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V. D. POPOV
MEANS FOR CONVEYING MATERIAL FROM ONE MACHINE TO ANOTHER

Filed Jan. 23, 1940

Serial No.
315,260

2 Sheets-Sheet 1

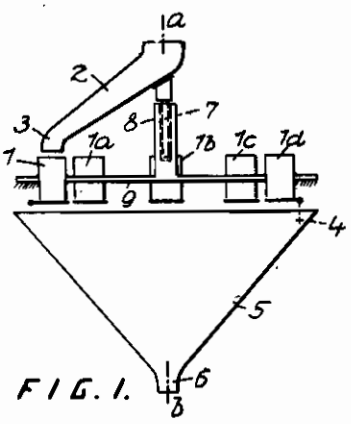

FIG. 1.

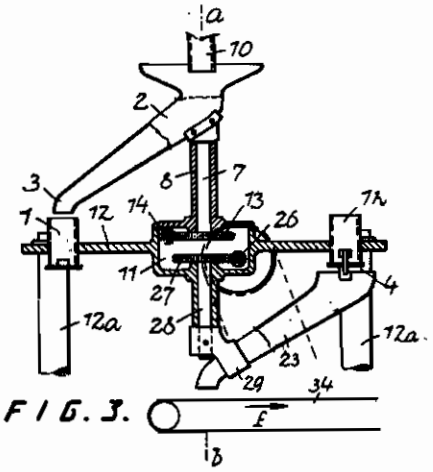

FIG. 3.

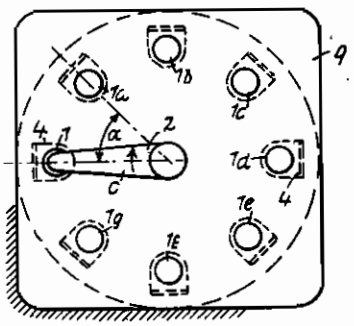

FIG. 2.

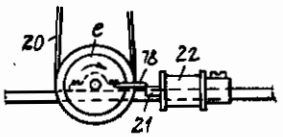

FIG. 4.

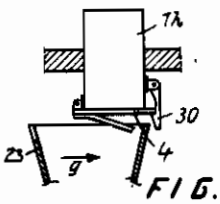

FIG. 6.

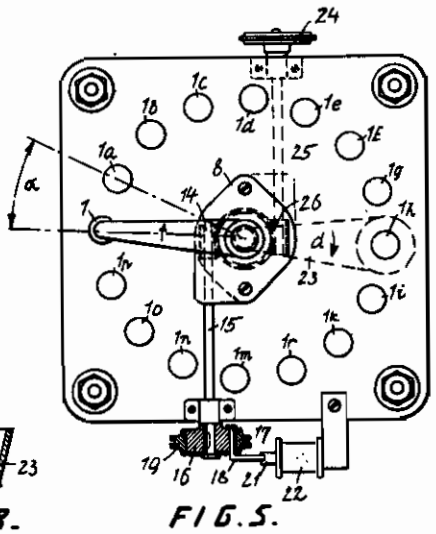

FIG. 5.

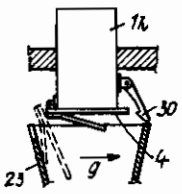

FIG. 7.

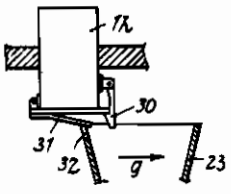

FIG. 8.

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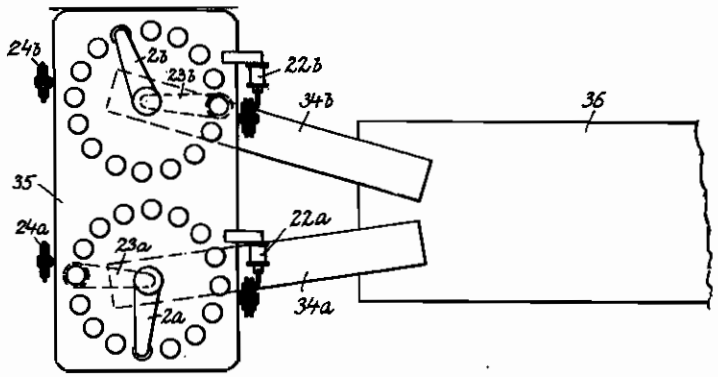

FIG. 9.

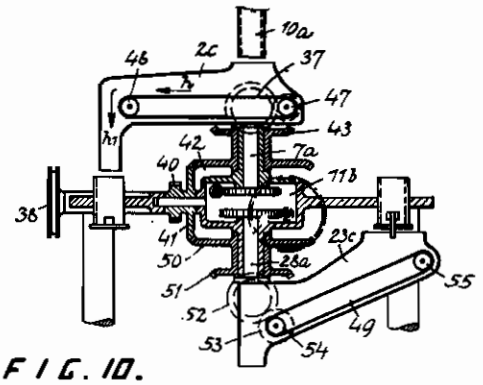

FIG. 10.

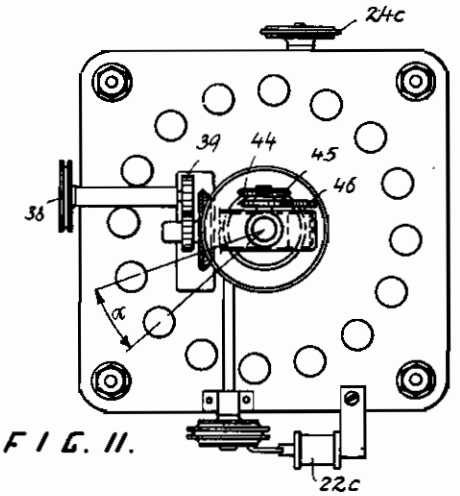

FIG. 11.

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MEANS FOR CONVEYING MATERIAL FROM ONE MACHINE TO ANOTHER

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Application filed January 23, 1940

This invention relates to a method of and an apparatus for conveying batches of material or separate articles from one machine to another, the first machine which for instance produces separate articles or prepares or weighs off batches of material delivering these articles or batches of material at time intervals differing from those at which they are to be conveyed to the second machine in which, for instance, these articles or batches of material are further operated on.

The solution according to the invention of the above problem consists substantially in this, that the products of the first machine are not conveyed directly to the second machine, but are deposited batchwise in a temporary receiving device consisting, for instance, of receptacles suitable for the reception and discharge of the material, are thereupon taken again batchwise from this device and are conveyed at suitable time intervals to the second machine.

The method and the apparatus according to the invention differ, however, from the known methods and apparatus more particularly in this, that the separate articles or batches of material delivered by the first machine or the vessels intended for temporarily receiving the latter are not moved from the filling place to the discharging place. The temporary receiving stations or receptacles can therefore, if no special technical requirements necessitate their displacement, be arranged so as to be immovable on a closed endless curve, for instance a circular line. Movably arranged is, on the other hand, the member which conveys the separate articles or batches of material from the first machine to the temporary receiving stations and movably arranged may also be the member which removes the separate articles or the batches of material from the store at the said temporary receiving stations.

Thus, the otherwise unavoidable loss of time, necessarily entailed in moving the separate articles or batches of material from one station to another, is eliminated and jolts and damage to the separate articles to be conveyed or to the receptacles containing the material during the movement of the articles or receptacles and to the storing device are avoided. This simplification is particularly important for large or heavy articles, the shifting of which in the temporary receiving device cannot be effected at as great a speed as is permissible for the motion of the individual supplying and removing members in the method according to the invention.

For elucidating the method according to the invention an example of an apparatus is described in the specification and illustrated in the accompanying drawings, which enables a machine for weighing off batches of a loose material, which operates in an irregular manner, to coact with a machine for packaging these weighed-off batches, which operates in a regular manner. Hereinafter the weighing machine will be referred to as the first machine and the packaging machine as the second machine.

Figs. 1 and 2 show a constructional example of the apparatus according to the invention in diagrammatic form,

Fig. 3 an example of the actual construction of this apparatus.

Fig. 4 a part elevation thereof,

Fig. 5 the plan view of Fig. 3,

Figs. 6, 7 and 8 an example of a device for opening and closing the receptacles of the conveying device,

Fig. 9 a twin arrangement of this device and

Figs. 10 and 11 another constructional form of the apparatus according to the invention.

The procedure in the temporary storage of batches of material in accordance with the invention is illustrated diagrammatically in Figs. 1 and 2. The batches of material pass from the first machine into the receptacles *1*, *1a*, *1b*, *1c*, *1d*, *1e*, *1f*, *1g* respectively, which receptacles are for instance arranged immovably in a circle around the axis *a—b* (Figs. 1 and 2), being transferred for instance by means of a feed chute or feed funnel **2**. The chute which is mounted so as to rotate about the axis *a—b* and the other opening of which is preferably concentric with the axis *a—b* is so shaped and arranged that its lower discharge opening **3** is immediately above the upper openings of the receptacles *1*, *1a* . . . After each delivery of the separate batch of material from the first machine into one of the receptacles *1*, *1a* . . . the chute **2** is turned through the pitch angle α, so that the next batch of material is discharged into the next following receptacle. The lower end **3** of the chute thus travels in the periods of time corresponding to the rhythm of the first machine the endless path, on which are arranged the receptacles which are successively filled during this operation. In periods of time corresponding to the rhythm of the second machine the filled receptacles are emptied for instance through the bottom **4** being opened, so that the batches of material are discharged successively into the receiving funnel **5** which is common to all the receptacles. The funnel or hopper **5** is provided with a discharge

opening 6, through which the batches of material fall directly into the second machine or on to a conveyor band which leads to the second machine.

Figs. 1 and 2 also show an example of an apparatus with which the described method can be carried into effect. The filling funnel 2 is rotatably journalled for instance by the pin 7 in a stationary bearing 9 of the table 9 which also supports the receptacles 1, 1a . . . In the position shown the lower end 3 of the funnel is above the receptacle 1. As soon as the latter is filled, the funnel 2 is rotated in the direction of the arrow c (Fig. 2) through the angle α, so that the funnel end 3 will come above the receptacle 1a, which will then be filled, and so forth. Through the opened bottom 4 the filled receptacles are discharged successively into the hopper 5. After the discharge of the receptacle 1d the receptacle 1e is discharged and so on. In Figs. 1 and 2 the receptacles 1a, 1b, 1c and 1d are empty, whilst the receptacles 1e, 1f, 1g and 1 are filled with material. The relation of the numbers of empty and full receptacles varies in dependence on the average performance of the two machines.

Constructional examples of the apparatus according to the invention are illustrated in Figs. 3 to 6. The supply funnel 2 (Fig. 3) is arranged with its upper end in the axis a—b below the outlet of the conveying pipe 10, through which the separate articles or batches of material are conveyed from the weighing machine into the funnel. In the position shown, the lower end 3 of the funnel 2 is over the receptacle 1. The upper end of the supply funnel 2 can be appropriately shaped, for instance for allowing the material to be supplied through several pipes. The pivot pin 7 of the funnel 2 is supported so as to be rotatable in the bearing 8, the bearing 8 forming the cover of the chamber 11 arranged in the table 12. The table 12 rests on supporting columns 12a. To the lower end of the pivot pin 7 is fixed in the chamber 11 a worm wheel 13 which is driven by the worm 14 provided on the shaft 15.

At the outer end of the shaft 15 is a clutch device of any known kind (Figs. 4 and 5) which for instance comprises, fixed on the shaft 15, a body 16 with a clutch-actuating member 17 which is rotatable therein and has an arm 18 and a sheave 19 which is turned freely on the body 16 in the direction of the arrow e, as long as the arm 18 is held by the armature 21 of the electromagnet 22.

On the electromagnet 22 attracting the armature 21, the arm 18 of the clutch actuating member 17 couples through the intermediary of a spring (not shown) the clutch actuating member 17 with the movable sheave 19, whereby the body 16, the shaft 15 and the worm 14 are put in motion. During the rotary motion of the worm 14 the worm wheel 13 causes the funnel 2 to turn through the angle α. After one revolution the body 16 comes to rest, as the arm 18 will again have engaged the armature 21 which has been released by the electromagnet 22. The moment of excitation and disconnection of the electromagnet 22 is regulated automatically through the intermediary of a contact device of a known kind, which is put in operation by the scale beam of the weighing machine.

From the above it will be seen, that the funnel 2 turns intermittently each time through the angle α, filling the receptacles with weighed-off batches of material. From the receptacles the batches of material may be discharged into a common receiving hopper (Figs. 1 and 2) or into a discharging chute 23 (Fig. 3) which acts similarly to the described funnel 2. If the packaging machine operates uniformly, the chute 23 which is turned in the same rotary sense as the funnel 2, but at a spaced interval behind the latter, must receiver the individual batches of material also uniformly from the receptacles 1, 1a, 1b, 1c . . . (Fig. 5). This motion is imparted to the chute 23 by a chain wheel 24 which rotates uniformly with the packaging machine and through the intermediary of the shaft 25, the worm 26 and the worm wheel 27 imparts its motion to the pivot pin 26, with which the chute 23 is rigidly connected by means of the holder 29.

In the position shown in Fig. 3 the upper opening of the chute 23 is below the receptacle 1h, in which position the bottom 4 of this receptacle opens. A constructional example of the device for opening and closing the bottom of the receptacles is illustrated in Figs. 6, 7 and 8.

The chute 23 (Fig. 6) moves in the direction of the arrow g with respect to the receptacle 1h, the hinged bottom 4 of which is normally held in the closed position by the latch 30. During the continued motion of the chute 23 the upper edge of the latter strikes against the latch 30, so that the receptacle bottom 4 swings into the position indicated by broken lines in Fig. 7 and the material falls out of the receptacle 1h into the chute 23. During its continued motion the chute 23 by means of the flat spring 31 lifts the bottom 4 again into its closed position, in which the latter is secured by the latch 30, which during the further motion of the chute 23 passes through the notch 32. The same procedure is repeated at the discharging of all the receptacles.

The lower end of the chute 23 may deliver the batches of material either directly to the packaging machine or on to a conveyor band 34 (Fig. 3) which travels in the direction of the arrow f.

The described arrangement is intended to enable a weighing machine to co-operate with a packaging machine. As, however, the usual weighing machines do not have such a great performance as packaging machines, one packaging machine frequently has two or more weighing machines associated with it. In this case the arrangement operating according to the described method conveys the batches of material from for instance two weighing machines to one packaging machine. As shown in Fig. 9, on a common table 35 two groups of receptacles are arranged, of which each group is served by its own chute 23a and 23b respectively, the rotary motion of which is controlled by the electromagnets 24a and 24b respectively. The receiving chutes 23a, 23b are turned through the intermediary of chain wheels 24a and 24b, the speed of revolution of which is regulated in accordance with the performance of the packaging machine. The chutes 23a and 23b alternately receive the individual batches of material, so that the conveyer bands 34a and 34b transfer the individual batches, also alternately, on to the common conveyer device 36 which passes the batches to the packaging machine.

Figs. 10 and 11 represent another constructional form of the machine according to the invention. It differs from that previously described in this, that the funnel 2c is provided with an internal conveyer band 37 which travels in the direction of the arrow h, so that the material coming from the first machine through the feed

pipe 10a falls on the band 37 and is carried by the latter to the discharge opening, through which it falls out in the direction of the arrow h_1 into the receptacle disposed below the opening. This arrangement is specially suitable for the conveyance of batches of a material of not such a loose or of a fibrous consistency.

Motion may be imparted to the band 37 by a belt pulley 38, the shaft of which carries a gear wheel 39 which through the intermediary of gear wheels 40, 41, 42, 43, 44, 45 and 48 drives one of the rollers 47 and 48, over which the band 37 is stretched. The chute 23c may also be provided with a conveyer band 49 which is stretched over the rollers 54 and 55 and is driven by the wheel 41 through the intermediary of the gear wheels 50, 51, 52 and 53 (Fig. 10).

It is obvious that in the case, in which the described arrangement serves two machines, of which neither operates in regular time intervals, both the funnel 2 and the funnel 23 (Figs. 3, 4 and 5) must be driven in dependence on these machines, for instance through the intermediary of clutches which operate similarly to the coupling shown in Figs. 4 and 5. It is quite clear, that this clutch can be coupled with and uncoupled from the associated machines without electric current, exclusively by means of mechanical gearing.

When all the receptacles are full, the first machine must be stopped; conversely, the second machine must be stopped, when it takes the material from the receptacles at too short intervals, so that the available amount of material is insufficient. This stopping and starting is effected either by the person attending the machine or automatically through the intermediary of known electrically or mechanically operating devices.

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