Nov. 14, 1939. A. C. AVRIL 2,179,485

MEANS FOR UNIFORM PACKAGING OF MIXTURES

Filed Oct. 28, 1936

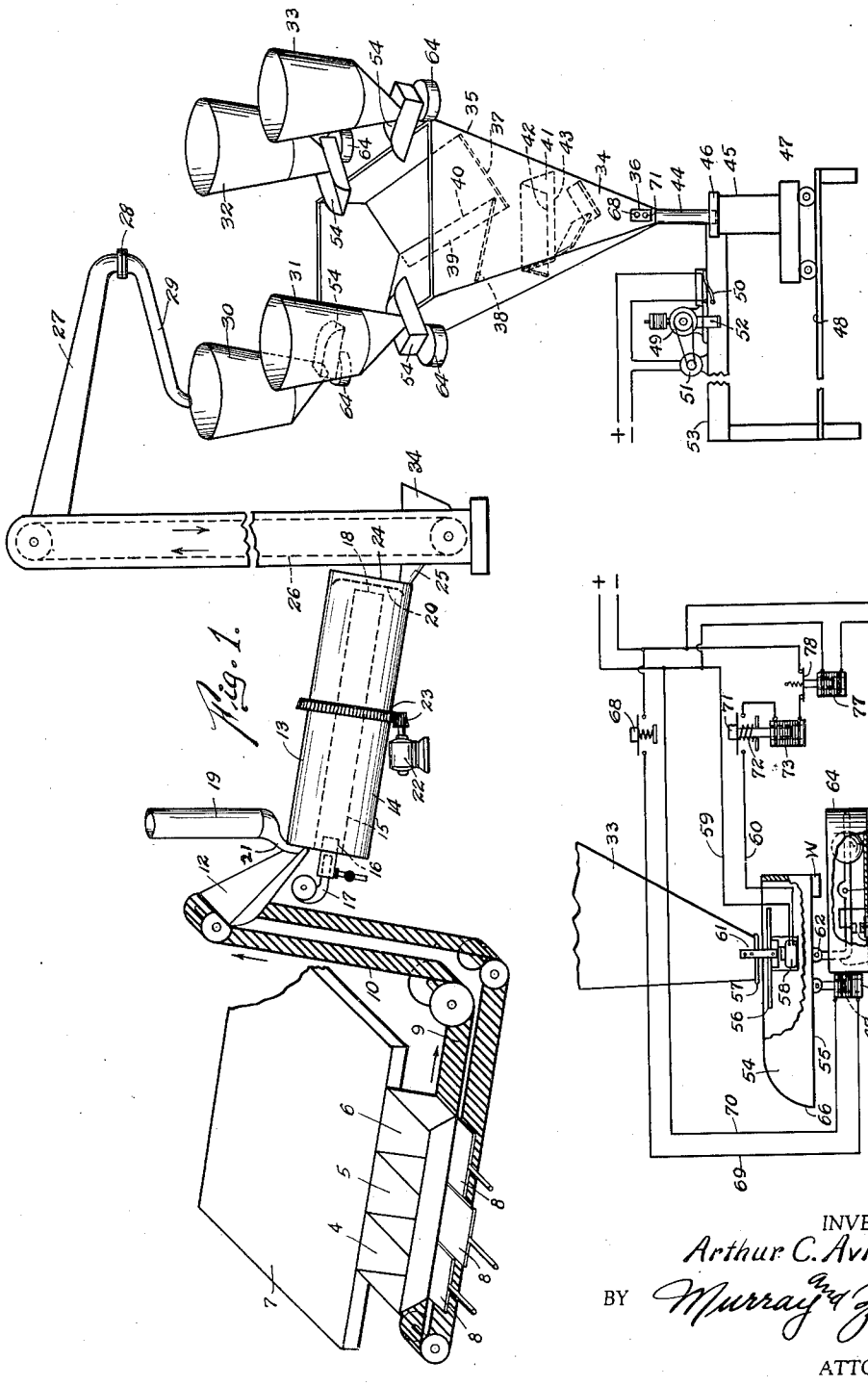

Fig. 1.

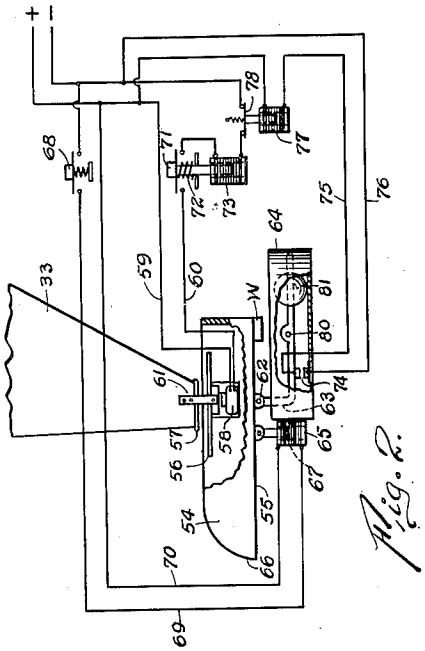

Fig. 2.

INVENTOR.
Arthur C. Avril
BY Murray and Zugelter
ATTORNEYS.

Patented Nov. 14, 1939

2,179,485

UNITED STATES PATENT OFFICE

2,179,485

MEANS FOR UNIFORM PACKAGING OF MIXTURES

Arthur C. Avril, Cincinnati, Ohio

Application October 28, 1936, Serial No. 108,040

2 Claims. (Cl. 259—180)

This invention relates to a means for the uniform packaging of mixtures, with the ultimate object of producing identical packages of thoroughly mixed and accurately measured ingredients or constituents.

Another object of the invention is to provide a method and means for the purpose stated, whereby a succession of packages are duplicated consistently, with the high degree of accuracy that is necessary or desirable in connection with certain mixtures or combinations of materials.

Another object of the invention is to provide a simple, effective, and reliable combination of means for handling, processing, storing, mixing, and packaging materials in the manner stated, as a continuous production operation, and with a substantial saving of time, effort, and operating expense.

A further object of the invention is to provide a novel and effective control means for feeding materials to be weighed or measured, and for thoroughly mixing and releasing them to the packaging station of the apparatus.

The foregoing and other objects are attained by the means described herein and disclosed in the accompanying drawing, in which:

Fig. 1 is a mixed perspective and elevational view of the apparatus embodying the present invention.

Fig. 2 is a wiring diagram and detail view showing a control means for weighing or measuring one ingredient of a mixture to be produced in the apparatus of Fig. 1, parts being broken away in the interest of clarity of disclosure.

In the blending, mixing, and packaging of certain products or substances, it is often necessary, or at least desirable, that the completed packages or mixture units be very substantial duplicates of one another, especially as to the proportions of the various constituents. This requirement is particularly applicable to the blending and packaging of concrete or cement constituents in the dry state, as well as to the blending and packaging of grain, seed, or cereals, feeds of various kinds including food products, ores, minerals, fertilizers, and the like. By means of the present invention, the blending and packaging operation can be performed accurately on a large scale, and with a minimum of labor and expense.

In the description which follows, the invention will be treated in its application to the handling of ingredients for the production of units of dry concrete or cement mixes. Such treatment will not only be convenient, but also sufficiently comprehensive to suffice for a full understanding of the more simple application of the invention in the handling of the other substances and products above mentioned.

With reference to the accompanying drawing, the characters 4, 5 and 6 indicate a plurality of storage bins for the constituents of a concrete or cement mix, these being generally sand and one or more grades of gravel or stone. Adjacent to the bins, there may be provided a platform or ramp 7 upon which trucks may travel for dumping the constituents into the bins. Each bin may be provided with any suitable type of gate, preferably at the open bottom of the bin, such gates being indicated conventionally by the characters 8. The gates are adapted to be actuated either by power or by hand manipulation, to release the contents of a bin onto a combination conveyor and elevator 9—10. The conveyor may be of any approved type, for example, one of the bucket type which includes means at the top of the elevating or vertical run, for releasing the material carried thereon.

The material elevated by the conveyor 10 is released into a chute 12 which feeds a drier indicated generally at 13. The drier, like the conveyor, may be of any approved and accepted construction, for example, it may comprise a rotary inclined drum 14 having an inner cylinder 15 which is heated to drying temperature by means of a suitable heat generator or burner 16 having associated therewith a blower 17 or other source of air or gas under pressure. Flame or heat generated by the burner is forced through the cylindrical tube 15, and passes from the open end 18 thereof, to be returned toward the burner and into the stack 19, through the space between the tube 15 and the cylindrical wall of the inclined rotary drum. A baffle or deflector plate 20 directs the flame or heat of combustion toward the stack opening 21 of the drier. Rotary movement of the drier shell or body may be effected by means of a motor 22 and suitable power transmission elements 23. The lower end 24 of the drier drum is open, so that materials fed to the drier by way of the chute 12, may pass the baffle 20 and be deposited in a chute 25 which feeds the material to an elevator 26.

Materials from the storage bins, after having been treated in the drier 13, are carried upwardly by the elevator 26 and released into a distributor which comprises a gravity type conveyor or conduit 27 to which is connected, by means of a suitable rotary coupling arrangement 28, a swivel spout indicated by the character 29. The swivel

spout is adapted, upon being rotated, about the rotary coupling, to register with any one of a number of elevated hoppers 30, 31, 32 and 33, for the purpose of charging the hoppers with the different kinds of substances or ingredients taken from the storage bins 4, 5 and 6. The number of elevated hoppers to be employed corresponds, preferably, to the number of different kinds of ingredients that are needed to constitute a desired ultimate mix. For example, in the case illustrated, hopper 30 may be reserved for Portland cement or the like, while hopper 31 is adapted to contain sand. Hoppers 32 and 33 would ordinarily contain two different grades of aggregate, which may be gravel or crushed stone of two desired grades or sizes. From the foregoing, it should be understood that storage bin 4, for example, containing sand, may be caused to release the sand onto the conveyor and elevator 9—10 which feeds it to the drier and thence to the elevator 26, and under the circumstances, the swivel spout 29 would be moved to register with the hopper for sand, indicated at 31. Should the storage bins 5 and 6 contain two different grades of gravel or stone, the spout would be moved to one or the other of the elevated hoppers 32 or 33, as determined by the release of gravel from either of the storage bins 5 or 6. When cement is to be conveyed to the hopper 30, for replenishing the supply therein, it may be fed to the conveyor through a chute or hopper 34 of the elevator 26, while the swivel spout 29 registers with the cement hopper 30. From the foregoing, it will be understood that each hopper of the group of elevated hoppers 30 to 33 inclusive, may be supplied selectively with the required constituents of the mixture to be produced.

Associated with each elevated hopper of the group 30 to 33 inclusive, is a means controllable from a suitable station 36, for releasing a measured portion of each hopper content into a mixing chamber 35. The mixing chamber may be in the nature of a funnel-shaped hopper which includes a pair of opposed inclined baffle plates 37 and 38 having inner edges 39 and 40, respectively, the edge 40 overhanging the edge 39 of baffle 37. Beneath the baffles is positioned a secondary baffle or dividing element 41 which may be of inverted V-shaped configuration, and having outer edges 42 and 43 spaced from the adjacent side walls of the funnel-shaped member so that material gravitating from the elevated hoppers and onto the first set of baffle plates, will be intimately mixed by the action of the baffles which compel the particles to take a circuitous course and finally release the material into the lower portion of mixing chamber 34, where they enter a filler spout 44. The filler spout may be a length of flexible conduit or rubber hose of such dimensions as to insure easy insertion of its lower end into a container 45. The container 45 preferably is a paper bag which has a reinforced upper portion 46 that may be closed tightly to preclude leakage of the contents when stacked or transported.

In accordance with the present embodiment, a charge of materials from the elevated hoppers is directed into the container 45 while the container rests upon a suitable carriage or conveyor 47. When the container is filled, the operator merely removes the flexible filler spout 44 from the mouth of the container, and shifts the carriage or conveyor 47 along the track or guide 48, thereby to subject the open upper portion of the container to a sewing operation performed by any approved type of sewing machine 49. The sewing machine preferably is provided with an electrical switch 50 suitably wired for controlling the motor 51 of the sewing machine and so arranged that the switch will be closed automatically by movement of the bag toward the sewing needle 52, whereupon the sewing machine is automatically started and stopped by the action of the container or bag 45 moving past the switch and needle. The sewing machine is mounted upon a suitable support 53 and properly located to accommodate the upper end of the bag or container 45 as it is conveyed by the carriage 47 along the track or guide means 48. After passing the sewing machine, the completed package is lifted from the carriage and stored or shipped, as desired. The bag filling operation may be repeated indefinitely, following the succession of steps above recited.

In the preceding paragraph it was mentioned that the different materials of the elevated hoppers 30 to 33 inclusive, are weighed prior to discharge thereof into the mixing chamber 35. The weighing operation and also the discharge of weighed quantities of materials from said hoppers, are controlled by an operator located at the station 36, the operator having also as his duty the advancing of the bag or container 45 from the position of Fig. 1, to a position past the sewing machine. Thus, the operator may effect the weighing and discharging action of the apparatus after he has placed a bag or container 45 in proper position for receiving the charge from the mixing chamber. One form of weighing and discharging mechanism, together with the control means therefor, is illustrated in Fig. 2, wherein 33 indicates one of the hoppers, and 54 indicates a tiltable or dischargeable scale pan for receiving material from the hopper 33. Above the bottom 55 of the scale pan is positioned a vibratory distributor 56 which may be in the nature of a flat plate spaced a limited distance from the mouth 57 of the hopper, so that when the plate is at rest, it will serve to prevent a flow of material from the hopper mouth and into the scale pan. Upon vibrating the plate or distributor 56, however, the material from the hopper is shaken from the plate and flows over the edges thereof and into the scale pan continuously as the hopper mouth feeds the material onto the middle portion of the plate or distributor. To provide the necessary vibratory movement, a standard well known form of vibrator 58 is associated with the plate or distributor 56. The vibrator preferably is electrically actuated, and electrical current is supplied thereto through the conductors 59 and 60. The distributor or plate may be maintained in proper spaced relationship to the mouth of the hopper in any suitable manner, such as by means of a bracket 61 mounted upon a stationary supporting structure, or upon the hopper itself.

The scale pan is pivotally supported as at 62 upon the balance arm or beam 63 of a weighing scale 64, so that, by energizing a solenoid 65 or other electromagnetic motive means, the scale pan will be tilted about the pivot 62 to discharge the contents from the mouth 66 thereof. The movable armature of the solenoid is indicated at 67, and is adapted to enter the hollow core of the solenoid when an electrical circuit is completed therethrough. The solenoid is energized by the closing of the normally open electrical switch 68 at the operator's station. Thus, the discharge of weighed material from the scale pan 54 is under the control the operator. The wires connecting

the switch with the solenoid are indicated at 69 and 70.

The character 71 indicates a second switch at the operator's station, to be closed for vibrating the distributor 56 when it is desired to charge the scale pan with material from the hopper 33. This switch is normally held open by a spring 72, but upon being depressed to close the electrical circuit of the vibrator 56, a solenoid 73 is energized to hold the switch in the closed position, against the force of spring 72, until the vibrator circuit is opened. The opening of said circuit is accomplished by means of an electrical contactor or switch 74 associated with the scale beam or an equivalent movable part of the scale or hopper, so that when the required charge is present in the scale pan, the contactor 74 will complete a circuit which includes the conductors 75 and 76, and the winding of a solenoid 77 which acts upon the solenoid armature to open an electrical switch 78 in the circuit of the vibrator and solenoid 73. The opening of switch 78 of course de-energizes the solenoid 73 of switch 71, and permits the spring 72 to act for opening the contacts of switch 71. Thus, the charging of the scale pan with a measured quantity of material from hopper 33 automatically effects a disabling of the vibrator and cuts off the feed of material from the hopper into the scale pan. The hopper having been charged, it may be tilted or relieved of its contents at the will of the operator, by closing the switch 68 as stated. The characters 80 and 81 indicate, respectively, the fulcrum and the balance weight of the weighing scale 64.

It is to be understood that each of the four weighing scales indicated at 64 of Fig. 1 is equipped and associated with a scale pan structure such as is disclosed in Fig. 2, and that the electrical control means of Fig. 2 is duplicated in each scale charging and release mechanism of each elevated hopper, and wired in parallel so that actuation of the push buttons 68 and 71 effect unitary or simultaneous function of the charging, weighing and releasing apparatus of each elevated hopper.

It is to be understood that numerous conceivable methods of control are possible for securing the performance of the function of the elements disclosed herein for charging the scale pans and effecting the release of their contents into the mixing chamber, so that the particular means disclosed and described is to be considered exemplary only, and not as limiting the invention to the exact means employed. Moreover, it is conceivable also that for handling materials which do not require drying, the combination of Fig. 1 may be modified by omitting entirely the drier 13. Further, in certain installations it may be possible to dispense with the elevator 10 and to extend the conveyor 9 directly to the receiving hopper 25 of the elevator 26, or to the top portion of the chute or conduit 27. The present structure, however, is typical and convenient for use in a building having a main floor for supporting the drier, elevator 26, and sewing mechanism 49, while the group of elevated hoppers, the mixing chamber, and the swivel spout arrangement are supported upon a superstructure of the building. The ramp or platform 7 and the bins associated therewith may be located exteriorly of the building, if desired, although these elements may be located within the building when the circumstances permit.

One of the outstanding advantages of the apparatus of the invention, is that of securing a thorough mixing and a very accurate proportioning of the ingredients or constituents of the mix. Such a result is impossible when a large batch of mix is produced and packages made therefrom by removing weighed or measured portions from such batch. The reason for failure to secure uniformity in the individual packages under the conditions just mentioned, is that the ingredients or constituents are generally of different areas and specific gravities, so that one or more constituents would segregate from the mix as the packaging operation proceeds. In accordance with the present invention, however, every mixture unit is individually produced by combining individually measured or weighed portions of the several ingredients or constituents, with the result that all of the packages are uniform as to weight and proportions of the mix constituents. In the case of preparing individual dry mixes, for concrete, as exemplarily disclosed herein, it is possible to guarantee the contents of every individual package to produce a specified strength of concrete when mixed with a specified amount of water. In addition, the vicinity of the operator's station may be kept clean and free of dust, thereby enhancing the efficiency, the appearance and working conditions about the plant. The objects at the beginning of the description may be referred to for a statement of additional advantages.

What is claimed is:

1. In a mechanism for proportioning and intimately mixing materials, the combination of a plurality of material supply hoppers each including a scale pan having a discharge exit, said hoppers being arranged in spaced opposition to one another with the scale pan exits projecting toward a substantially central common point, and a funnel shaped mixing chamber having a plurality of triangular side walls joined along corresponding edges to provide adjacent corners and an upper peripheral edge of extensive perimeter, said corners each being located beneath a scale pan so that each scale pan overhangs a corner of the mixing chamber, a pair of opposed inclined baffle plates having inner edges, one overlapping the other, and extending substantially through the middle of the mixing chamber in substantial parallelism with a side wall thereof, said plates intercepting charges of materials released from the scale pans, a second set of baffles located beneath the baffle plates aforesaid, and comprising a pair of walls arranged in inverted V shape, with the line of intersection of the walls disposed transversely to the overlapping edges of the opposed inclined baffle plates, a filler spout at the convergent lower ends of the mixing chamber walls, and means at the filler spout for initiating a feed of materials from the supply hoppers in unison, whereby to charge the scale pans with the materials of the hoppers, and means for discharging the contents of the scale pans simultaneously adjacent to the corners of the mixing chamber whereby to increase the turbulence of the materials falling along the meeting side walls of the mixing chamber.

2. In a mechanism for proportioning and intimately mixing materials, the combination of a plurality of material supply hoppers each including a scale pan having a discharge exit, said hoppers being arranged in spaced opposition to one another with the scale pan exists projecting toward a substantially central common point, and funnel-shaped mixing chamber having a plural-

ity of triangular side walls joined along corresponding edges to provide adjacent corners and an upper peripheral edge of extensive perimeter, said corners each being located beneath a scale pan so that each scale pan overhangs a corner of the mixing chamber, a pair of opposed inclined baffle plates having inner edges, one overlapping the other, and extending substantially through the middle of the mixing chamber in substantial parallelism with a side wall thereof, said plates intercepting charges of materials released from the scale pans, a filler spout at the convergent lower ends of the mixing chamber walls, and means at the filler spout for initiating a feed of materials from the supply hoppers, whereby to charge the scale pans with the materials of the hoppers, and means for discharging the contents of the scale pans simultaneously adjacent to the corners of the mixing chamber whereby to increase the turbulence of the materials falling along the meeting side walls of the mixing chamber.

ARTHUR C. AVRIL.