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GB 2266598 A GB 2095569 A GB 2075696 A
SU 001496756 A1 US 5379923 A US 4478301 A
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G1W WA1A WA1B
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(54) Abstract Title

Automatically discharging milk powder from an in flight weigher and blending it with a feedstuff adjunct

(57) Dried skimmed milk powder is automatically discharged from an in flight weigher 46 and blended with an adjunct such as whey, starch, vitamins or fat. The powder is conveyed to the in flight weigher which discharges a selected weight of powder to hopper 48 where adjunct material from feed hopper 50 is added. The powder and adjunct are then conveyed to mixers 56, 57, 58 and blended by augers 59. The blended powder is then passed through a sieve 64 and conveyed to a storage silo 68 prior to bagging. The weigher 46 comprises trap doors that are activated when a preselected quantity of powder weighs against them and close after discharge so that a fresh weighing cycle can commence. The weigher has an agitator 47 and the entire weight of milk powder discharged can be monitored by a central control unit.

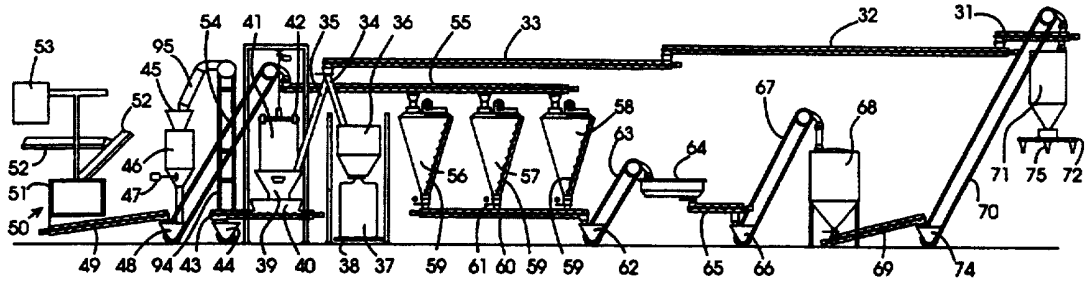

Fig. 2

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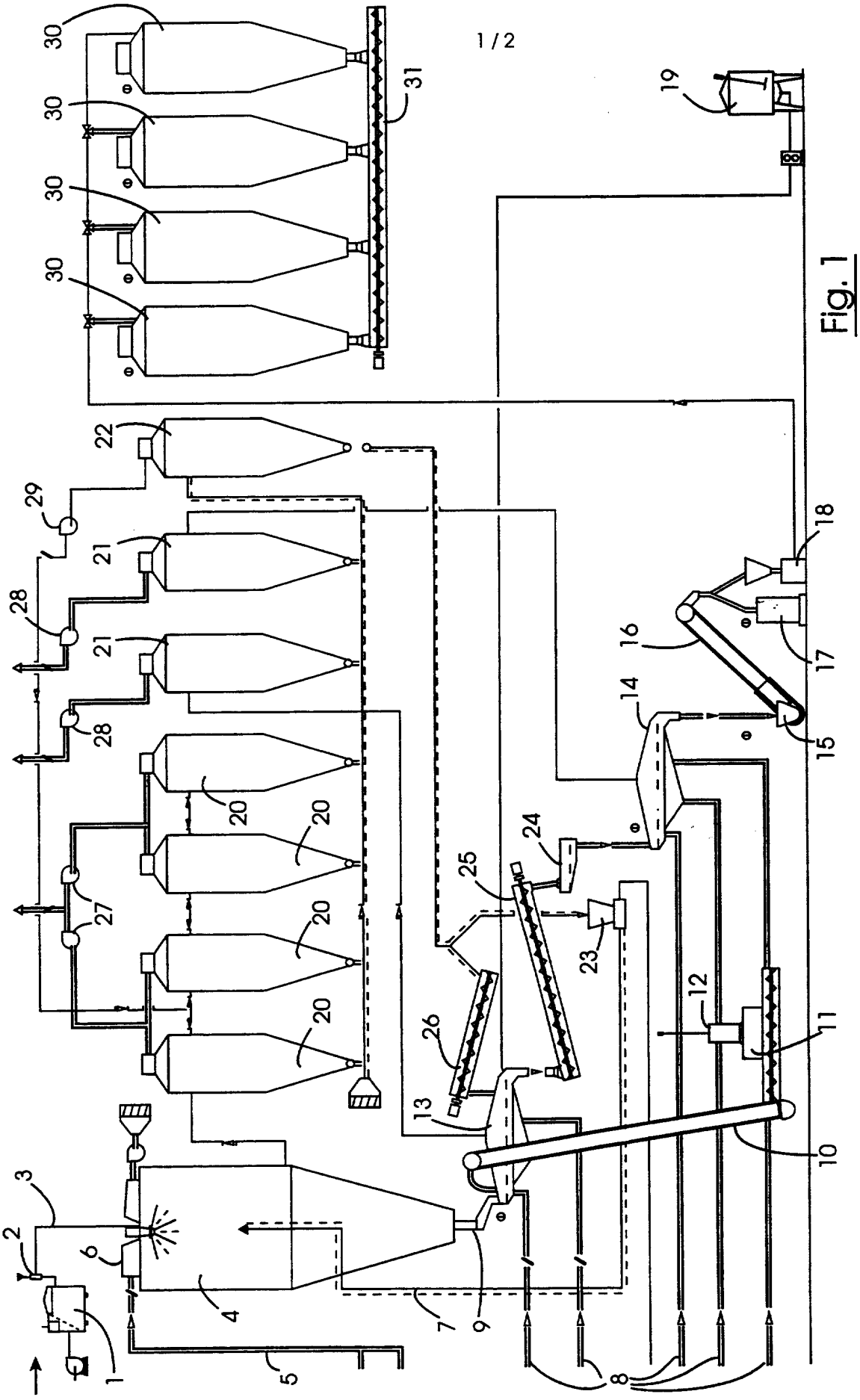
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Fig. 1

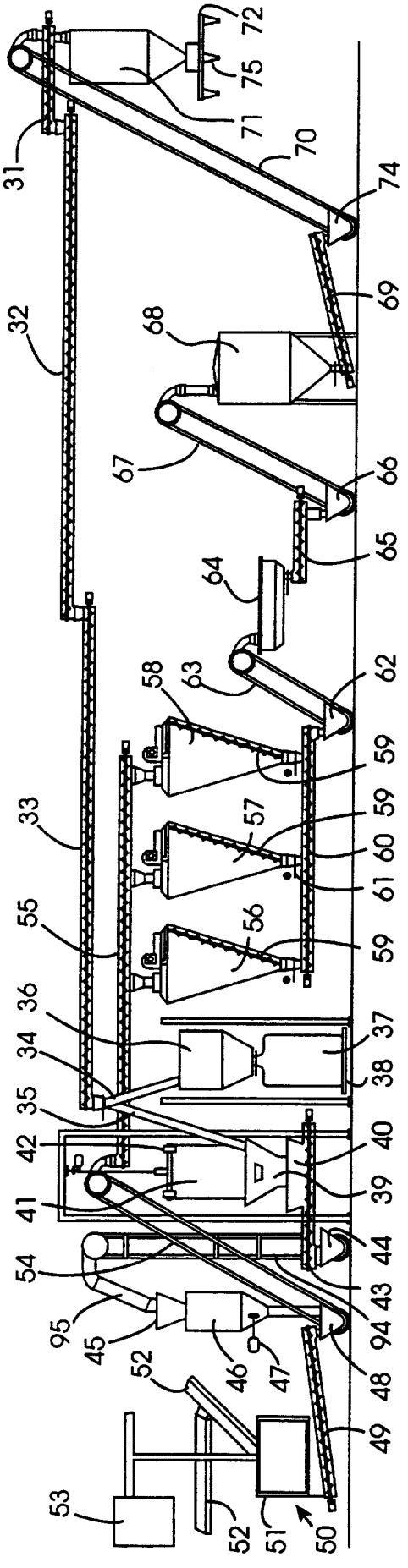
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Fig. 2

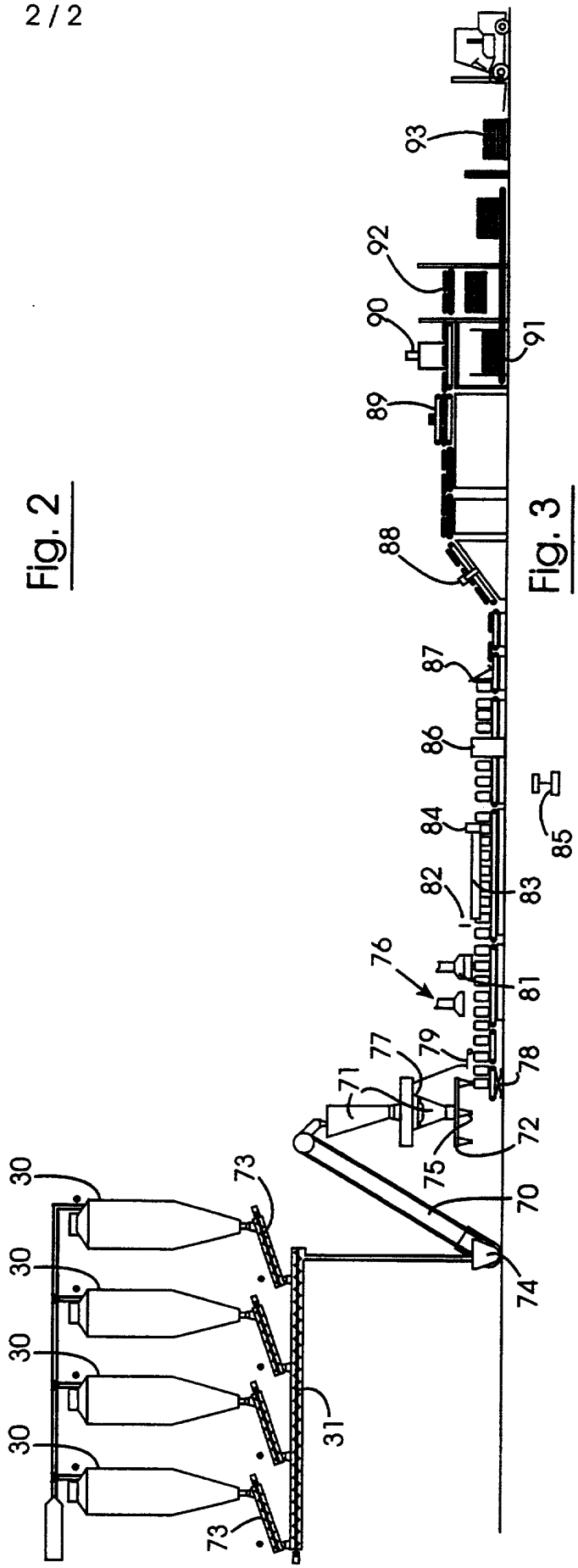
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Fig. 3

"Powder production"

The invention relates to powder production and more particularly to a process for the production of milk powder based foodstuffs.

In the production of milk powder based foodstuffs, it is necessary to first separate the raw milk product into cream and skimmed milk products. The skimmed milk product is then concentrated, dried and usually stored for later blending. Where the powdered milk product is used as a feedstuff, e.g. a calf milk replacer, a fat based adjunct is frequently added to the concentrated skimmed milk before forming the concentrated skimmed milk product into a powder.

Subsequently, other adjuncts, usually in powder form, can also be blended with the milk powder, e.g. whey powder, starch and vitamins etc.

However, the subsequent blending of powders in the correct proportions can be a time consuming and labour intensive process. More particularly, difficulties can arise in blending adjuncts and milk powder in the correct proportions to arrive at the specified finished product. Manual weighing of the milk powder is frequently required which interrupts the blending

process and preventing the use of a continuous process.

Accordingly, a need exists for an improved milk powder production and blending process in which the amount of milk powder used to form a final product can be easily controlled without interrupting the production process.

According to the invention there is provided a process for blending a powder material comprising conveying the powder to an in-flight weigher, weighing the powder in the in-flight weigher, automatically discharging a predetermined weight of powder from the in-flight weigher and blending the discharged powder with an adjunct.

Preferably the powder comprises dried milk powder.

More preferably, the powder is conveyed from a storage silo to the in-flight weigher.

Suitably, the in-flight weigher is calibrated to discharge a predetermined number of times.

Advantageously, the in-flight weigher is connected to a control unit.

Preferably, the central control unit is programmable.

More preferably, the powder and the adjuncts are conveyed to a mixing hopper.

Most preferably, the powder and adjunct mix is conveyed from the mixing hopper to a mixer.

The invention also extends to a process for the manufacture of a calf-milk replacer comprising drying milk to a milk powder conveying the powder to an in-flight weigher, weighing the powder in the in-flight weigher, automatically discharging a predetermined weight of powder from the in-flight weigher and blending the discharged powder with an adjunct.

The invention will now be described having regard to the accompanying drawings, in which:

Fig. 1 is a flow diagram of a milk drying system for use in drying milk in a drying chamber and storing the resulting powdered milk in milk powder silos;

Fig. 2 is a schematic diagram of the blending equipment for use in blending powdered milk with adjuncts to form an animal feedstuff, and

Fig. 3 is a schematic diagram of a bagging line for use in bagging powdered milk/adjunct feedstuffs blend.

As shown in the drawings, milk plus fats is fed into a homogeniser 1 of a milk drying system through a pipeline system 3. The homogenised milk is then conveyed through the pipeline 3 into a drying chamber or dryer 4. Movement of the homogenised skimmed milk between the homogeniser 1 and the drying chamber 4 is controlled by a control valve 2.

The drying chamber 4 is provided with a hot air source 5 and an atomizer 6 to disperse the homogenised milk. The hot air source 5 dries the atomised milk in conventional fashion.

Dried milk from the drying chamber 4 is conveyed through an exit pipe 9 into a vibro fluidiser 13, through a screw conveyor 25, sieve 24 and through a second vibro fluidiser 14.

The vibro fluidiser 13 is also in communication with a bulk hopper 11 which in turn can be filled with mini-bulk material indicated by the reference numeral 12. The bulk hopper 11 can feed material through a screw conveyor into a secondary feed floveyor 10 which feeds

into the vibro fluidiser 13.

The second vibro fluidiser 14 is also disposed within the pipeline system 3 and communicates with a hopper 15 which in turn is connected via a floveyor 16 to a mini-bulks container 17 and a pulse pump 18 so that the powder can be filled into 1 tonne bulk bags or conveyed to the powder silos 30. For example, as shown in the drawings the pulse pump 18 conveys the powder to the powder silo 30. The vibro fluidiser 13 is also connected via the pipeline system 3 to a lecithin tank 19 as is customary in the art.

The dryer 4 communicates via the pipeline system 3 with four cyclones 20 which separate the dried powder from the air which in turn is extracted through the side of the dryer 4.

The pipeline system 3 is also provided with a series of secondary heaters 8 in order to dry material being conveyed in the vibro fluidisers 13,14.

The drying system of Fig. 1 is further provided with two VF cyclones 21 and a transport cyclone 22 adjacent the VF cyclones 21. The cyclones 20 are provided with main exhaust fans 27 while the VF cyclones are also provided with exhausts 28.

The drying system is also provided with a sieve 24 for sieving dried milk powder conveyed to the sieve 24 on a screw conveyor 25 from the vibro fluidiser 13. The material from the sieve 24 is then conveyed to the second vibro fluidiser 14 which in turn feeds the sieved material into the hopper 15 which in turn feeds the material to the floveyor 16 and into the mini-bulks container 17 or pulse pump 18 as previously described.

In addition, the blow through valve 23 is connected via the pipeline system 3 to a screw conveyor 26 to return fines material into the primary vibro fluidiser 13 as required. Alternatively, the blow through valve 23 can return the fines through the pipeline 7 back to the drying chamber 4 in order to agglomerate and instantise the powder.

Accordingly, the pipeline system 3 used in the dryer system disclosed in Fig. 1 facilitates a number of iterations in the drying process to repeat the process where required or alternatively to draw dried milk powder from the drying system as required.

Dried milk conveyed through the system, i.e. namely the drying chamber 4, cyclones 20, VF cyclone 21 and transport-cyclone 22 are conveyed within the pipeline system 3 to storage silos 30 where the dried milk

powder can be stored to await further blending with adjuncts as shall be described more fully below.

Fig. 2 shows a side schematic elevation of the milk powder blending system used in the production process according to the invention. As shown in the drawing, dried milk powder from one of the powder milk silos 30 is conveyed in the screw conveyor 31 and subsequent stepped screw conveyors 32,33 to a bag filling pipe 34 and a hopper filling pipe 35. Valve means control whether the screw conveyor 33 communicates with the bag filling pipe 34 or alternatively the hopper filling pipe 35.

The bag filling pipe 34 communicates with a bag hopper 36 disposed over a bag 37 mounted on a platform 38 to fill the bag 37.

Alternatively, milk powder is conveyed through the hopper filling pipe 35 which communicates with a bulk discharger 39 which feeds into a bulk hopper 40 disposed beneath the bulk discharger 39. A bulk bag 41, which can also contain dried milk powder, is suspended over the bulk discharger 39 from a suspending frame 42.

The bulk bag 41 can be used to load milk powder into

the production line to supplement or indeed substitute for dried milk powder conveyed into the production line from the silos 30 through the screw conveyors 31, 32 and 33.

Dried milk powder from the bulk bag 41 or the hopper filling pipe 35 is channelled through the bulk discharger 39 into the bulk hopper 40. A bulk hopper screw conveyor 43 disposed at the base of the bulk hopper 40 conveys the contents of the bulk hopper 40 to a hopper 44 disposed at the base of a vertically disposed floveyor 94. The floveyor 94 conveys dried milk powder from the hopper 44 into a downwardly disposed pipeline 95 which feeds into a funnel 45.

The funnel 45 is disposed over and communicates with an in-flight weigher 46 which carries out a weighing cycle. The in-flight weigher 46 contains an agitator 47 and feeds into an exit hopper 48. The in-flight weigher 46 is calibrated such that a trap type twin door mechanism within the in-flight weigher 46 is activated when a selected weight of dried milk powder is disposed over the trap door and weighs against the trap door to activate same so that the dried milk powder passes through the in-flight weigher 46 and the trap door into the exit hopper 48.

An adjunct screw conveyor 49 also feeds into the hopper 48. At the end remote from the hopper 48, the adjunct screw conveyor 49 is disposed beneath a feed hopper 50. The feed hopper 50 receives adjunct material, typically manually released from bags into the hopper 50. The released adjunct material travels through the hopper 50 into the screw conveyor 49 and is thereby conveyed to the hopper 48.

The feed hopper 50 is provided with a dust extractor hood 51, waste paper conveyors 52 for conveying empty bags from the hopper 50 and a dust control unit 53.

Accordingly, predetermined weights determined by the calibration of the in-flight weigher 46 are conveyed from the silo 30 or a bulk bag 41 into the hopper 48 where adjunct material is added to the dried skimmed milk powder through the hopper 50.

Typically, the in-flight weigher 46 is attached by a control panel to a central control unit to monitor the weight of dried milk powder conveyed into the hopper 48 from the silos 30. Accordingly, batches of dried milk powder in the form of unit weights of milk powder are passed through the in-flight weigher 46 to facilitate a continuous blending process.

An example of a preferred in-flight weigher 46 is the E 55 model in-flight weigher available from Chronos Richardson. The E 55 in-flight weigher is made up of a number of principle components namely a housing, two load cells, a weigh hopper proper, two weigh hopper suspensions, two checklinks, a feeder and a control module. Typically, the load cells comprise strain gauge load cells. The weigh hopper proper accummulates the material to be weighed during a weighing cycle. Discharge of the material is effected by the trap or twin bottom door arrangement which is air operated. The hopper doors are provided with a proximity switch so that material is prevented from being conveyed into the weigh hopper when the trap or bottom doors are open.

The weigh hopper suspension serves to connect the weigh hopper to the load cells.

The control module provides an indication of the weight of material within the in-flight weigher 46 while also serving to control and monitor the entire weighing cycle. The control module can be used in conjunction with a central controller which comprises a keypad and display module. An example of a suitable controller is the PC454 controller also available from Chronos Richardson.

The total weight of material to be weighed in a weighing cycle is pre-set. A weighing cycle is commenced upon entry of material into the in-flight weigher 46. At a pre-set weight, influx of material into the inflight weigher 46 is slowed to continue at a dribble flow rate. The dribble flow rate terminates when the pre-set total weight desired is achieved. The material within the in-flight weigher 46 is then discharged by opening the trap door. Upon completion of a discharge, the in-flight weigher trap door or hopper doors are closed and a fresh weighing cycle is commenced on.

The weighing cycle is controlled and monitored by the control module based on the data received by the control module from the load cells.

The milk powder mix within the exit hopper 48 is subsequently conveyed through an exit floveyor 54 to an exit screw conveyor 55 disposed beneath the screw conveyor 33. The exit screw conveyor 55 conveys the milk powder mix to any of three mixers 56,57,58. Valve means are used to select the mixer 56,57,58 into which material from the hopper 48 is conveyed by the exit screw conveyor 55.

The milk powder mix is mixed in one of the mixers

56,57,58 for a predetermined period by a mixing auger 59 disposed within each of the mixers 56,57,58.

The mixers 56,57,58 are disposed over a common screw conveyor 60. The mixers 56,57,58 are provided with a slide valve 61 disposed between each mixer 56,57,58 and the screw conveyor 60 to control communication of the mixer 56,57,58 with the screw conveyor 60.

The screw conveyor 60 in turn communicates with a hopper 62 disposed at the base of a flow conveyor 63 which in turn communicates with a sieve 64. Accordingly, material conveyed from the screw conveyor 60 to the hopper 62 is in turn conveyed to the sieve 64 for sieving to ensure uniform size of the powder particles. The sieve 64 in turn communicates at its base with a screw conveyor 65 which also communicates with a hopper 66 which in turn communicates with an upwardly disposed floveyor 67. The floveyor 67 feeds material from the sieve 64, screw conveyor 65 and hopper 66 into a temporary storage silo 68 for storing blended milk powder temporarily prior to bagging.

The temporary storage silo 68 is disposed over a screw conveyor 69 which in turn feeds the contents of the temporary storage silo 68 to a hopper 74 disposed at the base of a floveyor 70 which conveys blended

material from the hopper 74 to a carousel hopper 71. The carousel hopper 71 feeds the finished material into carousel feeders 72 having nozzles 75 for discharging the raw material into bags which shall be explained more fully below.

Fig. 3 shows a schematic side elevation of a bagging line for use in bagging blended dried milk powder and adjuncts produced in accordance with the process of the invention. Fig. 3 also shows the storage silos 30 first used at the beginning of the production process in accordance with the invention. As shown in the drawing, the four storage silos 30 communicate with optional metering screws 73 disposed between each of the storage silos 30 and the screw conveyor 31. The metering screws 73 facilitate the metering of dried milk powder from the storage silos 30 into the screw conveyor 73.

A bag 82 to be filled by the carousel feeder 72 is positioned beneath a nozzle 75 on a scissors lift 78 to adjust the height of the bag 82 relative to the nozzle 75.

The carousel hopper 71 is also provided with an in-flight weigher 77 so that predetermined weights of dried milk powder are discharged into the bags 82.

A top up device 79 is also disposed adjacent the carousel feeder 72 so that additional product can be placed in the bag 82 where necessary. Each bag 82 is then passed through a vibrating conveyor 76 to compact the powder in the bag, a bag formation device 81, cleaning station 83, Doboy line 84, sewing machine and check weighers 85 followed by a metal detector 86 in order to detect contaminating metals within the finished product.

A kicker 87 is disposed as the end of the bagging line in order to place each bag 82 on its side for palletising.

Prior to palletising, each bag 82 is labelled with a labeller 88 and is flattened by a bag flattener 89. Each bag 82 is then passed through a programmed conveyor 90 onto a pallet magazine 91 and into a palletiser 92. A filled pallet is then shrink wrapped.

An embodiment of a milk powder based product produced according to the process of the invention will now be described having regard to the following non-limiting example:

Example 1

Base material containing 26% fat and 74% skimmed milk

solids is manufactured in the dryer 4.

The powder is conveyed, as previously described to the in-flight weigher 46 which is programmed to dispense 28 x 25kg lots, to make one tonne of milk replacer (700kg).

Adjuncts are then added via the hopper 50 at the following rate;

10 x 25kg whey powder (250kg)

1 x 25kg starch (25kg)

1 x 25kg vitamin and mineral supplement (25kg)

All adjuncts can then be automatically mixed in the predetermined proportions according to the process previously described to give one tonne of finished blended milk replacer.

Accordingly, the invention provides a continuous process for the production of a dried milk powder based feedstuff in which the ratio of milk powder to adjuncts is controllable by using a continuous process in which the weight of milk powder added to adjuncts is automatically controlled using an in-flight weigher prior to mixing of the dried milk powder with the food adjuncts.

Therefore, little or no operative input is required to control the amount of dried milk powder to be blended which facilitates a rapid throughput of dried milk powder.

The use of an in-flight weigher also ensures that less mixing is required at the end of the mixing process as the dried milk powder is mixed with all necessary adjuncts in a controlled and regular fashion thereby ensuring an equal distribution of the dried milk powder during mixing.

The process of the invention clearly has application as described above in relation to the production of feedstuffs based on dried milk powder. However, many powder based materials, particularly those relying on dried milk powder, but not necessarily exclusively feedstuffs, can benefit from the process of the invention. Accordingly, the process of the invention should not be construed as being restricted to feedstuffs.

CLAIMS

1. A process for blending a powder material comprising conveying the powder to an in-flight weigher, weighing the powder in the in-flight weigher, automatically discharging a predetermined weight of powder from the in-flight weigher and blending the discharged powder with an adjunct.

2. A process as claimed in Claim 1 characterised in that the powder comprises dried milk powder.

3. A process as claimed in Claim 1 or 2 characterised in that the powder is conveyed from a storage silo to the in-flight weigher.

4. A process as claimed in any of Claims 1 to 3 characterised in that the in-flight weigher is calibrated to discharge a predetermined number of times.

5. A process as claimed in any of Claims 1 to 4 characterised in that the in-flight weigher is connected to a control unit.

6. A process as claimed in Claim 5 characterised in that the central control unit is programmable.

7. A process as claimed in any of the preceding claims characterised in that the powder and the adjuncts are conveyed to a mixing hopper.

8. A process as claimed in Claim 7 characterised in that the powder and adjunct mix is conveyed from the mixing hopper to a mixer.

9. A process for the manufacture of a calf milk replacer comprising drying milk, blending the milk with an adjunct as claimed in any of Claims 1 to 8 and bagging the blended calf milk replacer.

10. A process for the blending of a powder material substantially as hereinbefore described with reference to the accompanying drawings.

11. A process for the manufacture of a calf milk replacer substantially as hereinbefore described with reference to the accompanying drawings.

The Patent Office

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Application No: GB 9804097.5 **Examiner:** Justin Black
Claims searched: 1 - 11 **Date of search:** 20 April 1998

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.P): B1C (CABB, CAC, CAF, CAGD, CPB); G1W (WA1A, WA1B)

Int Cl (Ed.6): A23N 17/00; B01F 13/10, 15/04; G01G 13/18

Other: Online: EDOC, WPI

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
X	GB 2266598 A	(TRÜTZSCHLER) see page 7 lines 12 - 15, page 7 lines 22 - 23, page 10 lines 2 - 11 and Figure 1	1 - 5
X	GB 2095569 A	(KINGMASTER) see page 2 line 43 - page 3 line 43 and Figure 1	1, 3, 5, 7 and 8
X	GB 2075696 A	(PETERSEN) see page 2 lines 77 - 92 and Figure 1	1, 2 and 5
X	SU 1496756 A1	(RIGA POLY) see WPI abstract accession number 90-146501 [19] and the Figure	1 - 3 and 7
X	US 5379923	(EAGLE PACKAGING) see column 4 line 64 - column 5 line 60	1, 2 and 5
X	US 4478301	(FRONTIER) see column 3 lines 4 - 8, column 2 lines 31 - 45, column 4 lines 18 - 24, column 4 lines 59 - 63 and Figures 2 & 3	1 - 3
X	US 3822866	(DAESTER - FAIRTEC) see column 3 lines 49 - 67, column 4 lines 8 - 11, column 4 lines 25 - 30, column 5 lines 37 - 40 and Figure 1	1 - 3 and 5 - 8

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.