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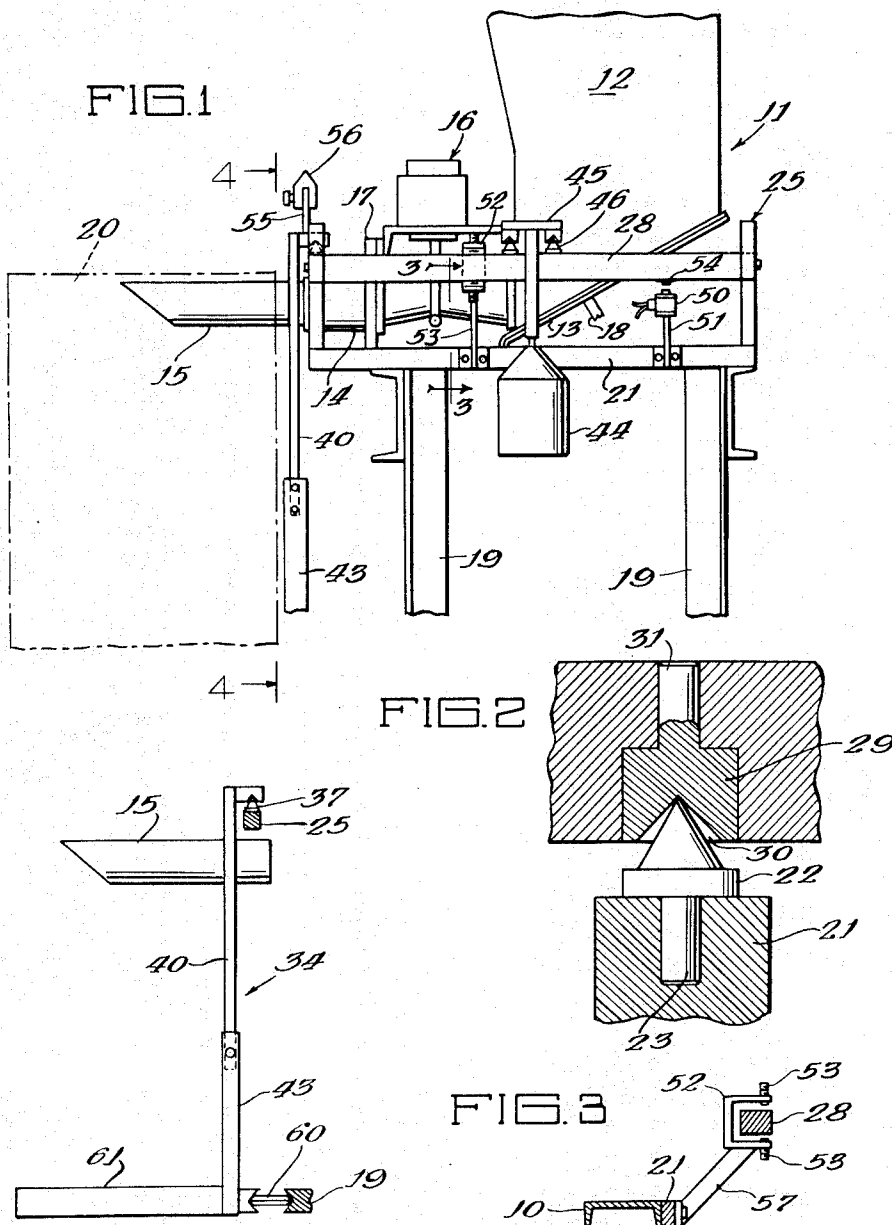
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3,133,609

BAG FILLING MACHINES

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3 Sheets-Sheet 1



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FIG. 6

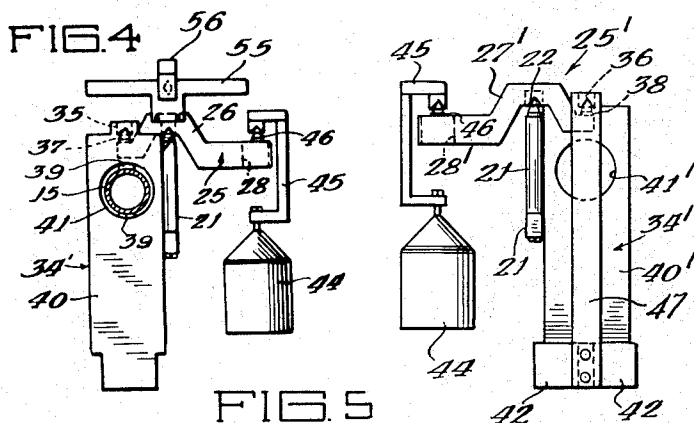


FIG. 5

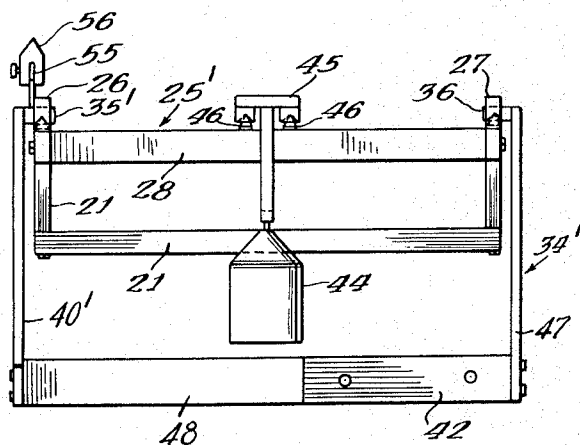
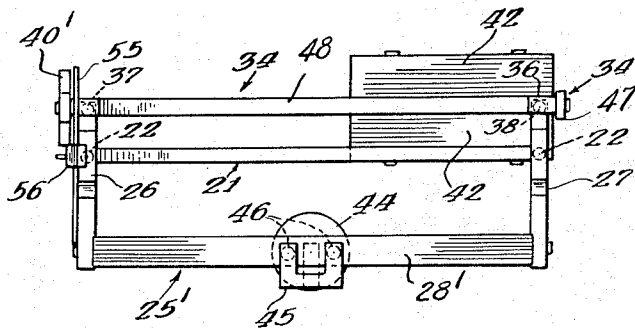


FIG. 7



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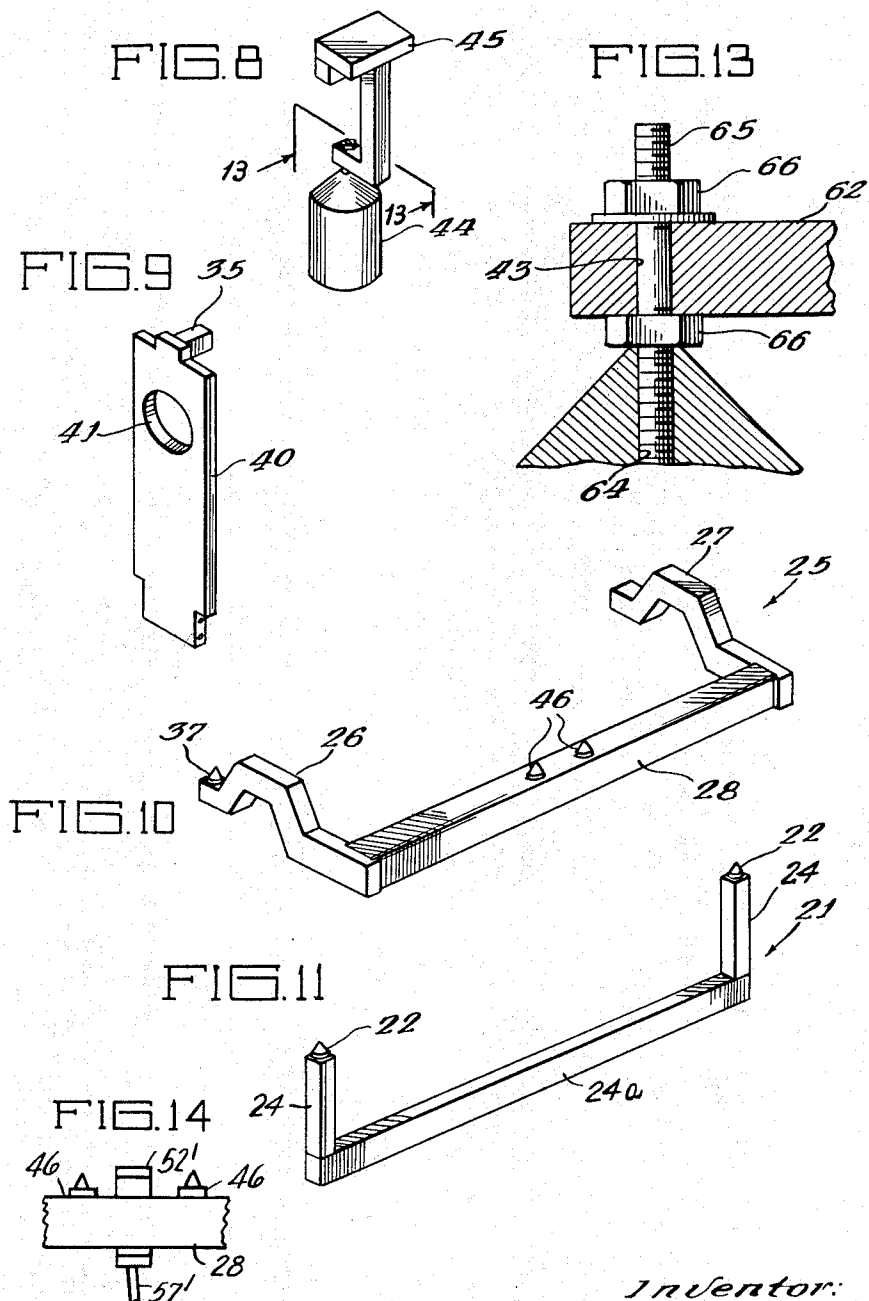
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BAG FILLING MACHINES

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3 Sheets-Sheet 3



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3,133,609

BAG FILLING MACHINES

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18 Claims. (Cl. 177—118)

This invention relates to improvements in bag filling machines of the automatic cutoff type.

In machines of this type, the bag is suspended from the filling spout. The filling spout is mounted for vertical movement and it bears on the beam of the scale mechanism. When a predetermined amount of material has been fed into the bag, the movement of the beam cuts off the filling operation.

The present invention is an improvement of the parallel beam axis type of machine shown in my copending application, Serial No. 801,143, filed March 23, 1959, now Patent No. 3,062,307, in which the beam axis is parallel to the spout axis, as contrasted with the usual arrangement in which the beam axis is transverse to the spout axis.

The advantage of the parallel beam axis type of machine is that the position of the bag on the spout will not vary the length of the lever arm, and hence it will not affect the accuracy of the scale mechanism.

Another advantage is that it permits the use of a suspended spout assembly, thus reducing the number of bearing points required and providing a simplified construction without sacrifice of sensitivity.

It is an object of my invention to provide a parallel axis type of machine in which the beam is stabilized against axial movement and vibration.

Movement of the beam in an axial direction can arise from various sources. For instance, with a single point of suspension type of spout assembly, a horizontal reaction force is developed which is transmitted to the beam. Also, the placing of the empty bag on the spout and particularly the removal of the filled bag from the spout may cause axial displacement of the beam. Also, in those instances where a bag settling device is mounted on the spout assembly (as shown in my copending application, Serial No. 83,224, filed January 17, 1961, now Patent No. 3,115,905, granted December 31, 1963), vibrations will be transmitted to the beam which causes a hammering of the bearing points, resulting in damage, undue wear, and possible disengagement.

These various types of axial movement interfere with the sensitivity of the scale mechanism and with the proper operation of the control mechanism which is actuated thereby, and also may result in bearing damage.

For instance, the standard knife edge type of fulcrum bearings are easily damaged by axial beam movement. The edge disk type of bearing shown in my aforesaid copending application, Serial No. 801,143, now Patent No. 3,062,307, is designed to resist damage of this type, but it is not designed to take up the horizontal forces which cause axial movement.

According to the present invention, I provide a conical bearing means which in large measure overcomes the above difficulties and which at the same time provides a high degree of sensitivity.

Furthermore, I have found that beam stability is considerably enhanced by providing an improved type of connection between the balance weight and the scale beam, as a result of which hammering of the bearings may be substantially eliminated.

It is another object of my invention to provide an improved means for suspending the balance weight from the beam so that it is restrained from forward and back swinging movement in a plane parallel to the fulcrum axis, but which nevertheless provides a pivoted connection for

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swinging movement in a plane perpendicular to the fulcrum axis.

It is a further object of my invention to provide improved fulcrum means in the form of conical bearing points and conically recessed bearing pads which tend to take up any longitudinal forces acting on the beam and which would result in longitudinal displacement thereof.

Still another object is to provide an improved conical bearing point means by means of which the spout assembly may be suspended from the beam, thus avoiding the climbing of the spout assembly due to the horizontal force component developed by the strut.

Still another object is to provide a scale mechanism which includes an auxiliary balance beam which is readily accessible and which can be utilized by the operator to set the machine for different types of bags of equivalent capacity.

Other objects, features and advantages of my invention will become apparent as the description proceeds.

With reference now to the drawings in which like reference numerals designate like parts:

FIG. 1 is a side elevation of a preferred embodiment of my invention;

FIG. 2 is a sectional detail showing the bearing point construction;

FIG. 3 is a fragmentary section taken along line 3—3 of FIG. 1;

FIG. 4 is a front elevation of the scale mechanism divorced from the remainder of the machine;

FIG. 5 is a side elevation of a modified scale mechanism embodying my invention;

FIG. 6 is a rear elevation of FIG. 5, but with the auxiliary beam omitted;

FIG. 7 is a plan view of FIG. 5;

FIG. 8 is a perspective view of the balance weight and hanger;

FIG. 9 is a perspective view of the spout assembly;

FIG. 10 is a perspective view of the beam;

FIG. 11 is a perspective view of the fulcrum assembly;

FIG. 12 is a side elevation of the strut type spout assembly shown in FIGS. 1, 4 and 9;

FIG. 13 is a sectional detail taken along the plane 13—13 of FIG. 8 showing the rigid connection between the balance weight and the hanger; and

FIG. 14 is a detail elevation of a portion of the side arm 28, showing a modification.

With reference now to FIG. 1, the bag filling machine comprises a bed plate 10 (FIG. 3) and suitable supporting framework 19. Mounted above the bed plate are feeding mechanism designated generally by the reference numeral 11, and scale mechanism shown in FIGS. 4—7 which includes a beam 25, and a suspended spout assembly 34.

The feeding mechanism 11 shown herein by way of example comprises a conditioning chamber 12 having as its bottom wall a diffusing pad 13. A flexible flanged tube 14, such as a rubber tube, extends forwardly from an opening in the front wall of the conditioning chamber 12 and communicates with the rear end of a spout 15 on which the bag is to be suspended. The flanged tube 14 is supported at an intermediate point by a vertical plate 17 which is mounted on the bed plate 10.

Material is caused to flow from the conditioning chamber 12 through the flanged tube 14 and into a bag 20 when the diffuser pad 13 is energized by means of an air supply 18. Cutoff means to discontinue the feeding operation are provided in the form of a pinch valve 16 for the tube 14. The feeding mechanism is described in greater detail in my Patent No. 2,936,994, granted May 17, 1960, to which reference is hereby made.

Scale mechanism is provided to actuate the cutoff means when the weight of the bag contents reaches a pre-

determined amount. The scale mechanism comprises a beam 25 which is mounted on fulcrum means 21 in such a manner that the fulcrum axis of the beam is parallel to the axis of the spout 15.

The fulcrum means 21 is in the form of a U-shaped structure, shown in FIG. 11, which is disposed adjacent to a flange of the bed plate 10, as shown in FIG. 3, and which may be suitably secured thereto and to the cross members of the supporting framework 19. The fulcrum means is provided with fulcrum points in the form of conical bearing points 22 which, as shown in FIG. 2, are separately formed members of hardened steel which are mounted on the fulcrum member 21 by means of a shank 23.

The beam 25, as shown in FIG. 10, comprises front and rear inverted U-shaped members 26 and 27 which are connected by longitudinally extending side bar 28. Hardened bearing pads 29 are set into each of the members 26 and 27, and the construction is shown in FIG. 2. Each bearing pad 29 is provided with a conical recess 30 in which the bearing point 22 is received. The bearing pad 29 is also provided with a shank 31 by means of which it can be accurately located against the shoulder of a counterbore formed in the members 26 and 27.

The bearing point 22 may comprise a 60° cone, and the recess 30 may comprise a 90° conical surface, the radius of the point of the former being $\frac{1}{64}$ of an inch and the radius of the apex of the latter being $\frac{1}{32}$ of an inch. The parts 22 and 29 are preferably made of hardened tool steel so that they will provide a substantially frictionless and very sensitive bearing surface.

The spout assembly 34, as shown in FIG. 9, comprises a mounting plate 40 having a support lug 35 at its upper end by means of which it may be suspended from the front member 26 of the beam 25. The support lug 35 is provided with a conical bearing pad similar to the bearing pads 29 and is mounted for cooperation with a bearing point 37 on the front member 26. The mounting plate 40 is provided with an opening 41. The spout 15 is rigidly mounted in the opening by spaced lugs 39 so that it forms a part of and moves with the spout assembly. Thus the medial plane of the suspended spout assembly 34 will tend to remain vertical during the rocking of the beam 25, and the lever arm, which constitutes the horizontal distance between the fulcrum points 22 and 37, will be maintained constant at all times. According to this arrangement, the location of the bag 20 upon the spout 15 will not affect the lever arm.

In some types of bag filling apparatus, it is customary to provide a saddle or platform 61 to support the lower end of the bag 20, as shown in FIG. 12, and in this event, saddle hanger rods 43 may be secured to the lower end of the mounting plate 40 for supporting such saddle.

Since the spout assembly 34 is supported from the beam 25 only at one point, the bearing point 37, it is stabilized against backward swinging movement by means of a strut 60 or other link which extends between the lower end of the saddle hanger rods 43 and a part of the framework 19, as shown in FIG. 12.

The operation of the strut is pointed out in my aforesaid copending application, Serial No. 801,143, in greater detail. If desired, suitable yoke means or the like may be provided to confine the spout assembly against sideways displacement or inadvertent removal, as pointed out therein.

The beam 25 is loaded by applying a balance weight 44 which is supported from the beam by a hanger 45, the hanger and balance weight being shown in FIGS. 8 and 13. The balance weight 44 is rigidly connected to the hanger 45. The hanger 45 is provided with a horizontal arm 62 having a bore 63 located beneath the side bar 28. The balance weight 44 is provided with a threaded bore 64 in which a stud 65 is secured, the stud extending through the bore 63. As shown in FIG. 13, when the

nuts 66 are tightened up, elements 44 and 45 will be rigidly connected to each other.

The side bar 28, as shown in FIG. 10, is provided with two conical bearing points 46 for engaging the hanger 45, the latter being provided with conical bearing pads similar to the bearing pads 29. Therefore the assembly is pivotally mounted with respect to motion in a plane perpendicular to the fulcrum axis but it is rigid with respect to swinging motion in a plane parallel to the fulcrum axis. The moment of the balance weight 44 must be sufficient to offset not only the weight of the bag contents, but also the weight of the spout assembly 34, including any counterweights 42.

A microswitch 50 is mounted on a suitable bracket 51 (FIG. 1) so that the plunger thereof will be engaged by a portion of the beam 25. In the arrangement shown, the microswitch is a biased open microswitch, the plunger of which is engaged by the underside of the side bar 28. When the weight of the bag contents exceeds the scale setting, then the beam will be tripped, breaking a suitable control circuit in order to close the cutoff valve 16. Preferably, the air supply 18 to the diffuser pad may also be cut off at this time by the control circuit.

Suitable stop means may be provided to limit the throw of the beam. As shown in FIG. 3, the stop means may be in the form of a yoke 52 which is suitably mounted on a bracket 57 and which engages the side bar 28. Screws 53 are preferably threaded into the yoke 52 to provide a fine adjustment, and a similar adjustment is desirably provided for the microswitch 50 in the form of a threaded pin 54 (FIG. 1) which engages the plunger of the microswitch 50.

As shown in FIGS. 1 and 4 an auxiliary scale beam 55 may be mounted on the front member 26 of the beam 25. A weight 56 is slidably mounted on the auxiliary scale beam 55. This provides a fine adjustment for the scale mechanism which is particularly useful in changing from one type of bag to another. In other words, hundred pound bags will vary in dimensions according to the type of material being packed, and this variation in dimensions is reflected in variation in weight which may be from a few ounces up to a pound. According to this aspect of my invention, the auxiliary scale beam 55 can be calibrated for different types of bags with the result that in changing over from one material and bag type to another, it will not be necessary to provide a separate balance weight for each type of bag.

A modified form of spout assembly 34' is shown in FIGS. 5 to 7. Here, the spout assembly is in the form of a cradle or U-shaped member comprising the support plate 40', a rear vertical member 47 and a longitudinally extending horizontal member 48 which connects the elements 40' and 47. The cradle is provided at its upper ends with two support lugs 35' and 36 in which conical bearing pads, similar to the bearing pads 29, are mounted for cooperation with bearing points 37 and 38 which are mounted in the front and rear members 26 and 27 of the beam 25'. The beam 25' is identical to the beam 25 except that it is provided with a bearing point 38 on the rear arm 27.

The spout assembly is so designed that the moment of the spout assembly 34' with respect to the front bearing point 37 is greater than the moment of the bag 20 and contents, so as to stabilize the spout assembly against backward tilting. To this end, it may be necessary to add counterweights 42 to the rear portion of the spout assembly 34'. The operation of the modified spout assembly 34' is described in greater detail in my copending application, Serial No. 171,200, filed February 5, 1962, to which reference is hereby made.

The conical bearing point construction herein shown provides a high degree of sensitivity for the vertical forces involved and also provides a stable mounting for the parts which are suspended therefrom, thus avoiding the need for separate bearing retainers. For instance, the

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bearing points 22 and the bearing pads 29 are firmly anchored against horizontal displacement and provide a simple and arcuate method of assembling the bearings to the parts. Accuracy in installation requires only accuracy in the location of the bores in which the shanks 23 and 31 are received. The problem of edge alignment is entirely eliminated.

The conical arrangement takes up, without impairment of vertical sensitivity, any horizontal forces which may be encountered, and positively prevents longitudinal displacement of the beam. For instance, one of the difficulties encountered in the edge disk type of bearing described in my aforesaid copending application, Serial No. 801,143, is that that type of bearing permits a longitudinal displacement of the beam which in turn increases the clearance between the scale beam 25 and the plunger of the microswitch 50. Any change in clearance reduces accuracy for the reason that it accelerates or retards the reaction interval, that is the interval between initial movement of the scale beam and actuation of the cutoff valve 16. Also, longitudinal displacement destroys the alignment of the pin 54 and the plunger of switch 50.

Longitudinal displacement of the beam will occur due to forward and back swinging movement of the balance weight, if the balance weight is linked to the beam. Even where the balance weights are mounted on a rigidly attached rod, the resilience of a relatively long rod will set up vibrations, both axial and transverse, which interfere with the proper operation of the scale mechanism. Furthermore, a rigid connection with respect to a plane perpendicular to the fulcrum axis is undesirable for the reason that the mass of the balance weight greatly increases, even multiplies, the moment of inertia of the scale beam system with respect to the fulcrum axis. This increased moment very markedly retards the reaction interval, and additionally may cause undesirable transient movements.

The two point suspension for the elements 44-45 avoids the above difficulties because the balance weight 44 is effectively a part of the beam system as far as axially directed forces are concerned, but not with respect to beam rotation.

FIG. 14 shows a modification in which the stop 52' is located between the bearing points 46. The adjusting screws 53 are omitted for clarity. As a practical matter, the side arm 28 is so stiff with respect to the forces involved that the longitudinal location of the stop 52 is immaterial. Theoretically the FIG. 14 position is preferable from the viewpoint of bearing life of the bearing points 46.

The provision of a fulcrum means in the form of a separate U-shaped structure 21 facilitates alignment of the two end posts 24 (FIG. 11) in which the conical bearing points 22 are mounted. In other words, in building the machine it is easier to assemble the U-shaped structure 21 so that the end posts are parallel than it is to mount the posts directly on the bed plate 10 in such a way as to insure parallelism. The parts 24 and 24a (FIG. 11) are of high grade steel having machined abutting surfaces and are secured to each other in perpendicular relationship by machine screws which extend axially of the end posts 24.

To summarize the operation, which has heretofore been pointed out in detail in connection with the description of the various parts and subassemblies, the beam 25 is first loaded with a balance weight 44 selected in accordance with the amount of material to be packed in the bag. Then the bag 20 is slipped over the spout 15 and the filling operation is initiated by causing the pinch valve 16 to be opened and by supplying air to the diffusing pad 13. At this time the side bar 28 engages the lower arm of the yoke 52 as shown in FIG. 3. Then, when the desired amount of material has been fed into the bag the beam 25 will be tripped causing the beam to be rotated in the counterclockwise direction as viewed in

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FIG. 4 and operating the microswitch 50 to actuate the cutoff means 16. The flexibility of the tube 14 permits vertical movement of the spout assembly 34 or 34' with respect to the feeding mechanism 11 without detracting from the accuracy or sensitivity of the scale mechanism.

When my invention is used with an auger type filling mechanism, a double tube spout arrangement may be employed to permit free movement of the spout assembly, this arrangement being shown in my Patent No. 2,733,040, issued January 31, 1956.

It will be noted that the beam 25 and the other parts are shaped so as to avoid interference with the feeding mechanism which extends into the space between the front and rear beam arms 26 and 27. Thus, my arrangement may be used with various types of feeding mechanism, the fluidizing type being shown herein for purposes of illustration only.

The subject matter of my aforesaid copending applications, Serial Nos. 801,143, now Patent No. 3,062,307 and 171,200, is incorporated herein by reference, insofar as consistent with the present disclosure, and the present application forms a continuation-in-part thereof.

Although only preferred embodiments of this invention have been shown and described herein, it will be understood that various modifications and changes may be made in the constructions shown without departing from the spirit of this invention as pointed out in the appended claims.

I claim:

1. A bag filling machine comprising material feeding mechanism and scale mechanism,

said scale mechanism including a beam,

said beam comprising spaced front and rear beam arms and a longitudinal connecting member,

a spout assembly suspended from said beam and including a bag supporting spout which communicates with said feeding mechanism,

fulcrum means for mounting said beam on a fulcrum axis which is parallel to the axis of said spout

whereby the longitudinal position of a bag which is suspended from said spout will not affect the lever arm of the force exerted by said bag upon said beam,

said feeding mechanism including cutoff means for discontinuing the feeding operation,

means actuated by the movement of said beam when the material fed into said bag reaches a predetermined weight for actuating said cutoff means,

a balance weight disposed rearwardly of said front beam arm, and

connecting means between said balance weight and said beam for permitting swinging movement of said balance weight only in a plane perpendicular to said fulcrum axis.

2. A bag filling machine as claimed in claim 1 in which said fulcrum means comprise two spaced conical bearing means engaging said front and rear beam arms.

3. A bag filling machine as claimed in claim 1 in which said longitudinal connecting member is in the form of a side arm which is located on the opposite side of said fulcrum axis from said feeding mechanism and said spout, said side arm being provided with two horizontally spaced conical bearing points on its upper surface, the alignment of said bearing points being substantially parallel to said fulcrum axis, said connecting means being in the form of a hanger suspended from said bearing points for supporting said balance weight from said side arm.

4. A bag filling machine as claimed in claim 3 in which said balance weight is rigidly connected to said hanger.

5. A bag filling machine as claimed in claim 1 which includes an auxiliary scale beam mounted on said front beam arm and extending horizontally in a direction perpendicular to said fulcrum axis, and a weight slidably mounted on said auxiliary scale beam to permit adjustment of

said scale mechanism without substitution of balance weights.

6. A bag filling machine comprising a supporting framework and having feeding mechanism and scale mechanism mounted thereon,

said scale mechanism including a beam,
a spout assembly suspended from said beam and including a bag supporting spout which communicates with said feeding mechanism,
a pair of spaced conical bearing points mounted on said supporting framework,
a pair of bearing pads, each having a conical recess, mounted on said beam,

said bearing points extending into and engaging said bearings pads,

said bearing points and said bearing pads defining a fulcrum axis which is parallel to the axis of said spout

whereby the longitudinal position of a bag which is suspended from said spout will not affect the lever arm of the force exerted by said bag upon said beam,

said feeding mechanism including cutoff means for discontinuing the feeding operation, and

means actuated by the movement of said beam when the material fed into said bag reaches a predetermined weight for actuating said cutoff means, said means including a microswitch mounted adjacent to said beam for engagement thereby.

7. A bag filling machine as claimed in claim 6 which includes a balance weight suspended from said beam for swinging movement only in a plane perpendicular to said fulcrum axis.

8. A bag filling machine comprising material feeding mechanism and scale mechanism,

said scale mechanism including a beam,

said beam comprising spaced front and rear beam arms and a longitudinal connecting member,

a spout assembly suspended from said beam and including a bag supporting spout which communicates with said feeding mechanism,

fulcrum means for mounting said beam on a fulcrum axis which is parallel to the axis of said spout

whereby the longitudinal position of a bag which is suspended from said spout will not affect the lever arm of the force exerted by said bag upon said beam,

said feeding mechanism including cutoff means for discontinuing the feeding operation,

means actuated by the movement of said beam when the material fed into said bag reaches a predetermined weight for actuating said cutoff means,

said fulcrum means comprising two spaced conical bearing means engaging said front and rear beam arms, and

a balance weight connected to said beam at a point rearwardly of said front beam arm.

9. A bag filling machine as claimed in claim 8 which includes conical bearing means disposed between said spout assembly and said beam for supporting said suspended spout assembly from said beam.

10. A bag filling machine as claimed in claim 9 in which said spout assembly is supported from said beam at a single point, and strut means disposed between the lower portion of said spout assembly and the framework of said bag filling machine, said strut means extending in a generally horizontal direction.

11. A bag filling machine as claimed in claim 9 in

which said spout assembly is suspended from said beam at two horizontally spaced points which are aligned in a direction substantially parallel to said fulcrum axis.

12. A bag filling machine as claimed in claim 9 in which said spout assembly is in the form of a cradle, the two upper ends of which are supported from said front and rear beam arms respectively.

13. A bag filling machine as claimed in claim 9 in which said conical bearing means each comprise a conical bearing point and a bearing pad having a conical recess, said bearing point extending into said recess and engaging said bearing pad at the apex of the conical recess.

14. A bag filling machine as claimed in claim 13 in which said conical bearing point is a cone of substantially 60°, and in which said conical recess is a conical surface of substantially 90°.

15. A bag filling machine as claimed in claim 14 in which the point of said cone has a radius of substantially $\frac{1}{64}$ of an inch and in which the apex of said conical surface has a radius of substantially $\frac{1}{32}$ of an inch.

16. A bag filling machine as claimed in claim 8 which includes an auxiliary scale beam mounted on said front beam arm, and a weight slidably mounted on said auxiliary scale beam.

17. A bag filling machine comprising a supporting framework and having material feeding mechanism and scale mechanism,

said scale mechanism including a beam,

said beam comprising spaced front and rear beam arms and a connecting side arm,

a spout assembly suspended from said beam and including a bag supporting spout which communicates with said feeding mechanism,

fulcrum means for mounting said beam on a fulcrum axis which is parallel to the axis of said spout

whereby the longitudinal position of a bag which is suspended from said spout will not affect the lever arm of the force exerted by said bag upon said beam,

said feeding mechanism including cutoff means for discontinuing the feeding operation,

stop means in the form of a yoke mounted with respect to said supporting framework and embracing said side arm for limiting movement of said beam,

means actuated by the movement of said beam when the material fed into said bag reaches a predetermined weight for actuating said cutoff means,

a pair of horizontally spaced conical bearing points mounted on the upper surface of said side arm, the alignment of said bearing points being substantially parallel to said fulcrum axis, and said stop means being located between said bearing points, and

balance weight means suspended from said bearing points.

18. A bag filling machine as claimed in claim 17 in which said supporting framework includes a bed plate in the form of a channel, said fulcrum means including a rigid U-shaped fulcrum member having aligned end posts, and conical bearing points mounted in the upper ends of said end posts and engaging said front and rear beam arms to form the fulcrum support therefor.

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