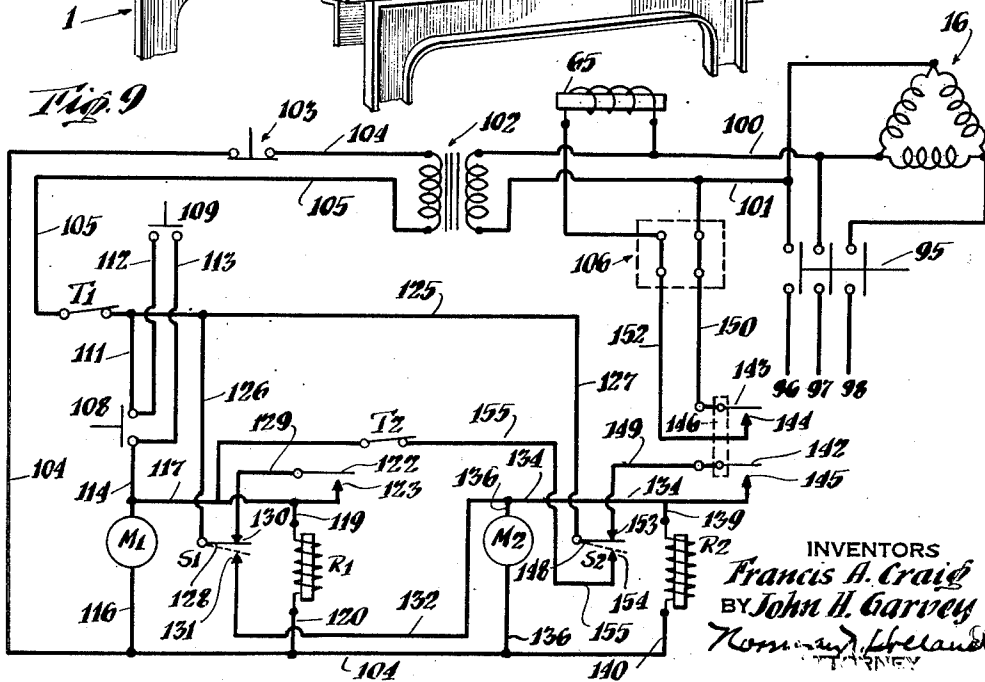
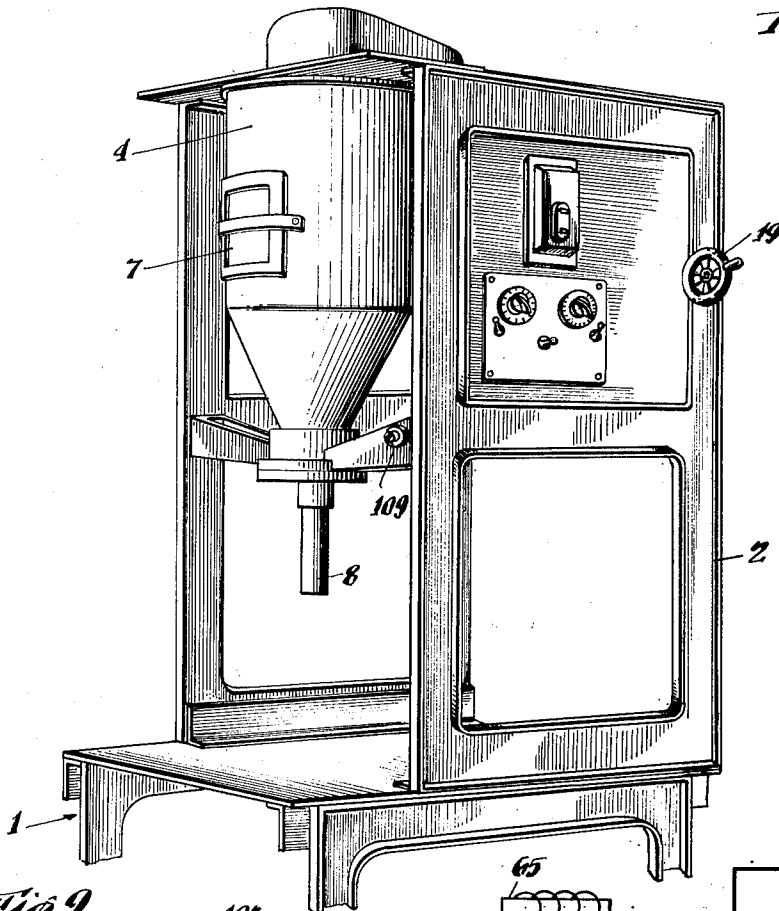


F. A. CRAIG ET AL
TIMER CONTROLLED APPARATUS ADAPTED
TO FEED AND MEASURE MATERIALS

3 Sheets-Sheet 1

Fig. 1



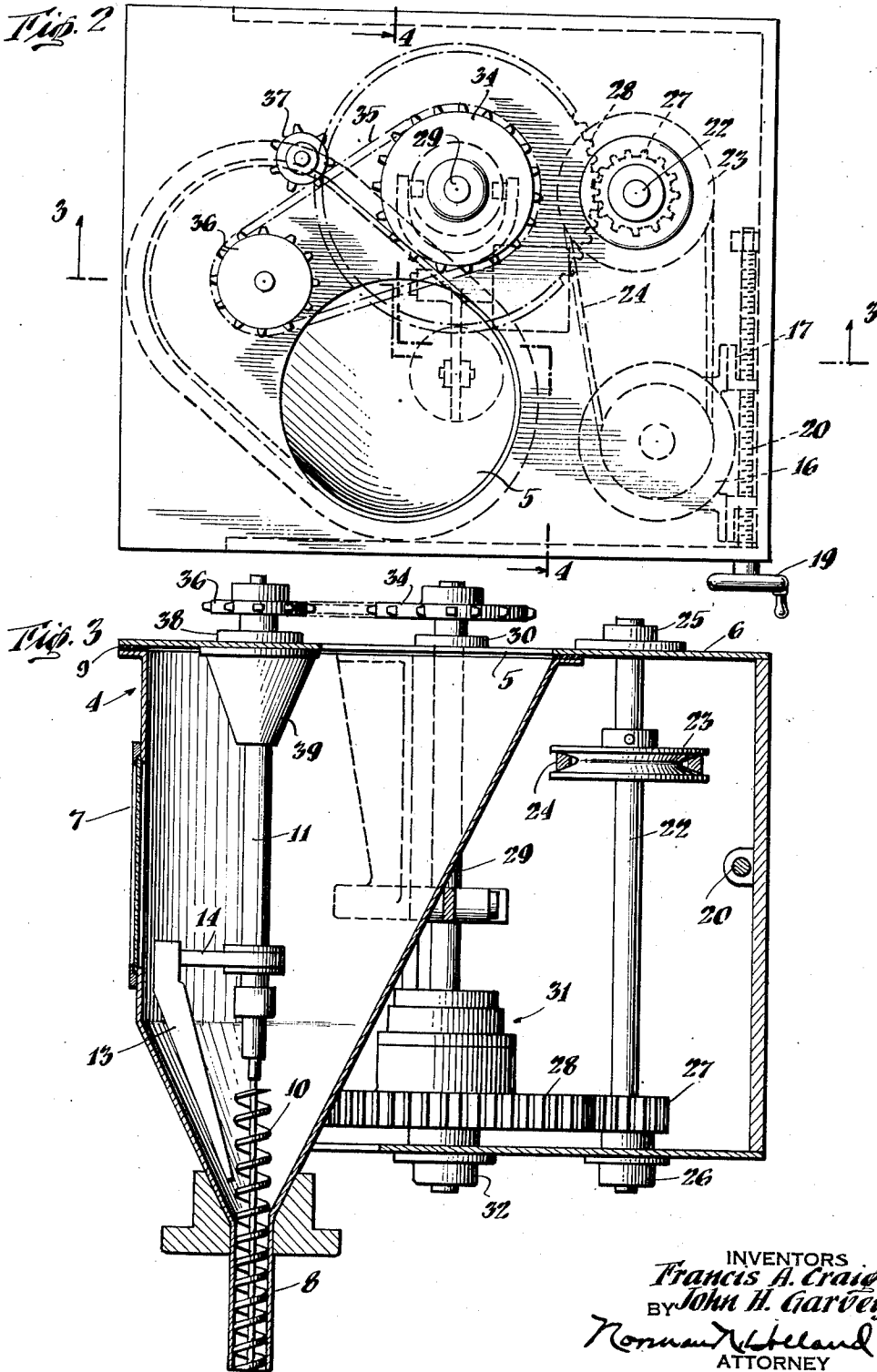
June 23, 1953

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TIMER CONTROLLED APPARATUS ADAPTED
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2,643,026

Filed April 2, 1947

3 Sheets-Sheet 2



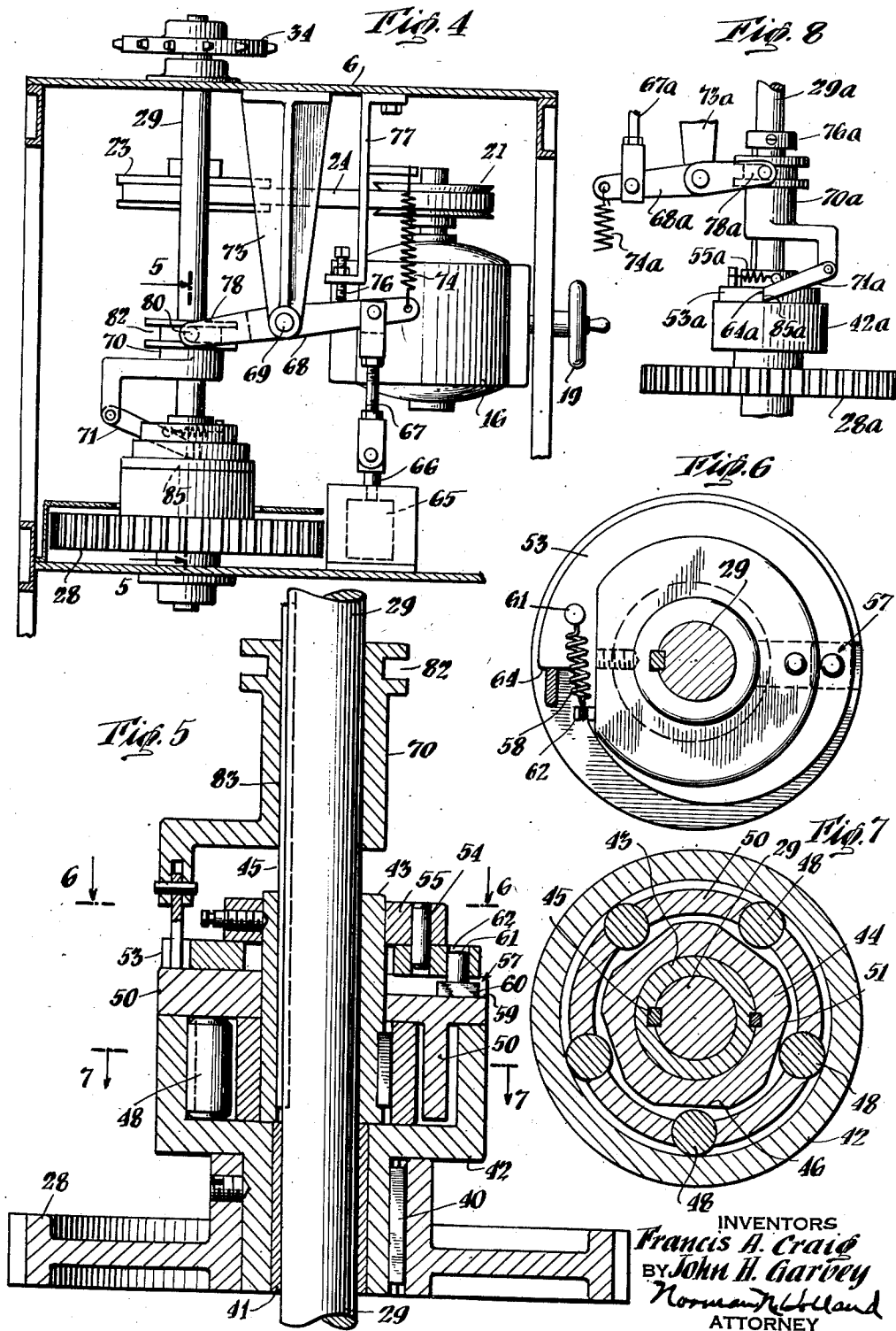
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3 Sheets-Sheet 3



INVENTORS
Francis A. Craig
BY John H. Garvey
Norman H. Holland
ATTORNEY

UNITED STATES PATENT OFFICE

2,643,026

TIMER CONTROLLED APPARATUS ADAPTED
TO FEED AND MEASURE MATERIALS

Francis A. Craig, Seneca Falls, and John H. Garvey, Brooklyn, N. Y., assignors to Cragar Packaging Co., Inc., Brooklyn, N. Y., a corporation of New York

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5 Claims. (Cl. 222—70)

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The present invention relates to feeding machines and more particularly to machines adapted to feed accurately determined quantities of powdered, pulverized, granular, pasty, and other materials.

It is generally desirable to feed materials such as the above directly into cartons, tubes or other containers in which the material is to be sold. In connection with such feeding or filling operations it is most desirable to measure the various materials with a high degree of exactness or accuracy. If the feeding and measuring gives short measure, the manufacturer will be liable to prosecution for violation of the law; if excessive measure is given the material will overflow the containers to promote unsanitary and unsightly conditions and there may also result increased costs to the manufacturer.

Numerous machines or mechanisms have been devised for feeding and measuring materials but they have presented various objections in practical usage, one objection being the difficulty of obtaining requisite exactness of control to thereby feed closely determined quantities of material. Where the filling and measuring machine is of the type which utilizes a rotatable auger or screw for feeding material it has heretofore proven difficult to obtain practically instantaneous starting and stopping of auger at any given instant of time or position of the auger. Where friction plate clutches or couplings are utilized to control rotation of the feed screw or auger the plates are subjected to excessive wear and, due to plate slippage, this type of coupling means is not well adapted to effect instantaneous starting and stopping of screw rotation at a desired instant. It has been attempted to remedy the objection to friction plate types of couplings by utilizing clutches or couplings of more "positive" type, but such devices are generally dependent upon the rotation of two fixed points, which means that the auger or screw is not readily engaged and disengaged with a driving means at any angular position of the drive means.

The present invention aims to provide new and improved feeding and measuring mechanisms which are adapted to instantly start and stop at any instant of time or at any point in the actuation of a feed screw, auger or other feeding means. The invention further contemplates the provision of means adapted to accurately and continuously control the feeding and non-feeding periods of operation of a feeding machine and to facilitate selective determination of these periods.

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An object of the present invention is to provide new and improved feeding and measuring means.

Another object of the invention is to provide a feeding apparatus or machine adapted to fill receptacles with a high degree of accuracy.

Another object of the invention is to provide a feeding or measuring machine embodying improved actuating mechanism.

Another object of the invention is to provide a new and improved means or mechanism for controlling the operation of a feeding or measuring machine.

A further object of the invention is to provide new and improved means for varying the periods of operation of a feeding or measuring device.

A still further object of the invention is to provide a feeding or measuring machine of relatively compact and simple construction.

Other and further objects of the invention will be obvious upon an understanding of the illustrative embodiment about to be described, or will be indicated in the appended claims, and various advantages not referred to herein will occur to one skilled in the art upon employment of the invention in practice.

A preferred embodiment of the invention has been chosen for purposes of illustration and description and is shown in the accompanying drawings, forming a part of the specification, wherein:

Fig. 1 is a perspective view, partly broken away showing one embodiment of the invention;

Fig. 2 is a top plan view of the apparatus shown in Fig. 1;

Fig. 3 is a sectional view taken along the line 3—3 of Fig. 2;

Fig. 4 is a sectional view taken along the line 4—4 of Fig. 2;

Fig. 5 is a sectional view taken along the line 5—5 of Fig. 4;

Fig. 6 is a sectional view taken along the line 6—6 of Fig. 5;

Fig. 7 is a sectional view taken along the line 7—7 of Fig. 5;

Fig. 8 is an elevational view of a preferred form of actuating mechanism for the construction illustrated in Fig. 4; and

Fig. 9 is a schematic and diagrammatic representation showing one form of electrical controlling means.

For purposes of illustration and description the present invention will be described chiefly with reference to a material feeding or measuring machine of the rotary screw or auger type.

The general arrangement of such a machine

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may be as illustrated in Fig. 1 of the drawings wherein there is disclosed a table or framework 1 upon which is mounted an upwardly extending framework 2 supporting a hopper 4. The hopper 4 may be bolted to the top plate 6, with a felt gasket 9 intermediate the hopper and the top plate. The hopper 4 is adapted to receive and contain the particular material which is to be fed into receptacles or containers (not shown), the material being supplied to the hopper through an opening 5 (Fig. 3) at the upper part of the hopper. A window 7 may be provided at one wall of the hopper to facilitate inspection of the interior thereof and to insure maintaining an adequate supply of material in the hopper.

A tubular extension 8 shown projecting downwardly from the bin or hopper 4 is adapted to guide material from the interior of the hopper to a receptacle. An auger or screw-like device 10 is provided at the interior of the tubular extension 8, with the outer edges of the helix or screw thread portion fitting closely against the interior walls of the tubular extension 8. The auger or screw 10 preferably terminates at or closely adjacent the end of the tubular extension 8 and may extend well into the hopper to facilitate movement of material through the hopper toward the tubular extension 8.

The auger 10 is shown connected with a rotatable shaft 11 and rotates with the shaft 11. An agitator 13 is carried by an arm 14 connected to the auger shaft 11 so that as the shaft 11 rotates the auger 10 it likewise rotates the agitator 13 and provides improved movement of material through the hopper by minimizing bridging thereof in the hopper.

As the shaft 11 rotates, and thus turns the auger 10 together with the agitator 13, material moves from the interior of the hopper 4 toward and into the tubular extension 8. The material does not fall out through the tubular extension 8 as the latter is closed by the auger or screw member 10, which fits relatively closely with the walls of the tubular extension. The auger is normally surrounded by material to be metered or measured and as the auger rotates with the shaft 11, material feeds or moves through the tubular extension 8 toward the open end thereof. When the auger is at rest material does not feed through the tube 8. Thus rotation of the shaft 11 and auger 10 feeds material through the feed tube 8 and stopping the rotation of the shaft 11 and auger 10 is effective to cut off the feed of material through the feed tube 8; intermittent rotation of the shaft 11 and auger 10 effects intermittent feed of material out of the tube 8. With auger rotation at a constant rate, equal periods of rotation are effective to feed equal quantities of material out of the tube 8.

The auger 10 and shaft 11 are adapted to be rotated by an electric motor 16 located adjacent the hopper 4 at the upper part of the framework 2. The motor 16 may be mounted on a base portion 17, with the motor shaft vertically disposed. The motor 16 is adapted to be moved bodily in a horizontal direction by a hand wheel 19 and threaded shaft 20 to vary the position of the motor from a driven shaft 22; when the hand wheel 19 and shaft 20 are rotated to shift the position of the motor 16 the pitch diameter of a variable speed pulley 21 is varied so that the rate of rotation of a pulley 23 connected with the variable pitch pulley 21 by the belt 24 is varied. Constructions for varying the speed of rotation of a shaft by changing the pitch diame-

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ter of a variable speed pulley are commercially known.

The vertically disposed shaft 22 is mounted in bearings 25 and 26 adjacent its ends and has keyed thereto a pinion gear 27, the latter pinion gear 27 meshing with a second gear 28. The gear 28 is connected with and normally rotates a portion of a coupling or clutch mechanism 31 (Figs. 3 and 5). This clutch mechanism will be hereinafter described in detail. When the coupling or clutch mechanism 31 is operatively engaged with the gear 28 the shaft 29 is rotated; the latter shaft may be mounted in bearings 30 and 32 and serves to rotate a sprocket 34 fixed to the upper part thereof. The sprocket 34 drives the shaft 11 through the intermediation of chain 35, idler sprocket 37, and sprocket 36 carried by the shaft 11. The shaft 11 may be maintained in position by suitable bearings 38 and 39. A preferred coupling or clutch mechanism 31 is shown in detail in Figs. 5, 6 and 7. As shown in these figures the gear 28 is secured by a key 40 to a housing member 42 so that the housing rotates with the gear 28. Both the gear 28 and housing 42 are shown extending around the shaft 29 with a bronze bushing 41 forming a bearing surface between the shaft 29 and the clutch housing 42. It is desired to intermittently rotate the shaft 29 to thereby effect intermittent rotation of the auger or screw member 10 carried by the rotatable shaft 11; the mechanism illustrated within and immediately adjacent the housing 42 is adapted to facilitate intermittently connecting the normally continuously rotating gear 28 and housing 42 with the shaft 29.

Intermittent rotation of the shaft 29 may be obtained by connecting the shaft 29 with the continuously rotating housing 42 for desired periods of time. As shown, the shaft 29 has keyed thereto a hub member 43, the hub member being in turn keyed to a cam member 44 provided with a plurality of substantially flattened surfaces. Intermediate the flattened surfaces of the cam 44 and the continuously rotating housing 42 is shown a plurality of rollers 48 and a cage portion 50. The cage 50 and rollers 48 carried thereby are adapted to be moved circumferentially with respect to the vertically disposed shaft 29 to thus position the rollers adjacent the "low" points or mid-portions 46 of the flattened surfaces of the cam 44 or to move the rollers toward "high" portions 51 of the cam 44. In the relationship shown in Fig. 7 the rollers 48 are disposed adjacent the "low" points 46 of the cam surfaces so that rotation of the housing 42 with the gear 28, is not effective to rotate the cam 44 together with the hub 43 and shaft 29. When the cage portion 50 is rotated so as to wedge the rollers 48 between "high" points 51 of the cam and the walls of the housing 42, the housing is in effect "locked" to the shaft 29 and the driving gear 28 is effective to rotate the shaft 29.

Movement of the cage 50 to effect movement of the rollers 48 and corresponding actuated and non-actuated periods of the shaft 29 may be obtained by a cam plate 53; through the intermediation of a pivot pin 54 carried by a collar 55 and a combination pin-and-slide member 57. The pin-and-slide member 57 has integral therewith a block-like lower portion 60 disposed within a radial slot 59 of the cage 50 and an outwardly extending protuberance 61 fitted into an aperture 62 of the cam plate 53. The collar 55 is fixedly secured to the hub 43 and serves to maintain the cam plate 53 in downward position

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and to retain the pivot pin 54 in position. The cam plate 53 is secured to the collar 55 by a spring 58 secured to pins 61 and 62 carried by the cam plate 53 and collar 55. As shown, the spring 58 normally urges a step 64 on the cam plate 53 toward the pin 62 carried by the collar 55.

When force is applied against the cam step 64 in a direction tending to move the cam plate 53 in opposition to the effect of the spring 58, the cam plate rotates about the pivot pin 54 carried by the collar 55. The cam plate 53 thus acts as a lever fulcrumed at the pivot pin 54, and the pin-and-slide member 57 together with its integral block 60 tends to move about the pivot pin 54 in an opposite direction to the cam step 64. The flat side walls of the block-like portion 60 carried by the pin-and-slide press against an adjacent wall of the radial slot 59 in the cage 50 and tend to move or rotate the cage 50 along with the pin-and-slide. As pointed out hereinabove, movement of the cage 50 shifts the positions of the rollers 48 with respect to the high and low points of the cam 44 keyed to the shaft 29. The effect of the spring 58 which connects the cam plate 53 with the roller 55 is to normally maintain the cage 50 and rollers 48 in such position that the rotating housing 42 and cam 44 are engaged; thus the effect of the spring is to normally maintain the gear 28 operatively connected with and rotating the shaft 29. Pressure applied against the cam step 64 moves the cage to place the rollers adjacent low points of the cam 44, and hence stops rotation of the shaft 29 which connects with and drives the feed auger 16.

Actuation or operation of the cam plate 53, to control rotation of the shaft 29 by intermittently disconnecting the driven parts of the coupling 31 from the continuously rotating gear 28 and housing 42, may be controlled by a solenoid 65, through the intermediation of a solenoid plunger 66, solenoid rod 67, lever 68, vertically adjustable sleeve 70, and finger member 71. The lever 68 is pivotally mounted intermediate its ends upon a bracket or arm 73, the latter being suitably secured by bolts, welding or the like to the plate 6 which forms the upper platform of the machine. The lever 68 is connected at the solenoid end thereof with a spring 74, the spring 74 serving to normally retain one end of the lever 68 upwardly against an adjustable stop pin 76 carried by a bracket 77. When the solenoid 65 is energized the solenoid plunger 66 moves downwardly together with the connecting rod 67 in opposition to the effect of the spring 74. Downward movement of the solenoid plunger is effective to rotate the lever 68 about the pin 69 to elevate the opposite end 78 of the lever.

The end 78 of the lever 68 is preferably of forked or yoke-like construction and provided with inwardly extending pins 80 which project into an annular recess 82 of the sleeve 70. The sleeve 70 is provided with a keyway 83 adapted to receive and slide along the key 45 which is carried by the shaft 29 and extends through the hub 43 of the coupling member 31.

When the lever 68 is operated to elevate or lift the sleeve 70 (by energizing the solenoid 65 of Fig. 4) the finger member 71 pivotally secured therewith tends to assume a more nearly vertical position so that its free end 85 moves away from the step 64 of the cam plate 53. The spring 58 urges the cam plate 53 circumferentially so that the cam step 64 follows along with the finger end 85 and approaches the pin 62 of the col-

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lar 55; thus the cage 50 is caused to rotate with the finger end 85 to shift the wedging rollers 48 toward "high" areas 51 of the cam member 44. In this relationship the shaft 29 will be "locked" to the continuously rotating gear 28 and housing 42 and the feed member 10 will be feeding material.

When the current of the solenoid 65 is cut off the spring 74 serves to pull one end of the lever 68 upwardly and to urge the opposite end 78 thereof downwardly; this means that the sleeve 70 will be moved downwardly and the end 85 of the finger member 71 pressed against the step 64 of the cam plate 53, in opposition to the effect of the interconnecting spring 58. When the sleeve 70 is in a downward position the finger 71 holds the cage 50 and wedge rollers 48 in "unlocked" position, as shown in Fig. 7; thus the shaft 29 and feed member 10 will be at rest and material will not be fed out of the tubular extension 8.

While the construction hereinabove described with respect to the solenoid 65 and spring 74 has proven satisfactory in actual operation, a slightly modified and preferred arrangement is illustrated in Fig. 8. In this latter figure a spring 74a connected with the lever 68a serves to normally maintain the sleeve 70a in elevated position on the shaft 29a. A solenoid (not shown) which connects with the solenoid rod 67a serves to maintain the solenoid end of the lever 68a in elevated position, to thus maintain the opposite end 78a and sleeve 70a in downward position. In the modified form of Fig. 8 the positions of the solenoid and spring are, in effect, interchanged. The construction of Fig. 8 is preferred for the reason that it has proven quite effective in controlling the operation of the coupling means 31 in those instances where there is a heavy load of material in the hopper 4. This latter construction, of course, requires that the solenoid be energized when the clutch or coupling means 31 is disengaged or unlocked from the rotating gear 28a and housing 42a. When the solenoid is energized the free end 85a of the finger member 71a presses against the step 64a of the cam plate 53a and the clutch is disengaged from the housing 42a and gear 28a. When the solenoid which actuates the solenoid rod 67a is deenergized the spring 74a serves to elevate the sleeve 70a and move the free end 85a of the finger member 71a away from the step 64a of the cam plate 53a; in this relationship the spring which interconnects the cam plate 53a with the collar 55a is effective to rotate the roller cage to engage the housing 42a with the shaft 29a.

It is most desirable that the engaged and disengaged periods of the auger or feed member 10 be accurately, continuously and automatically controlled and one form of mechanism or apparatus for so controlling the actuation of the mechanism is illustrated in Fig. 9. This figure shows a schematic diagram or wiring diagram which is adapted to control the operation of the solenoid 65 (65a of Fig. 8). It will be clear from the foregoing description that the solenoid 65 is in turn effective to control operation of the feed member 10 through the intermediation of shaft 11, sprocket 36, drive chain 35, sprocket 34, shaft 29, coupling means 31, finger member 71, sleeve 70, lever 68, solenoid rod 67 and solenoid plunger 66. When the solenoid is energized the shaft 29a, which drives the feed member 10, is at rest and when the solenoid 65 is deenergized the same shaft 29a will be rotating due to being opera-

tively connected with the continually rotating gear 28a (Fig. 8).

When the motor starter switch 95 is manually closed, current from the power lines 96, 97 and 98 passes through suitable contacts and leads to the coils of the driving motor 16. In actual usage a single horsepower, three phase, 220 volt motor has proven satisfactory. The effective speed of the drive belt 24 may be suitably adjusted, within designed limits, by the control handle 19 which is adapted to facilitate adjustment of the pitch diameter of the belt pulley 21.

As shown in Fig. 9 two take-off leads 100 and 101 convey current to one side of a suitable step-down transformer 102. The step-down transformer 102 need not be utilized in instances where it is desired to utilize higher power on the mechanism for automatically controlling the operation of the solenoid 65, however it is believed that its use will generally be preferred in actual operation. The coil of the solenoid 65 is shown connected at one end with the take-off lead 100 and at the other end with a suitable terminal block 106.

The mechanism for controlling the energized and deenergized periods of the solenoid 65, and thus the operating and non-operating periods of a feed device 10, may comprise a first timing or controlling mechanism for determining the period of deenergization of the solenoid and an additional timing or controlling mechanism for determining the period of energization of the solenoid. These two timing devices or mechanisms are preferably so interconnected or interlocked that when either one of them reaches substantially the end of its effective period it is adapted to initiate operation of the other.

The apparatus shown at the lower left portion of Fig. 9 is adapted to control the period of deenergization of the clutch-controlling solenoid 65. The apparatus shown at the lower right portion of Fig. 9 is adapted to control the period of energization of the clutch-controlling solenoid 65.

Normally the toggle switches T1 and T2 are in closed position, as well as the time delay relay stop switch 103 in the lead 104. The leads 104 and 105 are connected with the secondary coil or outlet side of the transformer 102. When either of the time delay relay start contactor switches 108 or 109 is momentarily closed current may flow, for example, from the lead 105 through the toggle switch T1 and thence through the leads 111, 112 and 113, depending upon which of the switches 108 or 109 is momentarily closed. Thence the current may flow through the lead 114, timing device M1 and lead 116 out to the return line 104; in addition, current from the lead 114 may pass through the lead 117, lead 119, coil of the relay R1, and lead 120 to the return line 104. Thus momentary closing of either of the start contactor switches 108 or 109 is effective to pass current through and operate the timing device M1 and to energize the solenoid of the relay R1.

Momentary energization of the relay R1 by momentarily closing switches 108 or 109, closes the breaker arm 122 against the contact 123 and current may flow through the lead 105, switch T1, lead 126, breaker arm 128, lead 129, breaker arm 122, lead 119, relay R1, and lead 120 out to the return line 104.

The timing device or mechanism M1 will have been pre-set or will have had its timing interval selectively predetermined so that after the timing device M1 has been in operation for the pre-

determined interval the breaker arm 128 momentarily moves away from the contact 130 and momentarily establishes contact with the point 131; the momentary position of the breaker arm 128 is indicated by the dotted position of the breaker arm. When the breaker arm 128 momentarily interrupted the contact with the point 130, flow of current through the timing device M1 and the relay R1 was interrupted. Momentary contact of the breaker arm 128 with the contact point 131 allows current to flow from the lead 126, through the breaker arm 128 and lead 132 to the lead 134. From the lead 134 current may flow through the timing device M2 via the leads 136 and 137 to the return line 104 and also may pass through the coil of the relay R2 via the leads 139 and 140 to the return lead 104. Thus the cutting off or inactivation of the apparatus shown at the lower left portion of Fig. 9 is effective to supply current to the mechanism shown at the lower right portion of Fig. 9.

Momentary energization of the coil of relay R2, due to momentary closing of the breaker arm 128 with the contact point 131, enables the solenoid of the relay R2 to move the breaker arms 142 and 143 against the contact points 145 and 144, respectively. The breaker arms 142 and 143 open and close simultaneously and this is indicated diagrammatically by the dotted member 146 shown pivotally interconnecting the breaker arms 142 and 143. With the breaker arm 142 moved into contact with the point 145 current from the leads 125 and 127 may flow through the breaker arm 148, lead 149, breaker arm 142, lead 139, relay R2 and lead 140 to the return line 104. Current may also pass from the lead 134 through the timing device M2 via the leads 136 and 137. Thus momentary contact of the breaker arm 128 against the contact point 131 serves to momentarily energize the relay R2 and the relay R2 moves the breaker arm 142 so that current will continue to flow through the relay R2 and the timing device M2 even after the breaker arm 128 moves away from the point 131.

Since the relay R2 also effects closing of the breaker arm 143 against the contact 144 current may flow from the line 101 through the coil of the solenoid 65 via the lead 150, breaker arm 143 and lead 152. As long as the relay R2 is energized, the solenoid 65 is energized and the latter solenoid is effective to control the position of the lever 68 which moves the sleeve 70 and controls the operation of the clutch or coupling means 31. When the solenoid 65 (or 65a) is deenergized the spring 74 (or 74a) is effective on the lever member.

The timing mechanism or device M2 which controls the period of effectiveness or energization of the solenoid 65 may be pre-set or selectively adjusted so that the solenoid 65 will be energized for a desired period of time. When the selectively predetermined time interval of the timing device M2 has elapsed the breaker arm 148 momentarily leaves the contact point 153 and establishes contact with the point 154, as indicated by the dotted line positioned at the lower right portion of Fig. 9. In this dotted position current from the lead 127 to the timing device M2 and relay R2 is momentarily interrupted and the breaker arms 142 and 143 move away from their respective contact points 145 and 144; the solenoid 65 is deenergized. Momentary contact of the breaker arm 148 with the contact point 154 allows current to flow from leads 125

and 127 through the lead 155, switch T2 and lead 117 through the timing device M1 and relay R1; the relay R1 closes the breaker arm 122 against the contact point 123. At this time the solenoid controlling apparatus shown at the lower right portion of Fig. 9 is rendered ineffective and the period controlling apparatus shown at the lower left portion of Fig. 9 is again rendered effective. Continuous repetition of the cycle occurs until such time as the circuit from the power source is interrupted. This interruption is normally achieved by momentarily opening the time delay relay stop switch 103, which may be positioned adjacent the foot of an operator.

The opening of either of the breaker arms 128 or 148 is effective to stop the cycle substantially precisely at predetermined time instants or points and thus the action of the machine, which is controlled by the solenoid 65, is stopped at the exact point that either of the breaker arms 128 and 148 is opened. This is a most desirable feature as it insures control of the clutch 31 in exact accordance with the operation of the relays R1 and R2; the clutch 31 cuts in and out in correspondence with the operation of the relays R1 and R2 and there is no necessity for dependence upon certain clutch points coming into contact prior to engagement or disengagement of the clutch which operates the shaft 29 and feed member 10.

Various scales may be used on the timers, for example, timers having ranges from zero up to sixty seconds maximum or from zero up to fifteen seconds maximum may be utilized. The minimum periods of adjustment generally obtainable with the timers are one-quarter second intervals, the timing adjustment being variable from minimum to maximum in one-quarter second intervals.

The present tandem type of time delay relay gives highly satisfactory results in obtaining precise periods of time control. The wiring of the clock mechanisms and the relays is such that by making momentary contact on the first relay, the clock may be set for any desired time period; at the end of its time period the circuit of the second relay is made. The clock mechanism of the second time delay relay may also be set for a desired predetermined interval. At the end of its time period the clock of the second relay is effective to reestablish the circuit of the first relay and the cycle is automatically repeated. Thus there is obtained continuous re-cycling which continues until such time as the current from the power source is momentarily interrupted.

The timers M1 and M2 may be of synchronous motor type and the particular frequency of alternating current will determine the equality of the time periods.

The tandem time delay relay is preferably so used that one relay provides a time interval during which an operator may transfer containers to and from the tubular filling extension 8; this being a period during the auger or feed member 10 does not operate. A second relay may be used to establish a circuit for energizing the solenoid 65, the time period of energization of the solenoid being that during which the feed member or auger is rotated to feed material to a receptacle.

While electronic timing means embodying vacuum tubes and the like may be utilized for controlling the periods of energization and deenergization of a solenoid 65, the foregoing described type of control mechanism is preferred in commercial usage for the reason that its installation

and maintenance are more generally understood by workmen and electricians.

It will be seen that the present invention provides new and improved apparatus or mechanism adapted to feed and measure various materials with close accuracy. The apparatus and devices of the present invention are adapted to feed and measure various materials in continuous "on-and-off" cycles to receptacles or containers; the apparatus initiates and continuously maintains alternating feeding and non-feeding periods or cycles. During feeding periods a machine feeds material for a definite time interval; the time interval may be selectively predetermined prior to initiating operation of the apparatus. Upon completion of a feeding period or cycle, which is effective to feed or measure a definite quantity of material, a non-feeding period is instituted. The duration of the non-feeding period may likewise be selectively predetermined prior to setting the apparatus into operation.

Either or both of the feeding and non-feeding intervals or periods may be pre-set or selectively predetermined and at the expiration of either one of these time periods actuating devices automatically initiate operation of the other period. Upon termination of a feeding period the non-feeding period is automatically set into operation and upon termination of the non-feeding period, the feeding period automatically becomes again effective. Continuous re-cycling of feeding and non-feeding periods occurs. Since the duration of the two periods may be accurately pre-set, and since the quantity of material fed is dependent upon the duration of the time period where the rate of feed is constant, the quantity of the material fed may be accurately predetermined by suitable adjustment or selection of the time period. Different time periods may be selected for different types of materials or for materials of different densities or degrees of coarseness.

Ease of adjustment for different sizes of receptacles or containers may be readily made by varying the rate of rotation of the driving motor or by varying the length of time during which a feed device is effective to feed material. The rate of rotation of the motor may alone be changed, the time duration of the feed may alone be adjusted, or both the rate of rotation of the actuating motor and the time duration periods may be adjusted. For example, some motor speed adjustment mechanisms of the type disclosed herein are capable of adjustment to any one of three different rates of rotation; the time control mechanisms may be adjusted in one-quarter second intervals from minimum to maximum time periods. Adjustment for varying densities of materials may be readily made.

The present machine or apparatus is of relatively simple and compact construction and occupies little floor space. Relatively complicated right angle drives are eliminated and moving parts are so positioned that they are not likely to readily become contaminated or contacted by the material being fed.

The actuating mechanism including the coupling or clutch is of compact and relatively fool-proof construction. The coupling or clutch co-operates with the present machine so that a feed member may be stopped at any point in its operation; whenever a predetermined time period expires and the solenoid or spring is effective to engage or disengage the coupling mechanism, the coupling immediately is effective to actuate or cease actuation of the feed member operatively

connected therewith. The present mechanism is not dependent upon two fixed points first coming into contact or moving out of contact prior to instituting control of the material feeding member; this is a distinct advantage over what may be termed "single revolution clutches."

As various changes may be made in the form, construction and arrangement of the parts herein without departing from the spirit and scope of the invention and without sacrificing any of its advantages, it is to be understood that all matter herein is to be interpreted as illustrative and not in a limiting sense.

Having thus described our invention, we claim:

1. A machine for feeding and measuring materials, comprising the combination of a rotatable feed screw, driving means to rotate said screw for feeding material, coupling means including a normally rotatable member operatively connected with the driving means and a movable member operatively connected with the feed member and movable into and out of engagement with the rotatable member for operatively connecting and disconnecting the driving means and the feed screw, a first electrical timing device operatively connected with said movable member of the coupling means to determine the time period during which the coupling means and driving means are connected and said feed screw is rotated, a second electrical timing device operatively connected with said movable member of the coupling means to determine the time period during which the coupling means and driving means are disconnected and said feed screw is not rotated, and electrical means so interconnecting said first and second electrical timing devices that either one automatically initiates operation of the other upon reaching substantially the end of its respective time period.

2. A machine for feeding and measuring materials, comprising the combination of a feed screw, means for actuating said feed screw, a coupling device for operatively connecting and disconnecting the feed screw and the actuating means, an electrical timer operatively connected with the coupling device for determining the time period during which said screw actuating means and coupling device are connected, a second electrical timer operatively connected with the coupling device for determining the time period during which said screw actuating means and coupling device are disconnected, and electrical relays so interconnected with said electrical timers that when either of said timers reaches the end of its time period the other timer is automatically set into operation.

3. A machine for feeding and measuring materials, comprising the combination of a feed screw, means for actuating said feed screw, a coupling device for operatively connecting and disconnecting the feed screw and the actuating means, an electrical timer of selectively determinable time periods operatively connected with the coupling device for determining the time period during which said screw actuating means and coupling device are operatively connected, a second electrical timer of selectively determinable

time periods operatively connected with the coupling device for determining the time period during which said screw actuating means and coupling device are operatively disconnected, and electrical relays so interconnected with said electrical timers that when either of said timers reaches the end of its selectively determined time period the other timer is set into operation, said interconnected relays normally automatically effecting continuous alternation of timers and continuous alternation of feeding and non-feeding periods of said feed screw.

4. A device for feeding materials, comprising the combination of a rotatable feed member, driving means to actuate said feed member, coupling means including a normally rotatable member operatively connected with the driving means and a member operatively connected with the feed member and movable into and out of engagement with the rotatable member to intermittently rotate said feed member, a solenoid and a finger member connected therewith for actuating said movable member and connecting and disconnecting the driving means and the feed member, a timer operatively connected with said solenoid to determine the time period during which the coupling means and driving means are operatively connected, and an additional timer independent of said first timer operatively connected with said solenoid to determine the time period during which the coupling means and driving means are operatively disconnected.

5. In a machine for feeding and measuring materials, the combination of a feed screw, a coupling device for operatively connecting and disconnecting the feed screw with an actuating means, an electrical timer operatively connected with the coupling device for determining the time period during which said screw actuating means and coupling device are connected, a second electrical timer operatively connected with the coupling device for determining the time period during which said screw actuating means and coupling device are disconnected, and electrical relays so interconnected with said electrical timers that when either of said timers reaches the end of its time period the other timer is automatically set into operation.

FRANCIS A. CRAIG.
JOHN H. GARVEY.

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