

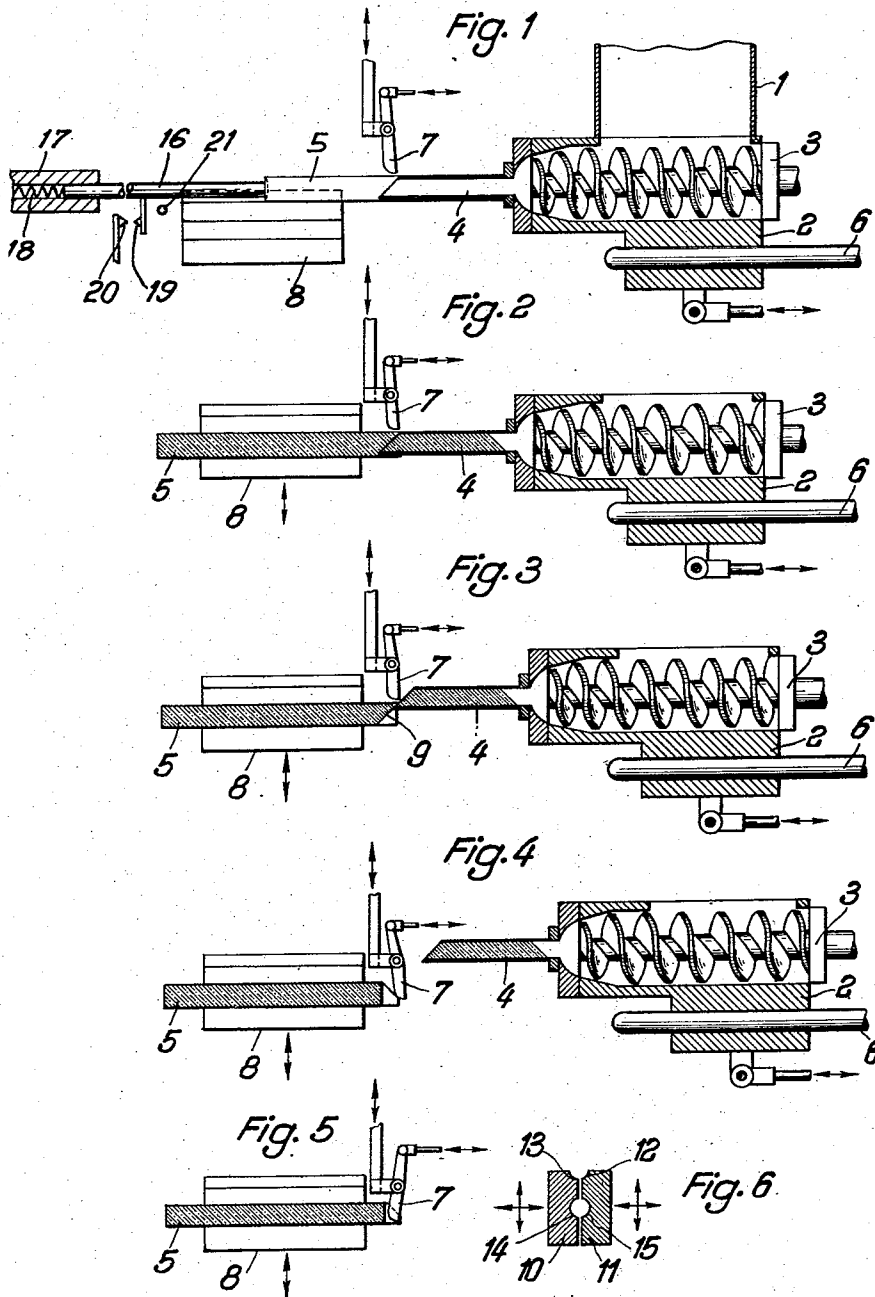
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CONTAINER FILLING PROCESS AND APPARATUS

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CONTAINER FILLING PROCESS AND APPARATUS

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The present invention relates to a filling process and apparatus.

More particularly, the present invention relates to a filling process and apparatus wherein an elongated tubular container made of paper or the like is filled with an explosive material in pasty form so as to provide a cartridge.

One of the objects of the present invention is to provide a filling process and apparatus of the above type capable of reliably and accurately filling a container with a precise amount of material.

Another object of the present invention is to provide a process and apparatus capable of filling containers of a length greater than conventional lengths in an efficient manner.

A further object of the present invention is to provide an apparatus capable of accomplishing the above objects and composed of simple and ruggedly constructed elements which carry out simple motions and which are very reliable in operation.

It is also an object of the present invention to provide an apparatus whose components may be easily exchanged for other components of different sizes to enable the apparatus to fill containers of different sizes.

With the above objects in view the present invention mainly consists of a filling apparatus which includes a housing means having an elongated tubular outlet and a feed screw in the housing means for feeding material out through the tubular outlet thereof. A support means supports an elongated hollow container in a position aligned with the tubular outlet to receive material therefrom, and the support means and housing means are both movable back and forth in directions which are perpendicular to each other.

Also with the above objects in view, the present invention mainly consists of a process for filling an elongated tubular container having a closed end and an open end, this process including the steps of filling the container from its closed end to its open end and then cutting off the material in the container at the open end thereof along a plane which is inclined to the axis of the container and which makes an acute angle with this axis.

The novel features which are considered as characteristic for the invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following description of specific embodiments when read in connection with the accompanying drawings, in which:

Figs. 1-5 show the structure of the invention in a sectional side elevational view respectively in the positions which this structure takes at different stages of the process according to the present invention; and

Fig. 6 is a transverse sectional view showing the details of a support means for supporting a container which is filled according to the present invention.

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Referring now to the drawings, the structure of the invention includes a housing means 2 having a hopper 1 communicating with the interior thereof and supporting a plurality of feed screws for respective rotation about their axes, these feed screws being driven in any suitable way. The housing means includes a plurality of tubular outlet members 4 located beside each other and respectively cooperating with the feed screws for receiving material therefrom. Only one tubular outlet member 4 and feed screw 3 is shown in the drawing for the sake of simplicity.

The containers which are to be filled are in the form of elongated tubular members 5 made of paper or the like and having a left closed end and a right open end, as viewed in the drawings. At the start of the process of the invention the containers 5 are respectively located on the tubular outlet members 4 with the latter extending through their entire length into the containers 5, respectively, as is indicated in Fig. 1.

In accordance with the present invention the housing means 2 is movable back and forth in a horizontal direction, and for this purpose the housing means 2 is formed with a plurality of elongated bores through which a plurality of guide rails or rods 6 respectively extend slidably, as indicated in Fig. 1, so that the housing means 2 may be moved back and forth to the right and left with any suitable mechanism on the rails 6.

A folding member 7 is located over each tubular outlet member 4 adjacent its discharge end, and this folding member 7 is pivotally carried by the angle member shown in Fig. 1 for rotation about an axis perpendicular to and located over the axis of the tubular discharge member 4, the angle member which carries the pivotal folding member 7 being itself movable up and down as indicated by the arrows of the top of Fig. 1. The folding member 7 is turnable in opposite directions about its turning axis.

The containers 5 are each supported during the filling process by a support means 8 the details of which are shown most clearly in Fig. 6. Each support means 8 includes a pair of elongated blocks 10 and 11 located beside each other in the manner shown in Fig. 6, and the upper inner edges of the blocks 10 and 11 which are located next to and directed toward each other are concave, as shown at 12 and 13 in Fig. 6 so as to cooperate together to form a groove for supporting a container 5 during part of the filling process. At their inner side faces which are directed toward each other, the blocks 10 and 11 are respectively formed with longitudinal grooves 14 and 15 which cooperate together to form an elongated cavity in which a container 5 is located during part of the filling process. The support means 8 is movable up and down as indicated by the arrow shown in Figs. 2-5, and as is also shown by the vertical arrows of Fig. 6, and in addition the blocks 10 and 11 of each support means 8 are movable horizontally toward and away from each other, as is also indicated by the arrows shown in Fig. 6.

A feeler 16 in the form of a rod shown in Fig. 1 is axially slidable in a tube 17 carrying a spring 18 which urges the feeler 16 to the right, as viewed in Fig. 1. The feeler rod 16 which is axially aligned with the discharge tube 4 carries an electrical contact member 19 which engages an electrical contact member 20 which is stationary when the container 5 has been filled, as will be pointed out below, and when contact members 19 and 20 engage each other they close a circuit which actuates a member which stops the rotation of the feed screw 3 so that in this way the feeding of the material into the container 5 is terminated automatically when the container 5 is filled. A stop bar 21 which is fixedly mounted by any suitable support structure cooperates with the supports for the con-

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tacts 19 to limit the movement of the feeler rods 16 to the right, as viewed in Fig. 1.

The above described structure operates as follows:

The empty containers 5 which are closed at their left ends and open at their right ends, as viewed in Fig. 1, are placed on the tubular discharge members 4, in the position shown in Fig. 1 where the members 4 are respectively located completely within the containers 5. These containers 5 are supported in this position by the support means 8. Each support means 8 has a container 5 located in the groove formed by the elongated cutouts 12 and 13 of the blocks 10 and 11 of each support means 8. As is apparent from Fig. 1, at the start of the process the feeler rod 16 engages the closed end of the container 5 to urge the latter to the right, as viewed in Fig. 1 with a predetermined force depending upon the spring 18 which may be adjusted to exert the desired force on the container 5.

The rotating feed screw 3 now feeds the pasty explosive material or the like from the hopper 1 through the tubular discharge member 4 into the container 5. The force of the spring 18 is such that the container 5 cannot move to the left, as viewed in Fig. 1, until the material moving into the container 5 from the member 4 engages the left closed end of the container 5. The force of the spring 18 is sufficient to prevent the container 5 from moving to the left while there are still air pockets in the container 5, and with this arrangement the container 5 is reliably filled throughout its interior, so that a precise filling of the containers 5 is assured in this way.

As soon as the material moving into the container 5 completely fills the space located within the latter to the left of the discharge member 4, as viewed in Fig. 1, the material which continues to move into the container 5 starts to shift the latter to the left, as viewed in Fig. 1, and the feeler rod 16 also moves to the left against the force of the spring 18. The cutouts 12 and 13 of the blocks 10 and 11 of the support means 8 support and guide the container 5 during its movement to the left in this manner.

When the container 5 has moved to the left through a distance sufficient to locate its right end in alignment with the upper part of the inclined open end of the tube 4, the switch contact member 19 engages the switch contact member 20 to stop the rotation of the feed screw 3, and thus the leftward movement of the container 5 also stops. The container 5 is now in the position shown in Fig. 2 with respect to the discharge member 4. It will be noted that the discharge member 4 has a left open end located in a plane which is inclined upwardly to the right, as viewed in Fig. 2, and this plane passes through the upper portion of the open end of the container 5 in the position of the parts shown in Fig. 2. Thus, in this position of the parts only the portion of the discharge member 4 located to the left of the uppermost part of the left end of the discharge member 4 is still located within the container 5.

With the parts in this position the container 5 is supported by the part of the discharge member 4 which still extends into the container 5 and by the feeler rod 16 bearing against the left end of the container 5. With the container 5 supported in this way the blocks 10 and 11 of each support means are moved away from each other, and then these blocks are moved upwardly in unison until their grooves 14 and 15 are located at the elevation of the container 5. Then the blocks 10 and 11 are moved toward each other so that the container 5 is gripped in the grooves 14 and 15 between the blocks 10 and 11, and this is the position of the parts shown in Fig. 2.

With the parts in this position shown in Fig. 2 the housing means 2 is moved to the right and at the same time the blocks 10 and 11 of the support means 8 together with the container 5 gripped thereby are moved downwardly. The coordinated rightward movement of

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the housing means 2 and downward movement of the support means 8 produces between the housing means 2 and the support means 8 a relative movement located in the same plane in which the discharge end of the tubular member 4 is located, so that as a result of the simultaneous movement of the housing means 2 and support means 8 in the manner described the end of the discharge member 4 moves upwardly to the right out of the container member 5 and cuts off the material therein along the plane 9 shown in Fig. 3, and as is evident from Fig. 3 this plane is in fact the same plane as the plane in which the discharge end of the tubular member 4 is located.

The housing means 2 continues to move to the right to the position indicated in Fig. 4 and the support means 8 continues to move together with the container 5 downwardly to the position shown in Fig. 4. During the downward movement of the support means 8 and container 5, the folding member 7 together with its support also moves downwardly but at a faster rate than the support means 8, so that the folding member 7 overtakes the container 5 and engages the latter to straighten the right end 9 of the material in container 5 and place the right end of the material in a vertical plane normal to the axis of the container 5. Simultaneously, the folding member 7 folds in the upper portion of the right end of the container 5 against the material therein, and then unillustrated additional folding members which are capable of moving back and forth engage the right free end of the container 5 to finish the folding thereof. When this folding is finished the blocks 10 and 11 of each support means are moved away from each other so that the completely filled and closed container 5 falls from each support means 8 onto a suitable guide which causes the now complete cartridges to move to a place where an operator can pick them up and pack them in suitable boxes or the like. Fig. 5 shows the position to which the folding member 7 has been turned in order to engage the material in the container 5 to straighten the same and in order to fold the material of the container 5 inwardly against the right end of the material therein.

After the process is completed in this manner, the parts are returned to the position of Fig. 1 and new containers 5 are placed on the members 4, respectively, with the feeler rods 16 respectively pressing against the containers 5, and then the above described process is repeated.

With the above described process and apparatus the containers 5 are precisely filled with a desired weight of material. Furthermore, it will be noted that the separation of the material from the free end of the discharge member 4 is very precisely carried out. Furthermore, with the process and apparatus of the present invention it is possible to fill much longer containers than has heretofore been possible. Tests have shown that with the process and apparatus of the present invention it is possible to automatically fill in a perfect manner containers having a length of approximately 300 mm. With the process and apparatus of the present invention there are no plungers which slide in cylinders to eject the material which is being filled, and as result there is no undesirable friction and therefore no danger when handling explosive material. The only rotating part of the entire structure is the feed screw, so that the construction is quite simple and reliable in operation. Furthermore, it is possible to exchange very easily a group of discharge tubes 4 and support means 8 for another group to accommodate containers of a different size.

It will be understood that each of the elements described above, or two or more together, may also find a useful application in other types of filling process and apparatus differing from the types described above.

While the invention has been illustrated and described as embodied in apparatus and process for filling explosives into containers, it is not intended to be limited to the details shown, since various modifications and structural

changes may be made without departing in any way from the spirit of the present invention.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can by applying current knowledge readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claims.

What is claimed as new and desired to be secured by Letters Patent is:

1. In a filling apparatus, in combination, housing means having an elongated tubular outlet; a worm screw in said housing means for feeding a material out of the same through said tubular outlet thereof; support means for supporting a container in alignment with said tubular outlet of said housing means to receive material discharged from said housing means through said tubular outlet thereof, one of said means being movable back and forth in one direction and the other of said means being movable back and forth in a direction perpendicular to said one direction.

2. In a filling apparatus, in combination, housing means having an elongated tubular outlet and being movable back and forth in a horizontal direction; a worm screw in said housing means for feeding a material therein out through said tubular outlet thereof; and support means for supporting an elongated hollow container in alignment with said tubular outlet to receive a material therefrom, said support means being movable up and down.

3. In a filling apparatus, in combination, housing means having an elongated tubular outlet and being movable back and forth in a horizontal direction; a worm screw in said housing means for feeding a material therein out through said tubular outlet thereof; support means for supporting an elongated hollow container in alignment with said tubular outlet to receive a material therefrom, said support means being movable up and down; and a folding member turnable about a predetermined axis in opposite directions and also being movable up and down.

4. In a filling apparatus, in combination, housing means having an elongated tubular outlet and being movable back and forth in a horizontal direction; a worm screw in said housing means for feeding a material therein out through said tubular outlet thereof; support means for supporting an elongated hollow container in alignment with said tubular outlet to receive a material therefrom, said support means being movable up and down; and guide rail means supporting said housing means for said movement back and forth in a horizontal direction.

5. In a filling apparatus, in combination, housing means having an elongated tubular outlet and being movable back and forth in a horizontal direction; a worm screw in said housing means for feeding a material therein out through said tubular outlet thereof; support means for supporting an elongated hollow container in alignment with said tubular outlet to receive a material therefrom, said support means being movable up and down; a folding member turnable about a predetermined axis in opposite directions and also being movable up and down; and guide rail means supporting said housing means for said movement back and forth in a horizontal direction.

6. In a filling apparatus, in combination, housing means

having an elongated tubular outlet; a worm screw in said housing means for feeding a material out of the same through said tubular outlet thereof; support means for supporting a container in alignment with said tubular outlet of said housing means to receive material discharged from said housing means through said tubular outlet thereof, one of said means being movable back and forth in one direction and the other of said means being movable back and forth in a direction perpendicular to said one direction, said support means including a pair of elongated members located beside each other, having at their top faces elongated concave edges located adjacent and directed toward each other and cooperating together to define an upwardly directed groove, said members having side faces directed toward each other and respectively formed with a pair of aligned grooves directed toward each other and cooperating together to form a cavity.

7. In a filling apparatus, in combination, housing means having an elongated tubular outlet; a feed screw in said housing means for feeding material therefrom through said tubular outlet thereof; support means for supporting a tubular container in alignment with said tubular outlet to receive a material therefrom; and means for providing between said housing means and support means a relative movement in a plane inclined to and making an acute angle with the axis of said tubular outlet of said housing means.

8. In a filling apparatus, in combination, a housing having an elongated tubular outlet member provided with an outer discharge end located in a plane inclined to and making an acute angle with the axis of said tubular outlet member; a feed screw in said housing means for feeding material out of the same through said tubular outlet member thereof; support means for supporting an elongated tubular container in a position aligned with said tubular outlet member for receiving material therefrom; and means for providing between said support means and housing means a relative movement in said plane.

9. In a process for filling an elongated hollow container having one closed end and one open end with a pasty material, the steps of filling the elongated container with the pasty material from said closed end thereof up to said open end thereof; cutting off the pasty material in said container at said open end thereof along a plane inclined to and making an acute angle with the axis of the container; and then folding the open end of the container in order to close said open end.

10. In a process for filling an elongated hollow container having one closed end and one open end with a pasty material, the steps of filling the elongated container with the pasty material from said closed end thereof up to said open end thereof; cutting off the pasty material in said container at said open end thereof along a plane inclined to and making an acute angle with the axis of the container; and then folding the open end of the container in order to close said open end and simultaneously changing the inclined plane of the pasty material to a plane which is normal to the axis of the container.

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