis to vary the angular relationship of the container relatively to the axis of rotation of the support.

The invention, with other objects, novel features and advantages thereof, and the particular construction, combinations and arrangements of parts comprising the same will be understood from the hereinafter contained detailed description when considered in connection with the accompanying drawings forming part hereof and illustrating two preferred embodiments of the invention.

In the drawings:

Fig. 1 is a front elevation of a tumbling machine constructed in accordance with the present invention, the containers being shown mounted on the support without the adapter blocks;

Fig. 2 is a side elevation of the construction shown in Fig. 1;

Fig. 3 is a side elevation, on an enlarged scale, of one of the containers shown in Figs. 1 and 2;

Fig. 4 is a longitudinal section of the container attached to the container support;

Fig. 5 is a side elevation of the container taken from the side thereof opposite to that shown in Fig. 3;

Fig. 6 is a transverse section taken on the line 6—6 of Fig. 3;

Fig. 7 is a side elevation of one of the containers and an adapter block mounted on the sup-

port, the adapter block and support being shown in section;

Fig. 8 is an elevation of one end of the adapter block;

Fig. 9 is an elevation of the other end of the adapter block;

Fig. 10 is a fragmentary front side elevation of the support;

Fig. 11 is a perspective view of a modified form of container;

Fig. 12 is an end view of a modified form of container;

Fig. 13 is a section on the line 13—13 of Fig. 12;

Fig. 14 is a front elevation of a modified construction of tumbling machine;

Fig. 15 is a fragmentary front elevation, on an enlarged scale, of the construction illustrated in Fig. 14 and showing the means for fastening the removable end members of the support thereon;

Fig. 16 is a detail section taken on the line 16—16 of Fig. 15;

Fig. 17 is a vertical section on the line 17—17 of Fig. 14;

Figs. 18, 19 and 20 are detail views of the closure fastening means for the containers shown in Fig. 17.

While the preferred embodiments of the invention are illustrated in the drawings, it will be understood that minor changes and modifications may be made in the particular constructions shown, and the invention may be embodied in other forms as will appeal to those skilled in the art and falling within the scope of the appended claims without departing from the spirit of the invention.

Referring to a detailed description of the particular embodiment of the invention illustrated in Figs. 1 to 10 inclusive, the construction shown includes a standard 1 on a base 2, the standard having a bearing 3 at its upper end in which is supported for rotation horizontally a shaft 4. One end of the shaft extends a slight distance to one side of the standard and has a pulley 5 fixed thereon. This pulley is connected by a belt 6 to a member 7 of a ratio electric motor 8 mounted on the base for driving the shaft. The shaft projects a substantial distance beyond the other side of the standard and on the end portion of this projecting part of the shaft is fixed a support 9, the same being of disc-like form vertically disposed to carry at the front unobstructed side thereof a plurality of barrel-like containers 10. For removably holding the containers 10 on the container support 9 disposed lengthwise relatively to the axis of rotation thereof, the container support is provided with a plurality of apertures 11 and each container 10 has a flat end face 12 to fit against the flat outer side face 13 of the container support 9, and a threaded stud 14 projecting centrally and longitudinally therefrom adapted to extend through one of the apertures 11 in the container support to be engaged by a clamping nut 15, this construction providing for quickly and easily loading the containers upon and removing the same from the container support by shifting the containers longitudinally at the outer unobstructed side of the container support, and various shapes and sizes of containers may be used interchangeably to suit objects of different sizes and shapes to be polished.

Provision is made for holding the containers on the container support at an angle to its axis of rotation as well as parallel thereto. For this purpose, blocks or members 16 are provided, each



block or member having end faces 17, 18 extending at an angle to each other, and adapted to be interposed between the container support and the end of one of the containers as shown in Fig. 7 of the drawings, each adapter block or member 16 having a threaded bore 19 extending inwardly from its end face 17 for engagement by a bolt 20 extending through one of the apertures 11 in the container support 9 to clamp the adapter block to the container support. Each adapter block has a bore 21 extending inwardly from its end face 18 to receive the stud 14 of the containers 10, and is provided with means for locking the studs 14 of the containers thereto. The means for this purpose is shown in the drawings as comprising a locking member 22 mounted in a recess 23 in the adapter block for movement transversely thereof and having a threaded or roughened face portion 24 to engage the threaded end portion of the studs 14 on the containers, a transversely extending adjustable screw member 25, engaging a threaded bore 26 in the adapter block being provided to force the locking member 22 into locking engagement with the threaded stud 14 of the containers. The locking member 22 is held in the recess 23 in the adapter block by a pin 27 engaging an elongated slot 28 in the locking member 22 at one end thereof. Each of the adapter blocks 16 is provided in its end face 17 with a series of recesses 29 and the container support 9 has sets of apertures 30 with pins 31 held therein and projecting from the front face 13 of the container support to engage the recesses 29 in the adapter block. As will be understood, the pins 31 and the series of recesses 29 provide for setting and holding the adapter block 16 on the container support 9 with its inclined outer face 18 disposed at several different angles to the axis of rotation of the support so that the angular relationship of the container relatively to the axis of rotation of the container support may be readily varied to obtain different degrees of tumbling action. As shown in Fig. 4 of the drawings, the containers 10 are formed closed at their inner ends and have removable closures at their outer ends with quick detachable fastening means therefor. Each closure is shown as comprising a cover plate 32 having a pilot disc 33 on the under side thereof with a gasket 34. The cover fastening means comprises a member 35 secured to the cover plate 32 and having a depending apertured ear 36 to interlock with a laterally projecting pin 37 on the container. At a point opposite the member 35, a lever 38 is pivotally connected with the cover plate 32 by a bale 39 and a metal strap 40, said lever being adapted to cooperate with a lug 41 on the container to clamp the cover plate on the container. 42 and 43 designate shims at the under side of the member 35 and the metal strap 40 respectively to take up wear in the fastening devices.

As hereinbefore stated the invention contemplates the use of containers of various sizes and shapes to suit the particular parts to be operated on. In Fig. 1 of the drawings the container support 9 is shown provided with additional apertures 44 for securing larger size containers on the support. In Figs. 1 to 10, the containers are shown as of cylindrical form with longitudinal ribs 51 on the inner face thereof. In Fig. 11 is illustrated a container 52 of general clover leaf form in cross section, this form of container providing for more violent tumbling action than the forms of containers shown in the other views.

In Figs. 12 and 13 is shown a barrel-like con-

tainer 45 of angular cross sectional form. In these views, the container is shown provided at its upper end interiorly thereof with an annular seat 79 for the cover 46, and the cover is shown provided with fastening means comprising a lock bar 47 having reduced end portions 48 to engage apertures 49 in opposite side wall portions of the container, and a clamping screw 50 engaging a threaded aperture 80 in the lock bar 47. As will be understood, when the clamping screw is turned up, its lower end will press against the upper face of the cover 46 and the cover will be tightly clamped to its seat. By turning back the clamping screw the lock bar can be shifted laterally and disengaged from the apertures 49 so that the cover may be removed.

It will be noted that the invention provides for individually detachably securing a plurality of tumbling containers or vessels on the tumbling vessel carrier at places located different distances radially outwardly from the axis of rotation of the carrier so that different degrees of tumbling action appropriate for different sizes and kinds of articles or parts can be obtained in this way as well as by varying the angular relationship of the longitudinal axis of one or more or all of the tumbling vessels relatively to the axis of rotation of the tumbling vessel carrier, the invention thus providing for individually varying the degree or intensity of tumbling action in the vessels on the parts or articles over an exceedingly wide range and enabling the ready independent selective removal and replacement of one or more of the tumbling vessels that are disposed substantially parallel with or at an angle to the axis of rotation of the vessel carrier so that various types of work can be operated on simultaneously for different periods of time and subjected to different degrees of tumbling action to meet different requirements in a single machine with only relatively small interruption in the operation of the machine, and this is accomplished easily and quickly by means of simple construction.

The modified construction of machine illustrated in Figs. 14 and 17 of the drawings, like the construction hereinbefore described and illustrated in Figs. 1 and 2, comprises a vertical standard with a shaft supported thereon to extend horizontally and projecting to one side thereof, and a support mounted on the projecting end portion of the shaft and rotatable about a horizontal axis adapted to carry thereon a plurality of barrel-like containers disposed lengthwise relatively to the axis of rotation of the support, and providing for positioning the containers on the rotatable support and the removal of the same therefrom by shifting the containers longitudinally at the outer or front unobstructed side of the support, and also for convenient loading and unloading the containers from the front side of the support without removing the same therefrom. In these views, 53 designates the supporting base, 54 the standard on the base, and 55 is the shaft supported at the upper end of the standard to extend horizontally and to one side thereof. In this instance, the shaft 55 is fixedly secured in a tubular part 56 on the standard, and the container support is mounted for rotation on the shaft. The container support comprises an inner hub part 57 fitting on a bearing 58 on the shaft 55, an intermediate disc or web 59 secured to the hub part, and a plurality of outer cylindrical drum-like members 60 of different diameters disposed concentrically in spaced relation. In the



particular exemplification of the invention shown in these views, there are three of such cylindrical members, the innermost cylindrical member being secured to the disc or web 59 at the periphery of the latter. The cylindrical members are secured to each other by a plurality of radially extending plates 61 disposed therebetween at regular intervals and forming with these cylindrical members two circular series of compartments 62 for containers 63 of barrel-like form. The container support is provided at each end with a removable closure member 64 to extend over the ends of the series of compartments 62 and hold the containers 63 therein. Each removable closure member 64 comprises a pair of annular plates 65, 66 of different diameters concentrically arranged and connected at intervals by radially extending strips 67. The inner annular plates 65 of the closure members are adapted to fit over pins 68 secured to and projecting from the ends of some of the radially extending plates 61. Catches 69 mounted on and projecting from the ends of some of the radially extending plates 61 are adapted to engage over the radially extending strips 67 and lock the closure members to the support. In placing the closure members on the support the inner annular plates 65 of the closure members are engaged over the pins 68 and then by a slight turning movement of the closure member the radially extending strips 67 are engaged beneath the catches 69.

In Figs. 18, 19 and 20 of the drawings, the container 63, as in the construction shown in Figs. 12 and 13, has at its open end an annular seat 81 for the cover 70. The cover is shown provided with fastening means comprising a lock bar 71 having end portions 72 to engage apertures 73 in opposite side wall portions of the container, and a clamping screw 74. In this form of fastening means, the clamping screw engages a threaded apertures 75 in the lock bar 71 and extends through a transverse slot 82 in the upper part of an inverted U-shaped bracket 76 on the cover. When the clamping screw is screwed up the head of the same bears against the upper face of the bracket 76 and the cover will be clamped to its seat. When the clamping screw is turned back, the lock bar 71 can be shifted laterally to disengage its end portions from the aperture 73, the slot 82 in the bracket 76 permitting lateral movement of the clamping screw.

Secured to the container support at the inner side thereof by arms 77 is a pulley 78 for connection to any suitable source of power for driving the support.

What I claim is:

1. A tumbling apparatus including a vessel carrier rotatable about a substantially horizontal axis, means supporting the vessel carrier for rotation, a plurality of tumbling vessels, means individually and removably mounting the vessels on the carrier at places located different distances radially from its axis of rotation, and means to rotate the vessel carrier.

2. A tumbling apparatus including a vessel carrier rotatable about an axis, means supporting the vessel carrier for rotation, a plurality of tumbling vessels, means individually detachably and rigidly securing each tumbling vessel on the vessel carrier at places located different distances radially from its axis of rotation, and means to rotate the vessel carrier.

3. A tumbling apparatus including a container carrier rotatable about a horizontal axis, means

supporting the container carrier for rotation, a plurality of tumbling containers, means for individually detachably and rigidly securing each tumbling container on the container carrier at places located different distances radially from the axis of rotation of the container carrier, and providing for individually varying the angular relationship of the longitudinal axis of each container relatively to the axis of rotation of the container carrier, and means to rotate the container carrier.

4. A tumbling apparatus including a container carrier of disc form substantially vertically disposed and rotatable about a substantially horizontal axis, means supporting the container carrier for rotation, a plurality of individual barrel-like tumbling containers, means for individually detachably and rigidly securing the tumbling containers at one end thereof on the container carrier disposed lengthwise relatively to the longitudinal axis of rotation of the container carrier and at places located different distances radially from the axis of rotation of the container carrier, and providing for individually varying the angular relationship of the longitudinal axes of the tumbling containers relatively to the axis of rotation of the container carrier, and means to rotate the container carrier.

5. A tumbling apparatus including a container carrier of disc form substantially verticaly disposed and rotatable about a substantially horizontal axis, means supporting the containers carrier for rotation, a plurality of individual barrel-like tumbling containers, means for individually detachably and rigidly securing each tumbling container at one end thereof on the container carrier disposed lengthwise relatively to the longitudinal axis of rotation of the container carrier and at places located different distances radially from the axis of rotation of the container carrier, and means to rotate the container carrier.

6. A tumbling apparatus including a container carrier of disc form substantially vertically disposed and rotatable about a horizontal axis, means supporting the container carrier, a plurality of individual barrel-like tumbling containers, means for individually detachably and rigidly securing each tumbling container at one end thereof on the container carrier disposed lengthwise relatively to the longitudinal axis of rotation of the container carrier and in circular series concentric with and at different distances radially from the axis of rotation of the container carrier, and means to rotate the container carrier.

7. A tumbling apparatus including a container carrier of disc form substantially vertically disposed and rotatable about a horizontal axis, the container being provided with a multitude of apertures therein located different distances from the axis of rotation of the container carrier, a plurality of barrel-like tumbling containers, means for individually detachably and rigidly securing each tumbling container at one end thereof on the container carrier disposed lengthwise relatively to the longitudinal axis of rotation of the container carrier, said means including fastening members adapted to be engaged with the apertures in the container carrier, and means to rotate the container carrier.

8. A tumbling apparatus including a container carrier of disc-form substantially vertically disposed and rotatable about a substantially horizontal axis, means supporting the container carrier at one side thereof, a plurality of individual barrel-like containers, means for individually detachably and rigidly securing each container on the container carrier disposed substantially lengthwise relative to the longitudinal axis of rotation of the container carrier and at places located different distances radially from the axis of rotation of the container carrier, and means to rotate the container carrier.



9. A tumbling apparatus including a container carrier of disc-form substantially vertically disposed and rotatable about a substantially horizontal axis, the container carrier being provided with a multitude of apertures therein located different distances radially from the axis of rotation of the container carrier, a plurality of barrel-like tumbling containers, means for individually detachably and rigidly securing each tumbling container at one end thereof on the container carrier disposed lengthwise relatively to the longitudinal axis of rotation of the container carrier, said means including a threaded stud projecting longitudinally from each tumbling container adapted to be engaged with one of said apertures in the container carrier, and a nut to cooperate with each of said threaded studs, and means to rotate the container carrier.

10. A tumbling apparatus including a support, a shaft mounted on the support extending substantially horizontally to one side thereof, a substantially vertically disposed carrier disc on the projecting end portion of the shaft rotatable about a substantially horizontal axis, a plurality of barrel-like tumbling containers, means for individually detachably and rigidly securing each tumbling container at one end thereof on the container carrier disposed lengthwise relatively to the axis of rotation of the container carrier at points located different distances radially from the axis of rotation of the container carrier, and means to rotate the container carrier.

11. A tumbling apparatus including a vessel carrier rotatable about a substantially horizontal axis, and having a flat face at one side thereof disposed at substantially right angles to its axis of rotation, means supporting the vessel carrier for rotation, an adapter member having opposite end faces extending at an inclination to each other, means detachably securing the adapter member on the vessel carrier with one end face of said member fitting against the flat face of the vessel carrier and with its other end face extending at an inclination, and a tumbling vessel detachably and rigidly secured on the adapter member with its axis disposed at an inclination to the axis of rotation of the vessel carrier, and means to rotate the vessel carrier.

12. A tumbling apparatus including a vessel carrier rotatable about a substantially horizontal axis, and having a flat face at one side thereof disposed at substantially right angles to its axis of rotation, means supporting the vessel carrier for rotation, a rotatably adjustable adapter member detachably mounted on the vessel carrier having opposite end faces extending at an inclination to each other, one end face of said adapter member fitting against the flat face of the vessel carrier and its other end face extending at an inclination, means for securing said adapter member to the vessel carrier in different positions of rotary adjustment, and a tumbling vessel detachably and rigidly secured on the adapter member with its axis disposed at an inclination to the axis of rotation of the vessel carrier, and means to rotate the vessel carrier.

13. A tumbling apparatus including a vessel carrier rotatable about a substantially horizontal axis, means supporting the vessel carrier for rotation, a plurality of tumbling vessels each of which has a separate independent closure, means individually and removably mounting the vessels on the vessel carrier at places located different distances radially from its axis of rotation, a common means for securing the plurality of vessels on the vessel carrier, and means to rotate the vessel carrier.

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