June 19, 1956 H. V. KINDSETH 2,751,115

REGULATOR FOR FEEDING POWDERED OR GRANULAR MATERIAL

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Fig. 1

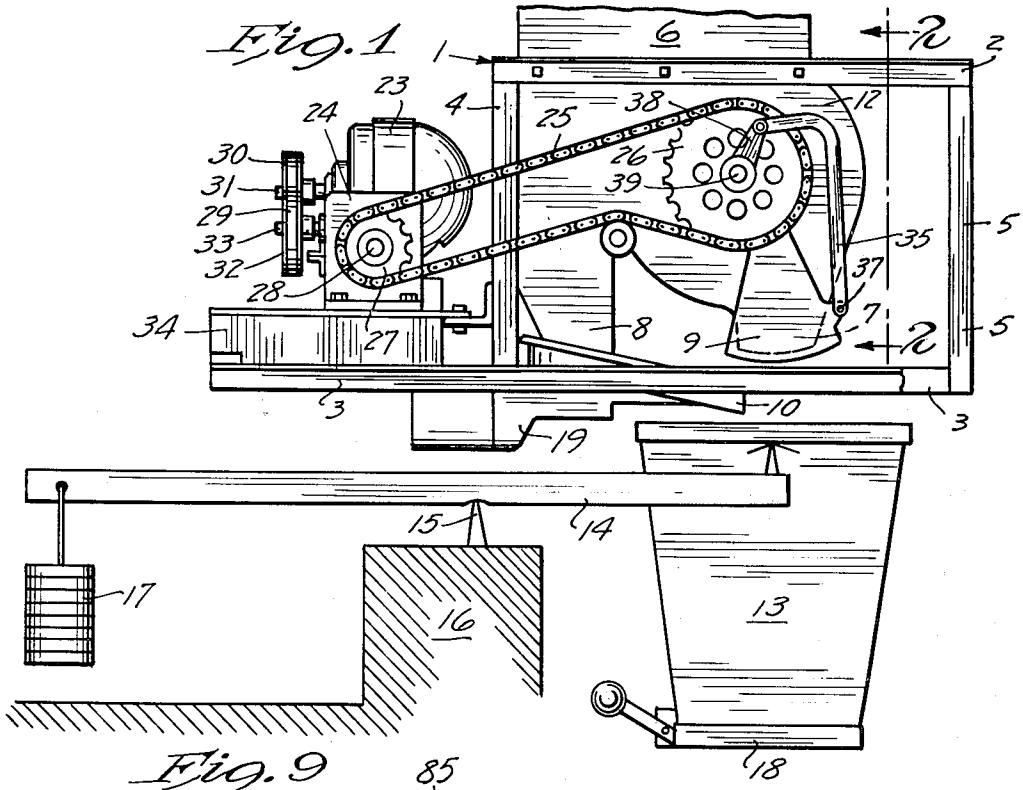
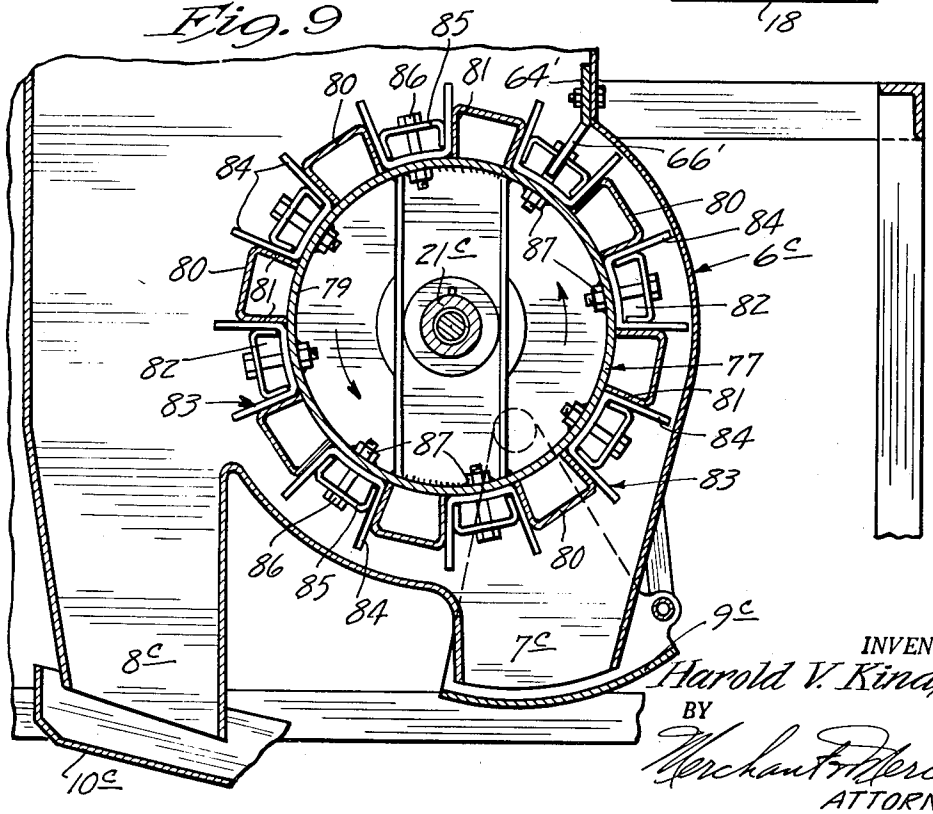


Fig. 9



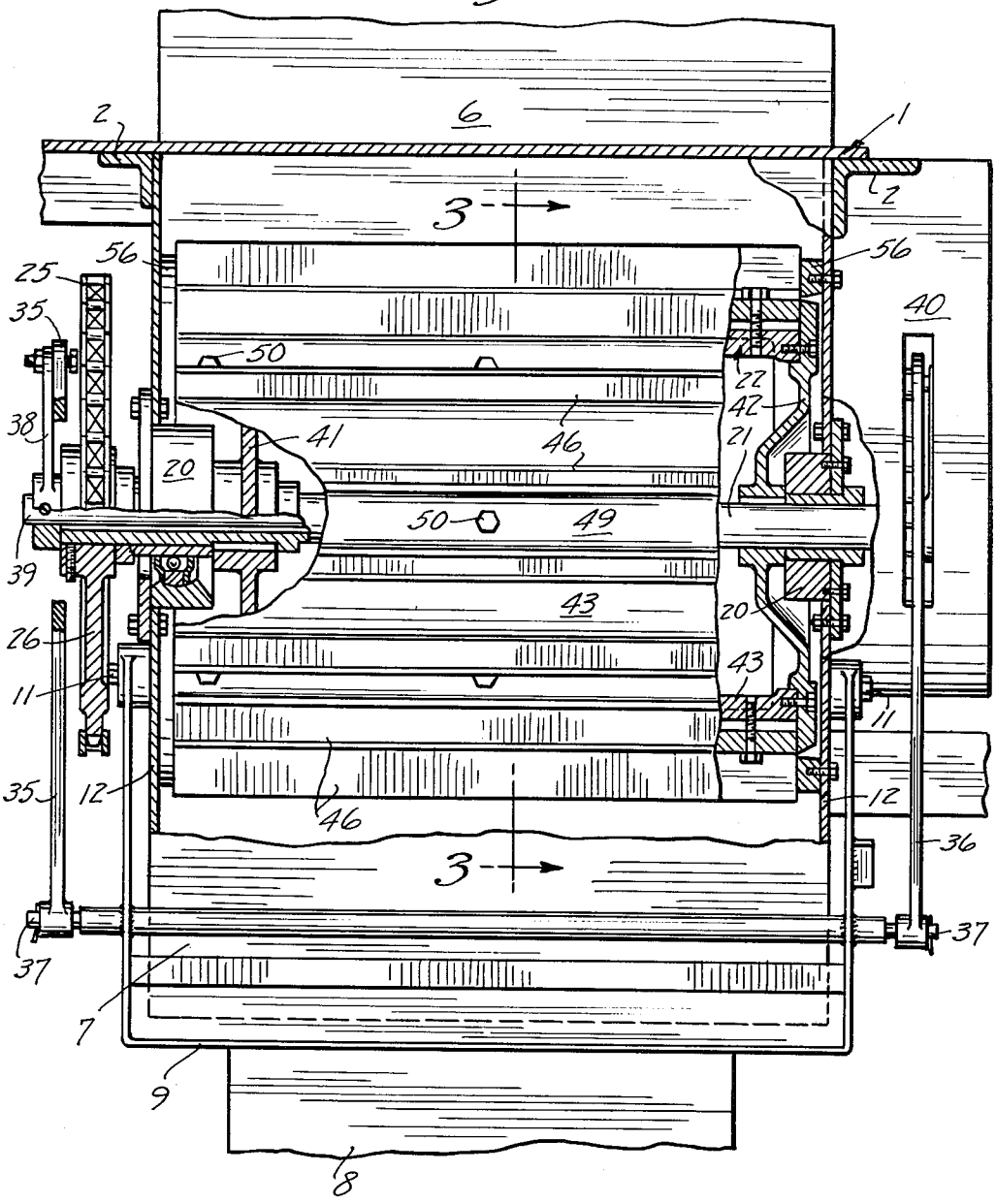
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Fig. 2



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Fig. 3

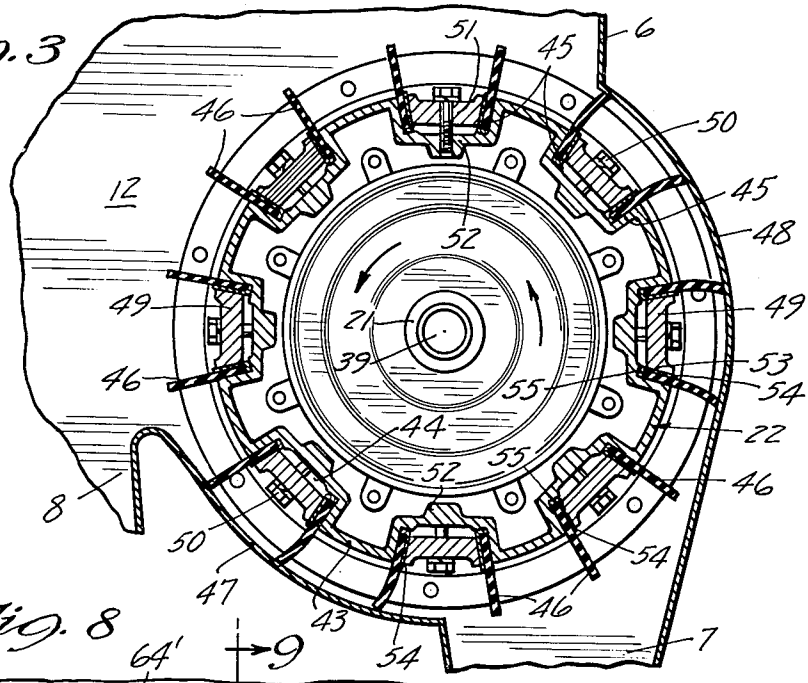
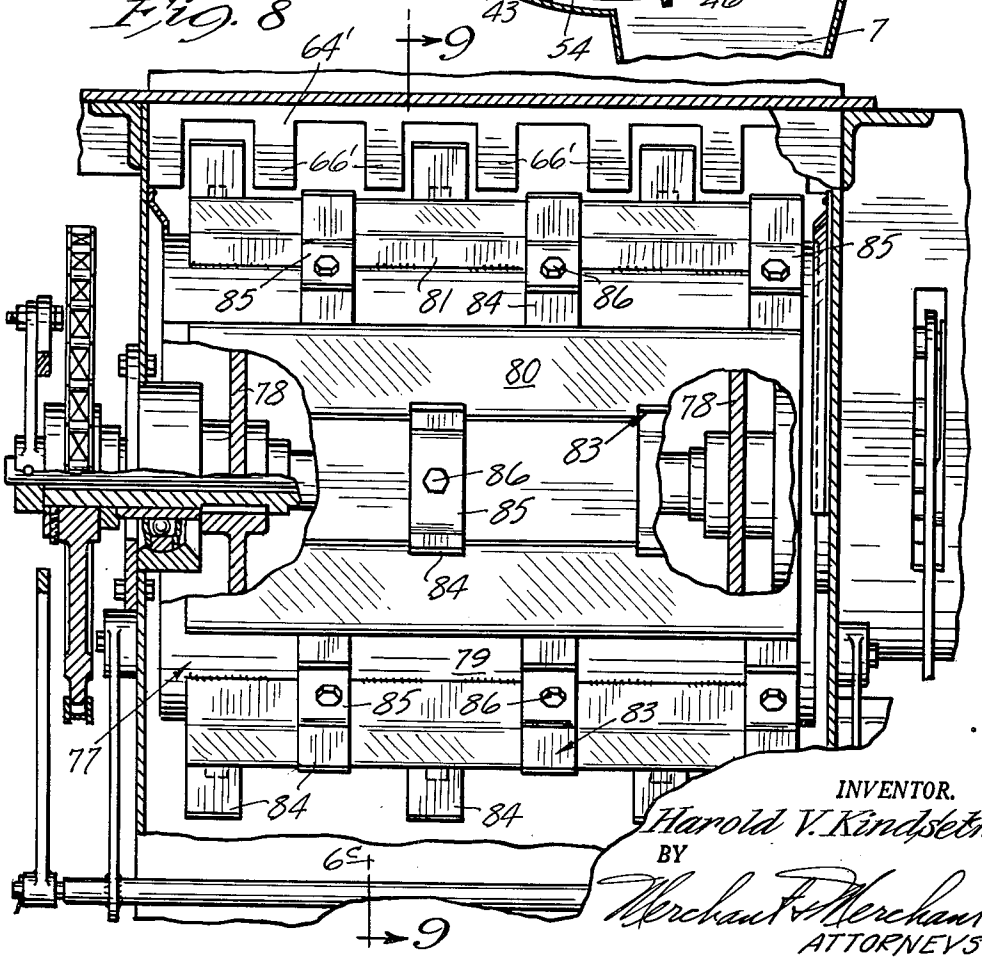


Fig. 8



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REGULATOR FOR FEEDING POWDERED OR GRANULAR MATERIAL

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Fig. 4

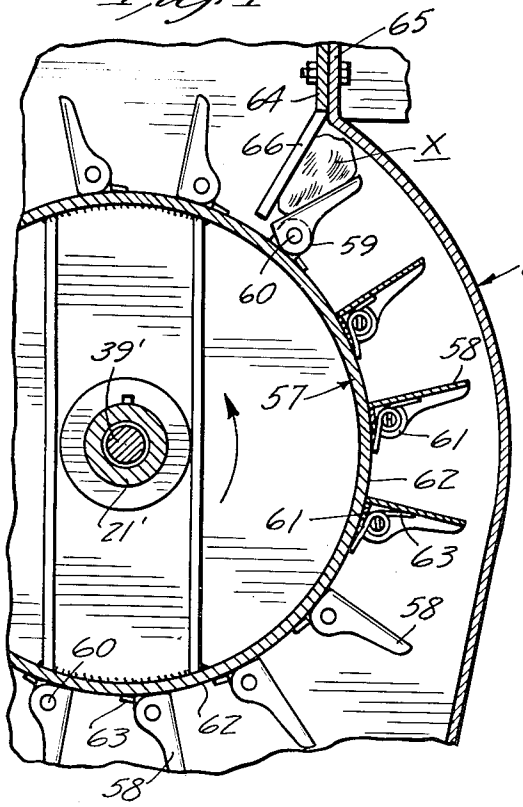


Fig. 5

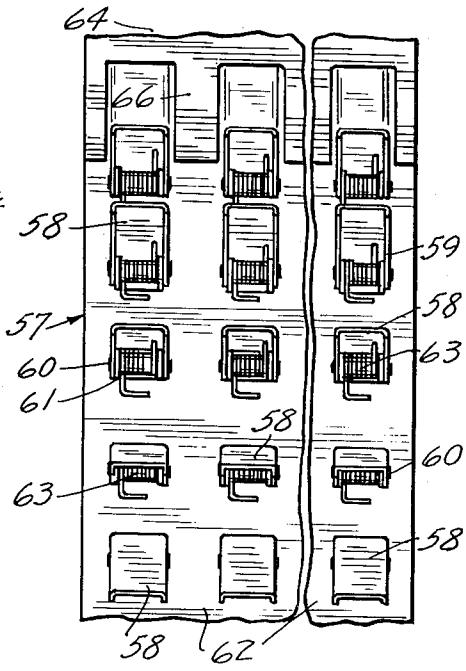


Fig. 6

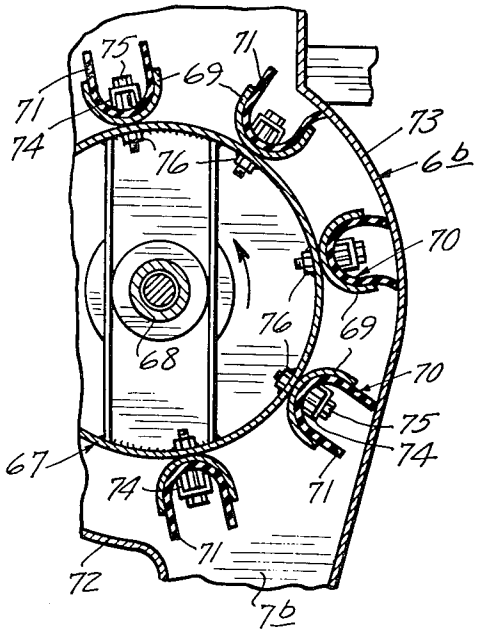
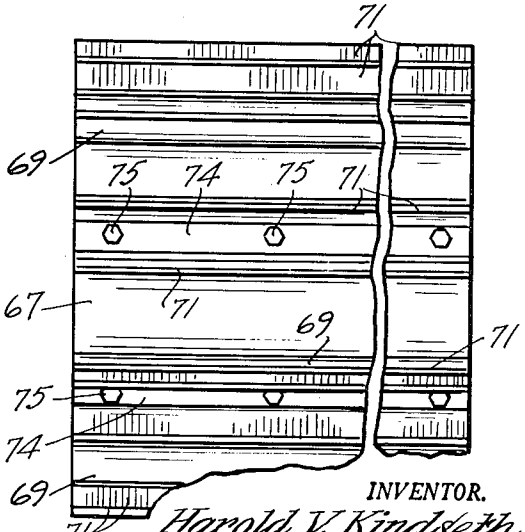


Fig. 7



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2,751,115

REGULATOR FOR FEEDING POWDERED OR GRANULAR MATERIAL

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Application May 15, 1953, Serial No. 355,295

9 Claims. (Cl. 222—77)

My invention relates generally to machines for feeding granular or powdered bulk material at predetermined rates, and more particularly to such machines utilized to feed bulk material to weighing scales in the packaging of said material.

An important object of my invention is the provision of a machine of the above type which will insure uniform feeding of the material to be dispensed.

Another object of my invention is the provision of a bulk feeding machine of the type set forth which will tend to break up lumps which will form in the material to be fed or dispensed and which will not be injured by relatively hard lumps of said material.

Another object of my invention is the provision of a feeding device incorporating novel vane-equipped feeding drum construction wherein the feeding vanes thereof may be quickly and easily adjusted or replaced.

Still another object of my invention is the provision of a novel feeding drum the feeding vanes of which are yieldable in one direction with respect to the direction of rotation of the drum.

Another object of my invention is the provision of a drum type feeding device having novel means for anchoring feeding vanes of the type set forth to the feeding drum.

A still further object of my invention is the provision of a feeding device as set forth which is relatively simple and inexpensive to manufacture, which is highly efficient in operation, and which is rugged in construction and durable in use.

The above, and still further highly important objects and advantages of my invention will become apparent from the following detailed specification, appended claims and attached drawings.

Referring to the drawings, which illustrate the invention, and in which like characters indicate like parts throughout the several views:

Fig. 1 is a fragmentary, partially diagrammatic, view in side elevation of a machine built in accordance with my invention;

Fig. 2 is an enlarged fragmentary view partly in side elevation and partly in section taken substantially on the line 2—2 of Fig. 1, some parts being broken away and other parts shown in section;

Fig. 3 is a fragmentary transverse section taken substantially on the line 3—3 of Fig. 2;

Fig. 4 is an enlarged fragmentary view corresponding to a portion of Fig. 3 but showing a modified form of feeding drum of my invention;

Fig. 5 is a fragmentary view in side elevation of the feeding drum of Fig. 4;

Fig. 6 is a view corresponding to Fig. 4 on a reduced scale and showing a further modification of my novel feeding drum;

Fig. 7 is a fragmentary view in side elevation of the feeding drum of Fig. 6;

Fig. 8 is a view corresponding to Fig. 2 but showing a still further modified form of the invention; and

Fig. 9 is a transverse section taken substantially on the line 9—9 of Fig. 8 on a reduced scale.

In the preferred embodiment of the invention illustrated in Figs. 1 to 3 inclusive, a generally rectangular frame is indicated in its entirety by the numeral 1 and comprises a pair of laterally spaced upper frame members 2, lower frame members 3 and vertically disposed legs 4 and 5. The frame 1 supports a feed hopper 6 which is provided in its bottom portion with a pair of laterally spaced discharge openings 7 and 8, the former of which is normally closed by a generally U-shaped swinging gate 9, and the latter of which is adapted to discharge material into a feeder trough or the like 10. The gate 9 is mounted for swinging movements about a horizontal axis on aligned trunnions or the like 11 which project laterally outwardly from opposite side walls 12 of hopper 6.

The discharge opening 7 and the delivery end of the feeder trough 10 overlie an open-topped receptacle 13 which is mounted on one end of a scale beam 14 mounted intermediate its ends on a fulcrum member 15 on a suitable support 16. A plurality of removable weights 17 are suspended from the opposite end of the beam 14 for counter-balancing the weight of the receptacle 13 and a predetermined amount of material contained therein. The receptacle 13 is provided at its bottom with a hinged trap door or the like 18 which may be opened by suitable mechanism not shown, for the discharge of material fed into the receptacle 13 from the hopper 6. It should be noted that the receptacle 13 and weighing mechanism above described are conventional in nature, and do not in themselves constitute the instant invention. Hence it is not believed necessary to show or describe the same in detail. The feeding trough 10 is supported and driven by a conventional electromagnetic vibratory feeding mechanism indicated diagrammatically at 19 in Fig. 1.

Journalled for rotation in suitable bearings 20 is a horizontal shaft 21 on which is mounted a feeding drum 22 which overlies the discharge opening 7. The shaft 21 is driven by suitable means such as an electric motor 23 through transmission mechanism including a speed reducer 24 and connections therebetween and the shaft 21. Said connections comprise an endless link chain 25 running over a sprocket 26 fast on one end of the shaft 21 and a driving sprocket 27 fact on the output shaft 28 of the speed reducer 24. An endless drive belt 29 runs over a pulley 30 secured to the shaft 31 of the motor 23 and another pulley 32 fast on the input shaft 33 of the reducer 24. As shown in Fig. 1, the motor 23 and speed reducer 24 are supported from the frame members 3 by mounting structure 34 which rests upon the frame members 3.

In the feeding of granular or powdered bulk material to the receptacle 13, the greater part of each charge of material is delivered through the discharge opening 7 to provide all but a very small portion of the weight desired. This relatively small portion is fed to the receptacle 13 from the discharge opening 8 in a so-called "dribble feed" caused by energization of the vibratory member 19. For weighing out quantities of material in succession, the gate 9 for the discharge opening 7 is opened for the time required to cause delivery of a predetermined amount of material to the receptacle 13, after which the gate 9 is closed and the balance of the desired weight dribbled into the receptacle from the trough 10 in a relatively fine stream. During this time the feeding drum is under constant rotation in a material feeding direction. Such rotation being counterclockwise with respect to Figs. 1 and 3. Means for opening and closing the gate 9 comprises a pair of links 35 and 36 that are pivotally connected at their lower ends to a pair of laterally outwardly projected trunnions 37 on opposite sides of the gate 9, and at their upper ends one each to one of a pair of crank arms 38, one

of which is shown, that have their inner ends pinned or otherwise anchored to opposite ends of a shaft 39 extending longitudinally through and concentric with the shaft 21 and journalled therein. Rocking movements are imparted to the shaft 39 to cause opening and closing of the gate 9 by suitable mechanisms not shown but contained within a casing 40, see Fig. 2. This mechanism is preferably of the type shown and described in my prior application for United States Letters Patent Serial No. 231,717, filed June 15, 1951, and entitled "Weighing Scale Feeder Mechanism" now Patent No. 2,661,876. The feeding drum 22 comprises a pair of end elements 41 and 42 and a generally cylindrical element 43. The cylindrical element 43 is formed to provide a plurality of axially extending radially outwardly opening channel-like recesses 44 having opposed relatively flat radial side walls 45 therein. Each of the recesses 44 is adapted to contain a pair of flexible resilient feeding vanes 46 that are preferably made from rubber or like suitable flat sheet material cut into strips which extend axially the entire length of the drum. The vanes 46 each lie against one of the side walls 45 of the recesses 44 and project radially outwardly therefrom, the outer side edges thereof being adapted to engage circumferentially spaced segmental wall portions 47 and 48 of the hopper 6. By reference to Fig. 3 it will be seen that the segmental wall portions 47 and 48 are disposed adjacent side portions of the discharge opening 7. Preferably and as shown, the diameter of the drum, and the radial projection of the vanes 46 are such that when the radially outer edges of the vanes engage the segmental wall sections 47 and 48, the flexible resilient nature of the vanes 46 permits them to yield in the direction opposite that of rotation of the drum 22, so that an effective seal is provided against flow of material through the discharge opening 7 when the drum is stationary.

The vanes 46 of each pair thereof are releasably locked adjacent their respective channel side walls 45 by means of elongated wedge elements 49 one each contained in a different one of the recesses 44 and clamping screws or the like 50 which extend through recesses 51 in the wedge elements 49 and which are screw threaded into the bottom walls 52 of the recesses 44. The wedges 49 each have radially projecting side walls 53 between which and the side walls 45 of the recesses, the vanes 46 are clamped. Interposed between the side walls 53 of the wedge elements 49 and the adjacent side faces of the vanes 46 are metallic wearing plates 54 having inturned flanges 55 at their inner edges which engage and support the radially inner edge portions of their respective vanes 46. The wearing plates 54 permit easy relative movement between the wedge elements 49 and their respective vanes 46 so that when the clamping screws 50 are loosened or tightened, the wedge elements 49 will readily lock or release the vanes 46. With reference to Fig. 2 it will be seen that the opposite ends of the vanes 46 have wiping engagement with annular rings 56 whereby to prevent finally divided material from sifting downwardly to and into the bearings 20.

From the above it should be obvious that rotation of the drum 22 in a feeding direction will cause the radially outer portions of the vanes 46 to flex slightly upon engagement thereof with the segmental wall portion 47. As they move successively into overlying relation with Fig. 7, they will tend to become straightened thus dislodging any granular particles which may otherwise adhere thereto. With the above described arrangement, powdered or granular material can be fed to the receptacle 13 in an even flow after the gate 9 has been opened and the accumulated material in the discharge opening has been discharged into the receptacle.

In the modified form of the invention illustrated in Figs. 4 and 5, a hopper 6*a* is shown as having a cylindrical drum 57 provided with a plurality of axially spaced circumferentially extended rows of axially extended radially outwardly projected feeding vanes 58. The vanes 58 are preferably stamped from sheet metal and are provided with laterally spaced ears or lugs 59 through which extend trunnion-forming pins or the like 60. Said pins 60 also extend through mounting brackets 61 welded or otherwise anchored to the peripheral surface 62 of the drum 57. The trunnions extend in a direction axially of the drum whereby to permit swinging movements of the vanes 58 in one direction away from their normal radially outwardly projecting positions. Each of the vanes 58 are provided with torsion springs 63 which yieldingly urge their respective vanes 58 toward their normal positions. As clearly shown in Fig. 4, the radially inner ends of the vanes 58 engage the outer peripheral surface 62 of the drum 57 to positively limit swinging movements of the vanes 58 forwardly with respect to rotation of the drum, which as indicated by the arrow in Fig. 4 is counterclockwise with respect thereto.

The hopper 6*a* is identical to the hopper 6 and may be assumed to have a discharge opening underlying the drum 57. The drum 57 is mounted on a rotary shaft 21' for continuous and uninterrupted feeding rotation. A rake element 64 is bolted or otherwise rigidly secured to a wall portion 65 of the hopper 6*a* and is provided with longitudinally spaced teeth 66 that project radially toward the axis of the drum 57. The teeth 66 are disposed to be received between the rows of feeding vanes 58 upon rotation of the drum 57 and cooperate with said vanes to break up lumps which tend to form in certain powdered materials, one of such lumps being illustrated in Fig. 4 and indicated by the reference character X. In the event that the lump X has become hardened to the extent that the impact therebetween and the adjacent teeth 66 is not sufficient to crumble the same, the vanes 58 carrying the same will swing rearwardly of the direction of rotation of the drum 57 and pass thereunder whereby succeeding vanes 58 will engage the same, the successive impingement thereof against the lump X eventually causing the same to break up into pieces sufficiently small to pass between the teeth 66 of the rake 64. Of course this situation will occur only when one of the lumps X adheres to the vanes 58 and is carried completely over the discharge opening underlying the drum 57 and upwardly toward the rake 64. It will be further noted that the rake 64 is similar to the rake of the modified form of the invention illustrated in Fig. 8 hereinafter to be described. Obviously, after a vane 58 has passed under the lump X caught by the teeth 66, the spring 63 thereof will cause the vane to resume its normal radially outwardly projected position on the drum 57.

In the modified form of the invention illustrated in Figs. 6 and 7, a hopper is fragmentarily shown and indicated by the reference character 6*b*. This hopper is identical to the hopper 6 of Figs. 1 to 3 inclusive and is shown as being provided with a discharge opening 7*b*. A feeding drum 67 is shown as overlying the discharge opening 7*b* and is mounted on a shaft 68 for rotary feeding movements on a horizontal axis and in a counterclockwise direction with respect to Fig. 6.

Mounted on the outer peripheral surface of the drum 67 is a plurality of cross sectionally U-shaped channel elements 69, preferably of metal, that extend axially the length of the drum in circumferentially spaced relationship. As shown, the channel elements 69 open radially outwardly and have nestingly received therein cross sectionally U-shaped channel-like members 70, the free longitudinal edges of which provide pairs of vanes 71. The members 70 are preferably of flexible sheet material such as rubber and are of such length as to engage wall portions 72 and 73 of the hopper 6*b* on opposite sides of the discharge opening 7*b* thereof. Like the vanes 46, the vanes 71 are of such length as to bend or flex upon engagement with the walls 72 and 73, returning to a normal radially outwardly projecting condition upon being disengaged from said wall portions. Means for anchoring the members 70 within the channel elements 69 and to the

drum 67 comprises a plurality of axially extended clamping members 74 one each operatively associated with a different one of said vane-forming members 70 and its cooperating channel element 69. With reference to Fig. 6 it will be seen that the clamping members 74 are in the nature of commercially available channel iron, the legs of which extend radially inwardly toward the intermediate portions of their respective members 70 and channel elements 59. Anchoring bolts 75 extend radially inwardly through the clamping members 74, the vane-forming members 70, the channel elements 69, and the drum 67 and screw threaded into nuts or burrs 76 welded or otherwise secured to the interior wall surface of the drum 67. This arrangement provides a simple and inexpensive manner of providing a feeding drum with replaceable feeding vanes. As indicated in Fig. 7, each clamping member 74 is provided with a plurality of axially spaced anchoring bolts 75.

Referring to the modified form of the invention illustrated in Figs. 8 and 9, the feeding hopper thereof is indicated at 6c having discharge apertures 7c and 8c, the former of which is closed by a swinging gate 9c. A feeding trough 10c underlies a discharge passage or opening 8c and together with other parts heretofore described in connection with Figs. 8 and 9, are identical to parts in Figs. 1 to 3 inclusive bearing the same numerals minus their coefficient c. The feeding drum of Figs. 9 and 10 is indicated in its entirety by the numeral 77 and is mounted on a shaft 21c for rotation about a horizontal axis and above the discharge opening 7c, said drum 77 comprises spaced end walls 78 and a connecting cylindrical wall having welded or otherwise secured to its outer peripheral surface a circumferentially spaced plurality of axially extending channel members 80 that open radially inwardly with respect to the drum 77. As shown in the Fig. 9, the side walls 81 of the channel members 80 are flat and extend radially, adjacent channel members 80 cooperating to define radially outwardly opening recesses 82 extending longitudinally of the drum. Mounted in the recesses 82 are a plurality of vane-forming members 83 preferably made from flexible resilient sheet material such as rubber or the like bent in generally U-shape to provide radially outwardly projecting vanes 84. As illustrated in Fig. 8, the vane-forming elements 83 are disposed in axially spaced circumferentially extended rows on the drum 77, the elements 83 of one row being staggered with respect to said elements in adjacent row. Each of the elements 83 is anchored by a wedge shaped clamping member or clip 85 and a headed screw or bolt 86 extending radially inwardly thereof and the cylindrical wall 79 of the drum 77. The bolts 86 are screw threaded into nuts or burrs 87 that are welded or otherwise rigidly secured to the inner surface of the cylindrical wall 79. A rake element 64' comprises a plurality of axially spaced teeth 66' that extend radially toward the axis of the drum 77 and which are disposed between the paths of travel of adjacent rows of vanes 84, for the same purpose as the teeth 66 of the rake element described in connection with the form of the invention illustrated in Figs. 4 and 5. In this form of the invention, the vane-forming members 83 may be removed independently of each other for replacement when necessary.

My invention has been thoroughly tested and found to be completely satisfactory for the accomplishment of the objectives set forth; and while I have shown and described a preferred form of my novel mechanism as well as several modifications thereof, it will be understood that the same is capable of still further modification without departure from the spirit and scope of the invention as defined in the claims.

What I claim is:

1. In a device of the class described, a hopper having a discharge opening in its bottom portion, a gate normally closing said discharge opening, a scale mounted receptacle underlying said opening and being adapted to receive material delivered thereto from said hopper when the gate is open, a feeding drum journalled in the hopper for rotation about a horizontal axis and overlying said discharge opening, a plurality of axially extending radially projecting feeding vanes yieldable in a direction opposite to the direction of rotation of said drum, and means for detachably securing said vanes to said drum in circumferentially spaced relationship, said means including cooperating anchoring elements associated with said drum and said vanes.

2. In a device for feeding automatic scales, a hopper having a discharge opening in its bottom portion, a feeding drum journalled in said hopper for rotation about a horizontal axis and overlying said discharge opening, means on the drum defining a plurality of circumferentially spaced axially extending radially outwardly opening recesses, a plurality of axially extending feeding vanes yieldable in a direction opposite to the direction of rotation of said drum and projecting radially outwardly from said recesses, and means in said recesses for detachably locking said vanes therein.

3. In a device for feeding automatic scales, a hopper having a discharge opening in its bottom portion, a feeding drum journalled in said hopper for rotation about a horizontal axis and overlying said discharge opening, means on said drum defining a plurality of circumferentially spaced axially extending radially outwardly opening recesses having relatively flat radially projecting side walls, a plurality of axially extending feeding vanes one each engaging a different one of said side walls and projecting radially outwardly therefrom, and means in said recess for detachably locking said vanes therein.

4. The structure defined in claim 3 in which the locking means for said vanes comprises a plurality of radially movable wedge elements one each contained in each of said recesses and having side walls parallel to adjacent side walls of their respective recesses, the side walls of said wedge elements each engaging a different one of said vanes to clamp the same therebetween and the adjacent side walls of their respective recesses upon radially inward movement of said wedge elements, and screw devices anchoring said wedge elements to said drum.

5. The structure defined in claim 4 in which said vanes comprise flexible resilient members, and in further combination with metallic wearing plates interposed between the side walls of said wedge elements and the adjacent sides of said vanes, said wearing plates having inturned flanges at their inner edge portions that engage and support the radially inner edges of said vanes.

6. The structure defined in claim 3 in which said recess and said vanes extend axially the full length of said drum, said vanes comprising flexible resilient members, the radially outer edges of which engage adjacent wall portions of the hopper on opposite sides of said discharge opening upon rotation of said drum.

7. In a device for feeding automatic scales, a hopper having a discharge opening in its bottom portion, a cylindrical feeding drum journalled in the hopper for rotation about a horizontal axis and overlying said discharge opening, a plurality of cross sectionally U-shaped channel elements extending in a direction axially of said drum, a plurality of cross sectionally U-shaped members nestingly received in said channel elements and each defining a pair of outwardly projecting flexible resilient vanes, and means releasably anchoring said channel elements and their associated vane-forming members to the outer peripheral surface of said drum in circumferentially spaced relationship.

8. The structure defined in claim 7 in which said anchoring means comprises a plurality of elongated clamping members each contained within a different one of said channel elements, and anchoring screws extending through said clamping members and their respective channel elements and vane-forming members radially into said drum.

9. In a device for feeding automatic scales, a hopper

having a discharge opening in its bottom portion, a feeding drum journalled in the hopper for rotation about a horizontal axis and overlying said discharge opening, means on said drum defining a plurality of circumferentially spaced axially extending outwardly opening channels having radially projecting flat side walls, a plurality of axially extending generally U-shaped members in said channels and arranged in axially spaced rows extending circumferentially about said drum, the intermediate portions of said members being disposed at the bottom portions of said channels and the free radially extending ends thereof defining flexible resilient vanes lying against the opposite flat side walls of said channels and projecting radially outwardly therefrom, means for independently anchoring each of said members in said channels, and a

rake element mounted on the hopper, said rake element comprising a plurality of rigid teeth projecting toward the axis of said drum and being spaced from each other in a direction axially of said drum, each of said teeth being receivable between adjecent rows of said members upon rotation of the drum.

References Cited in the file of this patent

UNITED STATES PATENTS

1,309,059	Bacon	July 8, 1919
2,205,324	Venable	June 18, 1940
2,304,753	Seidenstricker	Dec. 8, 1942
2,530,181	Schilling	Nov. 14, 1950
2,641,459	McHale et al.	June 9, 1953