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CONTAINER FILLING AND MATERIAL SETTLING MACHINE

Filed April 24, 1947

4 Sheets-Sheet 1

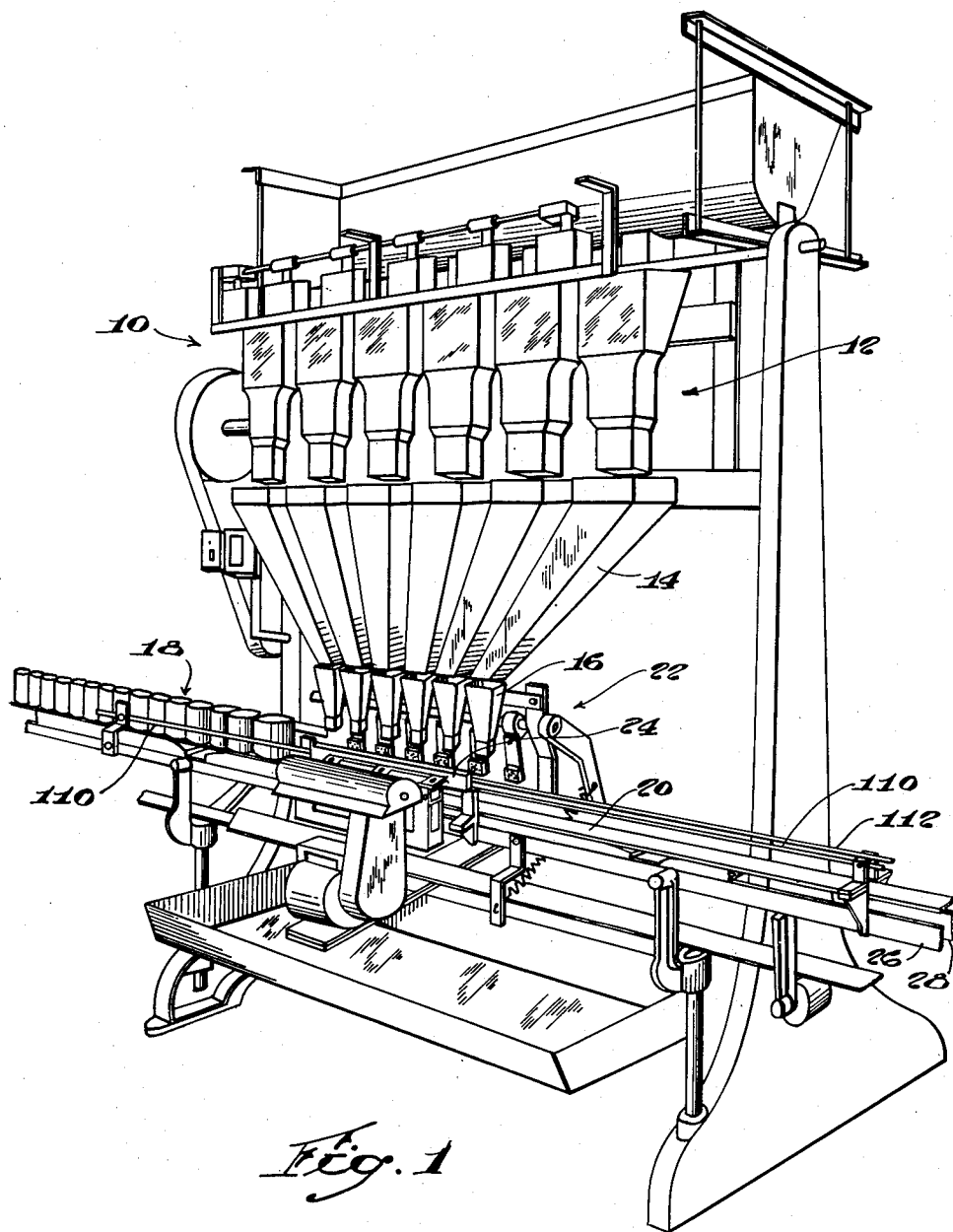


Fig. 1

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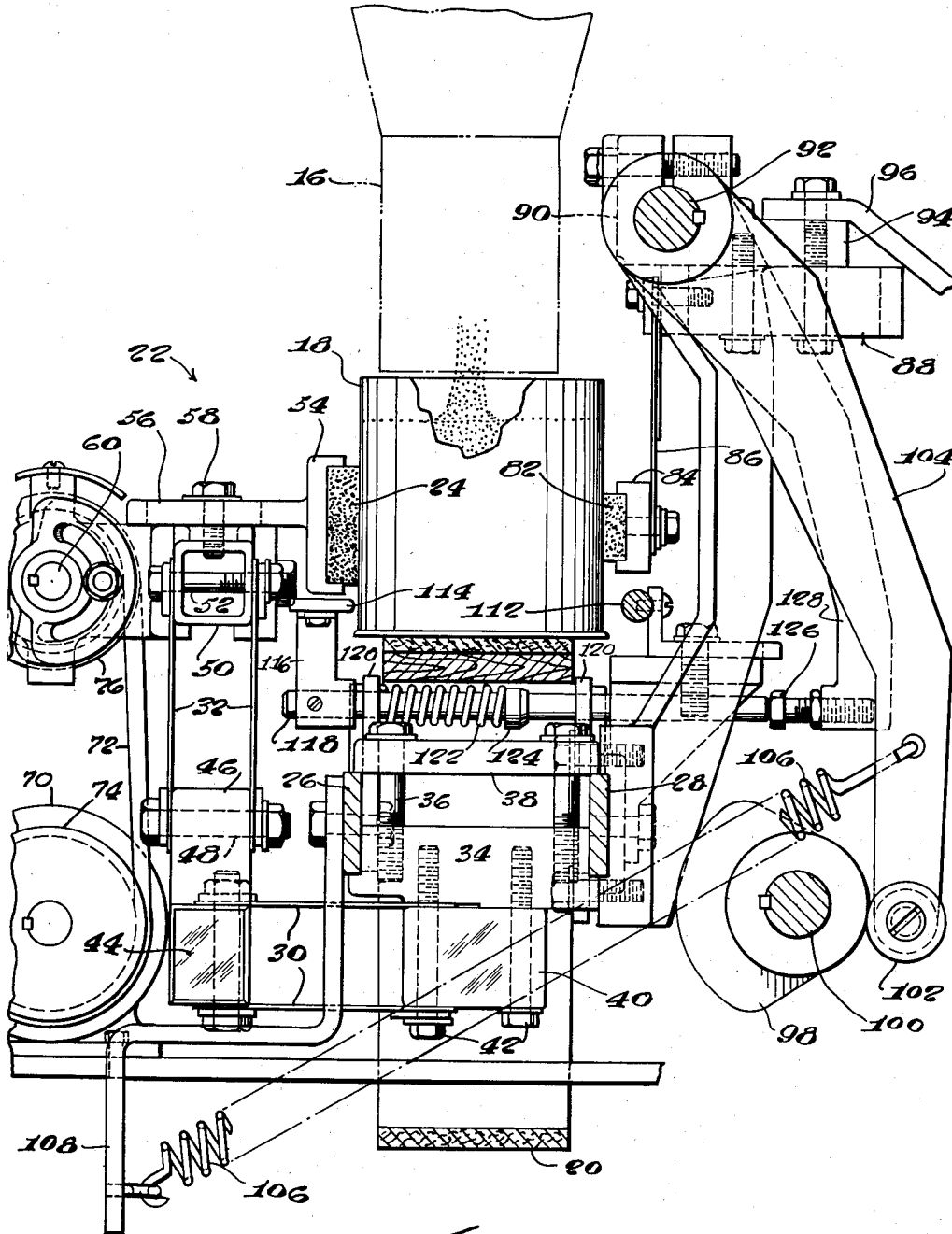


Fig. 2

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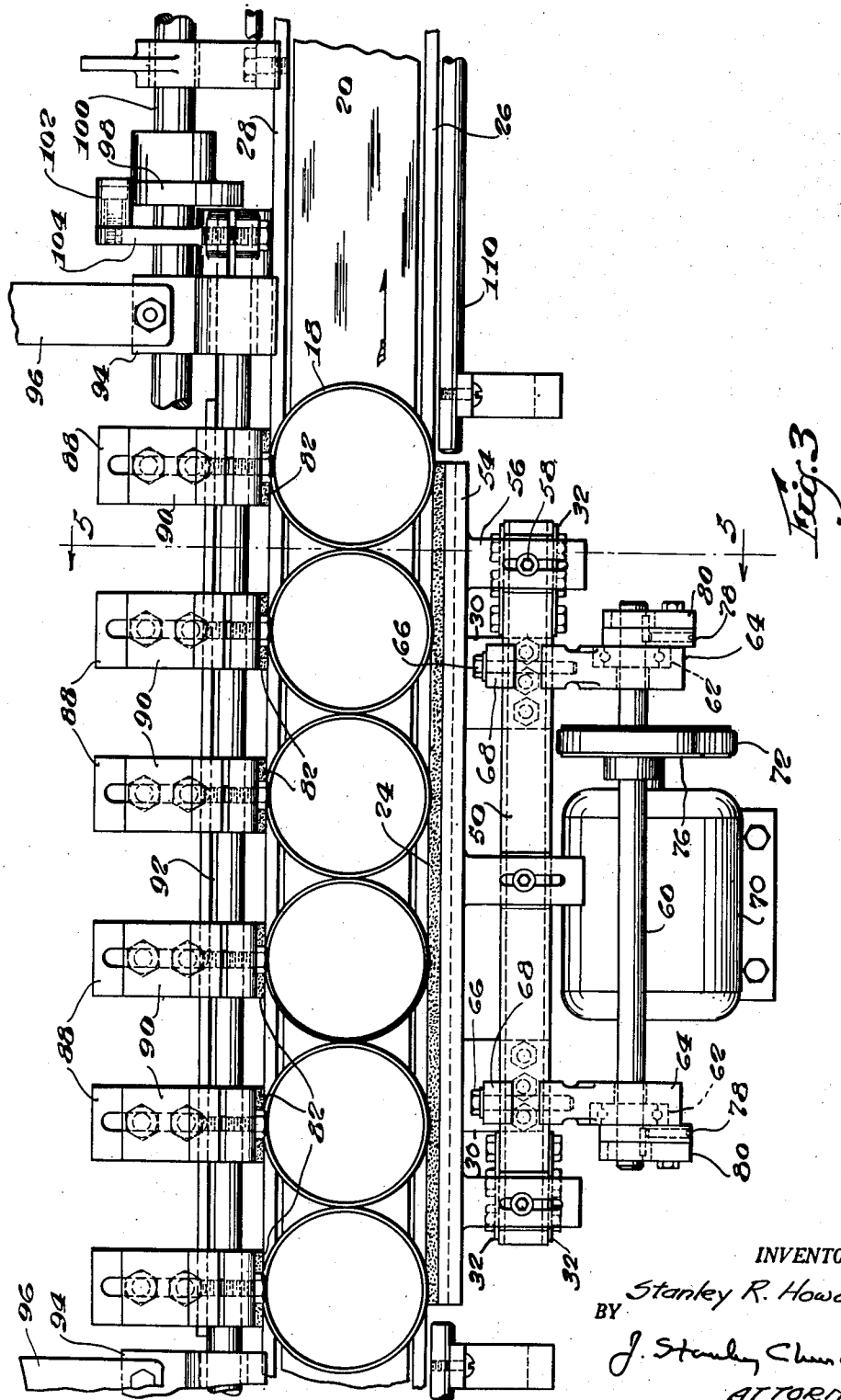
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UNITED STATES PATENT OFFICE

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CONTAINER FILLING AND MATERIAL
SETTLING MACHINE

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9 Claims. (Cl. 226-72)

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This invention relates to a packaging machine and more particularly to a filling machine having a settling device for settling the material being introduced into the container during the filling operation.

The invention has for an object to provide a novel and improved packaging machine, and particularly a container filling machine, having a mechanically operated high frequency vibrating device of novel construction arranged to vibrate the containers being filled during the filling operation whereby to settle the material therein in a novel, efficient and superior manner.

A further object of the invention is to provide a novel and highly efficient settling device for compacting the contents of a container.

With this general object in view, and such others as may hereinafter appear, the invention consists in the container filling machine, in the settling device and in the various structures, arrangements and combinations of parts herein after described and particularly defined in the claims at the end of this specification.

In the drawings illustrating the preferred embodiment of the invention, Fig. 1 is a perspective view of a filling machine comprising a net weight weighing machine embodying the present invention; Fig. 2 is a side elevation of the novel material settling device; Fig. 3 is a plan view of the settling device; Fig. 4 is a detail view in side elevation showing the parts in a different position of operation; and Fig. 5 is a cross sectional view taken on the line 5-5 of Fig. 3.

In general, the present invention contemplates a novel and improved vibratory material settling device for use with a container filling machine for settling the material during the progress of the filling operation whereby a predetermined load or weight of the material being introduced into the container in its loose and flowable condition may be compacted and settled so as to provide a substantially filled container not subject to further compacting during subsequent handling and transportation, it being understood that the containers are preferably of a size such that the predetermined load would overflow the container unless compacted during the filling operation. In the preferred embodiment of the invention, the settling device includes a continuously vibrated elongated bar and, in practice, the container is preferably firmly held or clamped in tight engagement with the vibratory member so as to move in unison therewith whereby to obtain the full effect of the vibratory movement. Furthermore, clamping of

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the container to the vibratory member eliminates the noise usually associated with a conventional tapping or settling device which operates to shift the container back and forth, and, also minimizes likelihood of breakage of fragile containers, such as glass containers.

In accordance with the present invention, the vibratory member is supported by a plurality of relatively thin flexible straps, and vibration is effected mechanically by an unbalanced rotary member also supported by the straps and in a manner such as to effect maximum lateral vibration of the container clamped to the bar while the same is supported on the filling machine conveyer during the filling operation.

Referring now to the drawings, the present invention is herein illustrated as embodied in an automatic weighing machine, indicated generally at 10, of the type provided with a plurality of load forming mechanisms 12 arranged to release their respective loads through funnels 14, 16 into containers 18 supported on a conveyer 20 beneath the funnels 16. In the operation of such a weighing machine, provision is made for advancing a plurality of containers into operative position beneath the funnels 16 in timed relation to the operation of the weighing machine, and upon receiving their respective loads, the filled containers are released while another set of containers is advanced into operative position to be filled. Reference is made to the United States patent to S. R. Howard, No. 2,204,134 dated June 11, 1940, for a complete disclosure of the details of construction and mode of operation of such an automatic net weight weighing machine.

In accordance with the present invention, the containers 18 which are advanced into operative position to be filled and brought to rest beneath the filling funnels 16 are arranged to be engaged by a vibratory unit, indicated generally at 22, which includes an elongated bar 24 arranged to engage one side of the containers disposed on the conveyer 20. As herein shown, the vibratory unit 22 is supported from the underside of the conveyer supporting rails 26, 28 by a plurality of horizontally extended relatively thin flexible straps 30 preferably of spring metal such as Swedish steel, and a plurality of similar vertically extended straps 32. The flexible straps 30 are connected at one end to a bracket 34 which is adjustably secured to the rails 26, 28 by bolts 36 extended through a member 38 reaching across the upper edges of the rails. As illustrated in Fig. 2, the straps 30 are supported in spaced rela-

tion by a spacing block 40 secured to the underside of the bracket 34 by bolts 42. The outwardly extended ends of the straps 30 are secured to and arranged to support an elongated solid bar 44 from which the vertically extended straps 32 are supported. As herein shown, the bar 44 is provided with upwardly extended blocks 46 which may be welded or otherwise secured thereto, and, the straps 32 are secured at their lower ends in spaced relation to the blocks 46 by through bolts 48. The upper ends of the straps 32 are connected to opposite sides of an elongated hollow bar 50 by bolts 52. The hollow bar 50 is arranged to support the vibratory bar 24 and as shown in Figs. 2 and 3, the bar 24 is carried by a bracket 54 which is provided with a plurality of slotted arms 56 adjustably secured to the hollow bar 50 by bolts 58.

Referring now to Figs. 2, 3 and 5, provision is made for mechanically effecting high frequency vibration of the vibratory unit through mechanical connections from an operating and rotating shaft 60 mounted in roller bearings 62 provided in brackets 64 secured to the hollow bar 50. The brackets 64 are grooved to receive the bar and are connected thereto by bolts 66 which extend through cooperating grooved members 68 fitted over the opposite side of the bar. The shaft 60 may be continuously rotated in any usual or preferred manner such as by a motor 70 connected to the shaft by a belt 72 which runs over pulleys 74, 76, the latter being fast on the shaft 60. In order to produce a wobbly movement of the shaft, two pairs of semi-circular discs 78, 80 are provided, one pair being mounted at each end of the shaft. One disc 78 of each pair is keyed to the shaft, the other being adjustable with relation thereto. With this construction, the unbalanced rotation of the shaft effects a vibratory movement which by virtue of the flexible strap mounting of the vibratory unit 22 is transmitted to the vibratory bar 24.

From the description thus far, it will be observed that the vibratory bar 24 is continuously vibrated so that when the containers being filled are urged thereagainst vibration of the containers and settling of the material may be effected. As illustrated in Fig. 2, provision is made for urging the containers into engagement with the vibratory bar 24, and as herein shown, a plurality of individual flexibly mounted members 82 are arranged to be rocked into engagement with the opposite sides of the containers. The cooperating engagement of the bar 24 and the members 82 with the containers effect gripping of the latter therebetween so as to effect a lateral shaking of the containers supported on the conveyor 20. As herein shown, each member 82 is carried in a grooved plate 84 which is supported by a relatively thin flexible strap 86 secured at its upper end to a laterally adjustable block 88 connected to an arm 90 fast on a rocker shaft 92.

The rocker shaft 92 is journaled in bearing members 94 which may be supported by angle bars 96 attached to the machine frame. As herein shown, provision is made for rocking the flexibly mounted member 82 into engagement with the containers to urge them against the continuously vibrating bar 24 in timed relation to the operation of the filling machine, and as illustrated in Fig. 2, this is accomplished by a cam 98 fast on a cam shaft 100, and a cooperating roller 102 carried by an arm 104 fast on the rocker shaft 92. The cam shaft 100 may and preferably

will form a part of and be driven from the filling machine. A spring 106 connected between the arm 104 and an angle bar 108 is provided to hold the cam roll 102 against the cam 98. Thus, in the operation of the machine, the flexibly mounted members 82 are rocked into yielding engagement with the containers, from the position shown in Fig. 4 to the position shown in Fig. 2, to urge and hold the containers in operative engagement with the vibratory bar 24 for a predetermined time in each cycle of operation of the filling machine and preferably during the time the material is being introduced into the containers.

Provision is made for positively holding the container out of engagement with the continuously vibrating bar 24 during the time the filled containers are being delivered out of the machine and a new set of containers is being advanced into operative position to be filled. As illustrated in Fig. 1, in practice the containers are guided between relatively narrow rails 110, 112, the forward rail 110 being discontinued for the space occupied by the vibratory bar 24. In its stead a laterally movable elongated rail 114 is provided which is arranged to be moved into engagement with the containers to hold them away from the effective range of the vibratory bar 24 during the container moving cycle of operation and, to be retracted during the filling cycle of operation to permit the containers to be urged into engagement with the bar 24 during this time. As herein shown, the rail 114 is supported on blocks 116 carried by pins 118 slidably mounted in extensions 120 from the side rails 26, 28. Each pin 118 is urged to present the rail 114 into engagement with the containers during the container moving cycle by a spring 122 interposed between an extension 120 and a collar 124 fixed on the pin 118, as shown in Fig. 4, the containers at this time being guided between the rail 114 and the rear rail 112. The hub of the supporting block 116 may be extended to engage an extension 120 and serve as a limiting stop.

Provision is made for moving the rail 114 outwardly during the filling cycle of operation and as herein shown the pins 118 are extended and arranged to be engaged by screws 126 carried by arms 128 fast on the rocker shaft 92. Thus, in operation, when the rocker shaft 92 is operated to urge the members 82 into engagement with the containers, the arms 128 are rocked to effect movement of the rail 114 away from the containers to permit the latter to be moved into engagement with the vibratory bar 24, as above described. Conversely, when the shaft 92 is rocked to remove the members 82 from engagement with the containers, the rail 114 is permitted to move the containers away from the bar 24 so that the containers are free from vibration during the container moving cycle of operation.

From the above description it will be observed that the present mechanically operated vibratory unit is effective to shake the containers laterally by a high frequency vibration while the containers are supported on the conveyor during the filling operation whereby to gradually and progressively settle the material as it is being introduced to the end that a predetermined volume of material being deposited into the containers in its loose and flowable state is reduced or compacted to substantially fill the container thus producing a filled container, the contents of which are not liable to be further compacted during

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handling and transportation. It will be understood that the size of the container is such that if the predetermined volume of material were introduced therein in its loose and flowable condition, without settling, the material would overfill the container. Thus, the present invention permits the use of a container which is substantially filled by the compacted material and eliminates the necessity of employing a larger container in which the loose material would be subsequently compacted by handling and during transportation to present a partly filled container to the consumer.

It will also be observed that in the preferred and illustrated embodiment of the invention, the vibratory unit 22 is supported by two pairs of spaced apart and horizontally extended thin flexible straps 30 disposed at the ends of the elongated vibratory unit, and by two pairs of similar vertically extended straps 32 also disposed at the ends of the unit and preferably beyond the horizontally extended straps, the straps being arranged in parallel relation so that their free ends move in a parallel path to thus convert the unbalanced rotary forces into substantially straight line movement. It will be further observed that the entire weight of the vibratory unit 22 is supported from the frame by the horizontal spring metal straps 30 extending from the underside of the conveyer frame and attached at their free ends to a relatively heavy weighted bar 44, and, the vertical straps 32 extending from the weighted bar are attached at their free ends to a relatively light weight hollow bar 56. As a result of this construction, the vertical vibratory components are substantially entirely absorbed or damped out by the heavy mass on the horizontally extending straps 30, the vertical components of the unbalanced rotary forces being dissipated by the acceleration of the moving structure in accordance with the principle that for a given acceleration the distance traveled is inversely proportional to the mass. As a further result, the reacting forces transmitted to the fixed ends of the horizontal straps 30 are greatly reduced so as to minimize vibration of the supporting framework and consequently protecting the sensitive weighing mechanism, supported by the frame, from the effects of the vibration. Thus, in operation, a maximum horizontal or lateral movement of the vibratory bar 24 and shaking of the container is effected by the unbalanced rotation of the shaft 60 transmitted to the vibratory bar 24 through the movement of the upper or free ends of the vertical supporting straps 32. As illustrated in Fig. 3, one pair of the substantially semi-circular discs 78, 80 is disposed at each extreme end of the rotary shaft 60, one of the discs of each pair being adjustable with relation to the other whereby the discs may be adjusted to produce most efficient results. In practice the discs 80 of each pair are preferably adjusted with relation to the fixed discs 78 in the same relative angular position so that one pair will be substantially in alignment with the other, thus providing a substantially equal unbalanced effect at both ends. The frequency of the vibrations depends upon the number of revolutions of the shaft 60 and the extent of the vibratory movement may be varied by adjustment of the rotary discs. In practice, different materials may require different frequencies of vibration, and this may be accomplished in the illustrated structure by changing the rotary speed of the continuously rotating unbalanced member and by changing the adjust-

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ment of the discs 80 to vary the intensity of force and to compensate for the change in rotary speed in accordance with the principle that the centrifugal force varies as the square of the rotary speed. In the illustrated embodiment of the invention, for example, a frequency of between 1750 and 1900 vibrations per minute may be maintained and the extent of lateral vibration may be varied between $\frac{1}{16}$ and $\frac{1}{8}$ of an inch. In practice the vibratory bar 24 and also the cooperating flexibly mounted members 32 may and preferably will be made of rubber or other yieldable and sound absorbent material in order that the containers will not be marked or otherwise injured and in order to reduce noise to a minimum.

While the preferred embodiment of the invention has been herein illustrated and described it will be understood that the invention may be embodied in other forms within the scope of the following claims.

Having thus described the invention, what is claimed is:

1. In a packaging machine, in combination, container filling means for simultaneously filling a plurality of containers, a conveyer for supporting and advancing a line of containers into and out of operative position to be filled, means for vibrating the containers during the filling operation to effect settling of the material as it is deposited therein, said vibrating means comprising an elongated continuously operated vibratory bar arranged to engage one side of the containers being filled, means for supporting said bar including a flexible mounting, an unbalanced rotary member carried by said flexible mounting for imparting high frequency vibration to said bar, a plurality of cooperating flexibly mounted members engageable with the opposite sides of the container for firmly clamping the same to said bar whereby to effect shaking of the containers in unison therewith, and means operating in timed relation to the operation of the filling means for moving said cooperating flexibly mounted members into and out of clamping engagement with the containers.

2. In a packaging machine, in combination, container filling means for simultaneously filling a plurality of containers, a conveyer for supporting and advancing a line of containers into and out of operative position to be filled, means for vibrating the containers during the filling operation to effect settling of the material as it is deposited therein, said vibrating means comprising an elongated continuously operated vibratory bar arranged to engage one side of the containers being filled, means for supporting said bar including a flexible mounting, an unbalanced rotary member carried by said flexible mounting for imparting high frequency vibration to said bar, a plurality of cooperating flexibly mounted members engageable with the opposite sides of the container for firmly clamping the same to said bar whereby to effect shaking of the containers in unison therewith, and means operating in timed relation to the operation of the filling means for moving said cooperating flexibly mounted members into and out of clamping engagement with the containers, and a movable guide rail operative to maintain the line of containers out of the effective range of said continuously operating vibratory bar during the container moving cycle of operation.

3. In a packaging machine, in combination, means for supporting the container, means for

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settling the contents of a container comprising a vibratory member engageable with the container, flexible means for supporting said vibratory member comprising a pair of spaced horizontally extended and relatively thin parallel straps fixedly supported at one end, and a pair of similar vertically extended straps connected at one end to the free ends of said horizontally extended straps, said vibratory member being connected to the free ends of said vertically extended straps, and a cooperating resiliently mounted member also engageable with the container during the settling operation.

4. In a packaging machine, in combination, means for supporting the container, means for settling the contents of a container comprising a vibratory member engageable with the container, flexible means for supporting said vibratory member comprising a pair of spaced horizontally extended and relatively thin parallel straps fixedly supported at one end, and a pair of similar vertically extended straps connected at one end to the free ends of said horizontally extended straps, said vibratory member being connected to the free ends of said vertically extended straps, and means for firmly clamping the container to said vibratory member whereby to effect shaking of the container in unison therewith.

5. In a packaging machine, in combination, means for supporting the container, means for settling the contents of a container comprising a vibratory member engageable with said container, means for imparting vibration to said member including an unbalanced rotary member operatively connected thereto, flexible supporting means for said vibratory member comprising a pair of spaced horizontally extended and relatively thin parallel straps fixedly supported at one end, a pair of similar vertically extended straps connected at one end to the free ends of said horizontally extended straps, said vibratory member being connected to the free ends of said vertically extended straps, and means for firmly clamping the container to said vibratory member whereby to effect shaking of the container in unison with said vibratory member.

6. In a packaging machine, in combination, means for supporting the container, means for settling the contents of a container comprising a vibratory member engageable with said container, means for imparting vibration to said member including an unbalanced rotary member operatively connected thereto, flexible supporting means for said vibratory member comprising a pair of spaced horizontally extended and relatively thin parallel straps fixedly supported at one end, a pair of similar vertically extended straps connected at one end to the free ends of said horizontally extended straps, said vibratory member being connected to the free ends of said vertically extended straps, and means for firmly clamping the container to said vibratory member whereby to effect shaking of the container in unison with said vibratory member, and means for reducing to a minimum the vertical components of said unbalanced rotary force comprising a weighted member connected to the free ends of said horizontally extended straps whereby substantially all of said unbalanced rotary force is converted into horizontal rectilinear vibratory movement.

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7. In a packaging machine, in combination, filling mechanism, container supporting means for supporting a container while being filled, a vibratory unit for settling the contents of a container during the filling operation comprising a vibratory bar engageable with the container, an unbalanced rotary member carried by said bar, and means for converting the rotary force imparted by said unbalanced rotary member into rectilinear motion comprising a flexible mounting for said unit including a pair of spaced horizontally extended and relatively thin parallel straps fixedly supported at one end, a pair of similar vertically extended straps connected at their lower ends to the free ends of said horizontally extended straps, the free ends of said vertically extended straps being connected to said vibratory unit, and a weighted member also carried by the free ends of said horizontally connected straps whereby to effectively dampen the vertical components of said unbalanced rotary force and to provide a maximum horizontal rectilinear movement to said vibratory bar.

8. In a packaging machine, in combination, container filling means, means for supporting a container in operative position to be filled, and means for vibrating the container during the filling operation to effect settling of the material as it is deposited therein comprising a vibratory member engageable with the container, means for supporting said vibratory member including spaced vertically disposed thin flexible metal supporting members and a flexible mounting therefor, means for vibrating the vibratory member in a substantially horizontal plane, and cooperating means for firmly clamping the container to said vibratory member whereby to effect shaking of the container in unison with said vibratory means while supported on said supporting means.

9. In a packaging machine, in combination, container filling means, means for supporting a container in operative position to be filled, and means for vibrating the container during the filling operation to effect settling of the material as it is deposited therein comprising a vibratory member engageable with the container, means for supporting said vibratory member including spaced vertically disposed thin flexible metal supporting members and a flexible mounting therefor, an unbalanced rotary member supported by said flexible mounting for imparting high frequency vibration to said vibratory member, and a cooperating flexibly mounted member engageable with the container for firmly clamping the same to said vibratory member whereby to effect shaking of the container in unison therewith.

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