

Oct. 17, 1950

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2,525,765

COMPONENT FEEDING DEVICE FOR AUTOMATIC MACHINES

Filed April 22, 1949

2 Sheets-Sheet 1

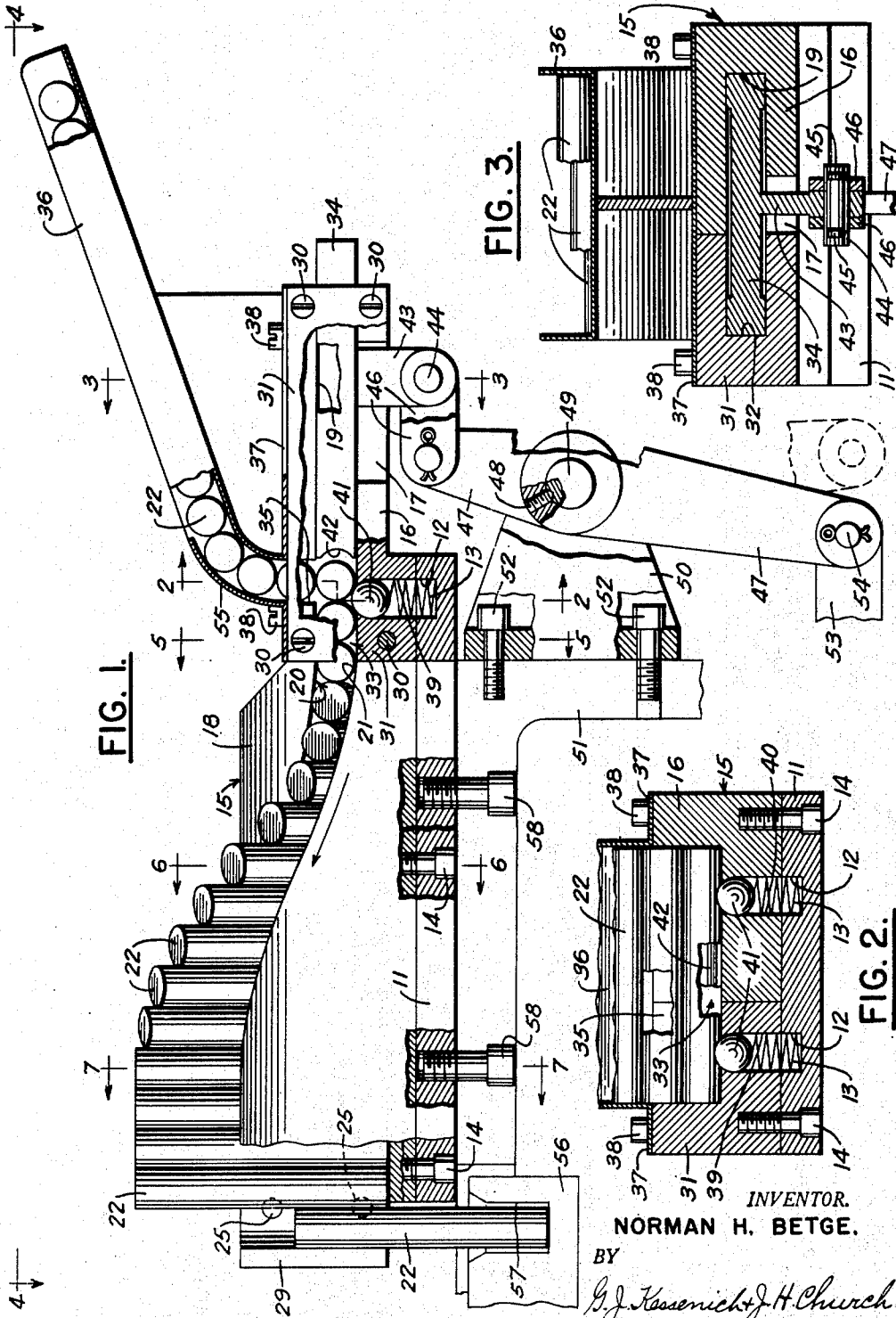


FIG. 1.

FIG. 3.

FIG. 2.

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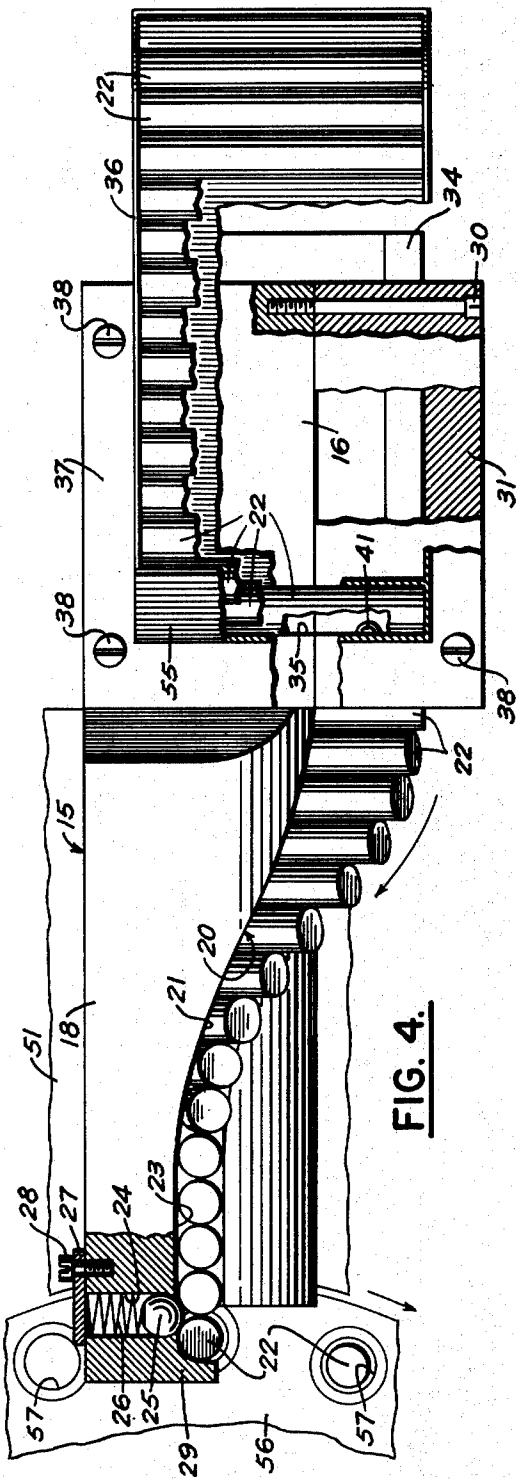


FIG. 4.

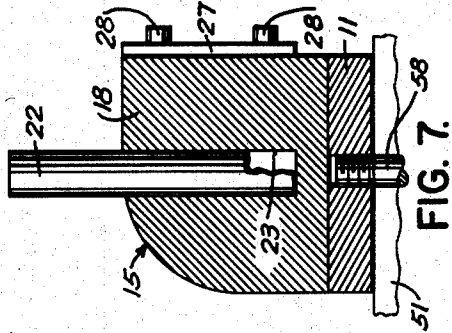


FIG. 7.

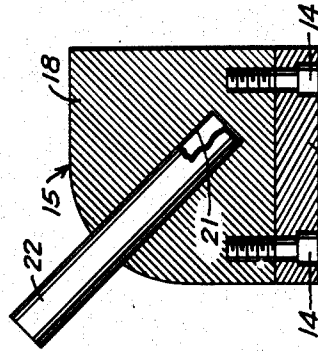


FIG. 6.

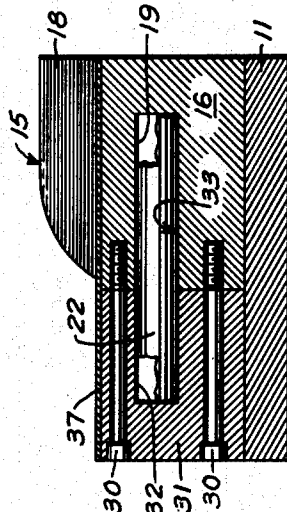


FIG. 5.

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# UNITED STATES PATENT OFFICE

2,525,765

## COMPONENT FEEDING DEVICE FOR AUTOMATIC MACHINES

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3 Claims. (Cl. 198—33)

(Granted under the act of March 3, 1883, as amended April 30, 1928; 370 O. G. 757)

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The invention described herein may be manufactured and used by or for the Government for governmental purposes without the payment of any royalty thereon.

My invention relates to a feeding mechanism for automatic machinery and, while not limited solely thereto, has particular reference to various types of machinery used in the manufacturing and salvaging of ammunition.

Broadly stated, the object of my invention is to improve the efficiency of automatic machinery by providing an improved means of feeding the machinery.

Another object is to enhance the safety factor of ammunition handling machines by removing the possibility of accidental explosion caused by improper contact of ammunition components with one another during the feeding operation.

A further object is to provide a feeding device which will accommodate an adequate uninterrupted supply of workpieces constantly available for delivery to the machine.

Yet another object is to reduce the number of personnel heretofore required in operating and attending automatic machinery.

A still further object is to make possible the handling of a greater number of workpieces per labor-time unit.

The foregoing and other objects of my invention will become apparent during an inspection of the following specification and accompanying drawings wherein:

Fig. 1 is a side view, partly in section, of my novel machinery feeding mechanism, and representing it as being attached to an automatic machine, only fragments of which are represented.

Figs. 2 and 3 are sections along lines 2—2 and 3—3, respectively, of Fig. 1.

Fig. 4 is a top view, partly in section, as seen from line 4—4 of Fig. 1, the fragmentary portions of the automatic machine on which my device is installed also being represented as they would appear from above.

Figs. 5, 6, 7 are sections along lines 5—5, 6—6, and 7—7, respectively, of Fig. 1, showing how a representative workpiece is turned through 90° from the horizontal position at the inlet end of my device to the vertical position at the outlet end.

In the mass production of ammunition, such as bullets, shells, and the like, it is frequently necessary to feed "live" cartridge cases, i. e., cartridge cases containing a percussion primer, into a machine. It is generally expedient to maintain the cases in a vertical position with their open or

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mouth ends at the top so as to facilitate filling them with propellant powder and, subsequently, positioning the projectiles in the neck ends of the cartridge cases.

In the process of disassembling or salvaging ammunition to reclaim costly components, it is also necessary to feed into a machine "live" ammunition, i. e., ammunition equipped not only with primers but propellant powder, too. In such operations it is likewise expedient to maintain the ammunition rounds in a vertical position, preferably with the bullets pointing upwards, so as to facilitate pulling of the projectile from the cartridge case, yet preventing the premature escape of the loose propellant powder from the then open, mouth end of the cartridge case. In this type of operation it is of further advantage as a safety factor to have the ammunition rounds fed side-by-side in a vertical position as opposed to conventional end-to-end feeding which presents the hazard of the projectiles striking the primer of the adjacent round and causing an explosion.

One example of a machine with which my invention may be used to great advantage is a Cartridge Disassembling Machine described in U. S. Patent 2,349,248 issued May 23, 1944. I have found that the efficiency of this machine could be increased if the mechanism of my present invention were provided. As that patent discloses, the live ammunition rounds are fed to the machine's dial notches one by one in an upright position. This feeding has heretofore been done by hand, it being impossible to utilize conventional hoppers, feed chutes or tubes because of the risk of accidentally discharging the ammunition. Prior, therefore, to the development of my inventive feeding mechanism, the desired high speed performance in salvaging ammunition, as well as manufacturing, was greatly hampered because it was necessary to resort to comparatively slow, frequent manual feeding of the machine. This process, besides being slow, required additional operators for the sole purpose of manually loading the machine.

Aside from the safety hazard, the chief disadvantages of prior art manual feeding systems resided in the fact that the ammunition, or other components, had to be placed into the machine in a vertical position, precluding the possibility of maintaining an adequate supply of workpieces available for use by the machine, since they could not be "stacked" up end-to-end. Moreover, once the workpieces were stood on end, there was great likelihood of one or more becoming upset and

thereby causing further hindrance to the progress of the job at hand. Furthermore, the hazard of accidentally "firing" the ammunition was ever present.

As the ensuing description will make clear, my novel machine loading device has eliminated the possibility of accidental firing of the ammunition, has considerably reduced the personnel required to attend and operate the machine, and has made possible increased and more efficient mass production salvaging and manufacturing of ammunition and like components.

In my inventive device I provide for the side-by-side, horizontal positioning of the components being fed to a machine, rather than the objectionable end-to-end positioning. By doing this I am able, if so desired, to place many rounds, one upon the other, without any possibility of accidental firing of one round by another; and, at the same time, provide a copious supply of ammunition constantly available for use by the feed mechanism. Since it is invariably necessary for the rounds of ammunition to enter the manufacturing, or perhaps salvaging, machine in a vertical position, my loading device also effects the turning of the rounds through 90° from the horizontal position at the inlet (at reader's right in the drawings) to the vertical position at the outlet end of the device (at the reader's left).

Subsequent discussion of my invention will pertain to its attachment to a hypothetical automatic machine, only pertinent parts of which will be shown.

For simplicity in drawing, the workpieces to be fed into the machine will be represented merely as cylindrical objects, such as drawn cartridge cases previous to heading or necking operations, although it must be understood that my device can be made to accommodate practically any size or shape of workpiece.

Figs. 1-2 show my mechanism to consist of a base 11 having recesses 12 in which one end of springs 13 rest. Mounted atop base plate 11 and secured thereto by means of screws 14 (Figs. 2, 6) is a body 15 which is the foundation upon which my inventive device is built. As seen in Fig. 1, body 15 comprises a smaller, right-hand portion 16, having an opening 17, and a larger, stepped-up, left-hand portion 18. Further details of these parts are shown in Figs. 5-6-7.

Referring now to the smaller portion 16 of body 15 there can be seen (Figs. 1, 3, 5) a straight, horizontal portion 19 of a twisted channel 20. This channel portion 19 commences at the reader's right and extends to the left end of body portion 16. At the juncture of body portion 16 with the larger portion 18, channel 20 begins to depart from the horizontal position and, taking a helical path as it extends further to the left, gradually assumes a vertical position in the top of the larger body portion 18 near the left end of body 15 (see Figs. 1, 4, 5, 6 and 7). The just named helical portion 21 of channel 20 therefore is seen to pass through 90° from a horizontal position at the right end to a vertical position at the left end. The distance required for helical portion 21 to turn through 90° from horizontal to vertical depends upon the amount of twist desired for that part of channel 20. Another factor which governs that distance is the diameter of the workpieces 22 being moved through the channel, the required length having to be a multiple of the diameter and number of workpieces desired to be processed through the channel per unit of time.

Continuing from the left end of helical portion

21 to near the left end of the larger portion 18 of body 15 is a straight, vertical portion 23 of the channel 20 (see Figs. 4 and 7). Located near the left end of body 15 are a number of recesses 24 (one of which is shown in Fig. 4) slidably containing ball retainers 25 and springs 26. The inner end of the recesses 24 is so made as to allow the ball retainers 25 to protrude partly into the path of channel 20's straight, vertical portion 23. Ball retainers 25 and springs 26 are held in place by a cover 27 which is secured to body 15 by means of screws 28. Adjacent the ball retainers 25 in body 15 is a guide finger 29 (see Fig. 4) whose action presently will be explained.

Attached to the length of the smaller portion 16 of body 15, by means of screws 30, is a side plate 31 (see Figs. 1 to 5 inclusive) containing a straight, horizontal channel 32 which aligns with the straight, horizontal portion 19 of channel 20 forming an opening 33 which slidably accommodates a pusher 34. Communicating from above with the pusher opening 33 is a passage 35 (see Figs. 1 and 4) which is in alignment with a representative hopper 36 that rests atop the smaller portion 16 and the side plate 31. Hopper 36 has a flange 37 which is secured to side plate 31 and portion 16 by means of screws 38.

A recess 39 in side plate 31 (see Figs. 1 and 2), and a recess 40 in body 15 (see Fig. 2), each contains a ball retainer 41 and each recess is so shaped at its upper end as to allow the ball retainers, under influence of springs 13 partly to protrude into the opening 33. Recesses 39 and 40 are placed strategically in definite relationship to the passage 35, ball retainers 25, and are in alignment with the recesses 12 in the base plate 11.

At its left end pusher 34 is shaped as at 42 (see Fig. 1) to contact the workpiece 22 properly thereby preventing it and those workpieces ahead (to the reader's left) from becoming askew, and promoting proper feeding action. Projecting from the lower surface of pusher 34 through opening 17 in the smaller portion 16 of body 15 is a lug 43 (see Figs. 1 and 3).

Connected to lug 43 by pivot pin 44 and cotter pins 45 (see Fig. 3) are links 46. These links are fastened to a lever 47 at their opposite ends by a similar attachment. Lever 47, in turn, is secured by set screw 48 to a pivot pin 49 which is rotatably mounted in a bracket 50 located on machine 51 (only a portion of which is shown) by means of screws 52. The lower end of lever 47 is connected to an operating member 53 as by a cotter-pinned pivot 54 (see Fig. 1). It should be assumed that the operating member 53 is motivated by any conventional means (not shown) to produce teetering movement of lever 47.

The above described novel feeding mechanism is removably secured as a unit to the machine 51 by means of screws 58 (see Fig. 1). It will thus be appreciated that my unique device is adaptable to many uses, for it may be transferred from one machine to another, and larger or smaller units of my invention may be interchanged as the needs may require for a particular operation.

In describing the actual operation of my inventive feeding mechanism for automatic machinery, I shall commence with the mechanism understood to be devoid of workpieces 22 and to be at rest with the pusher 34 at the extreme right-hand limit of its travel, the lower end of lever 47 being in the position shown by solid line in Fig. 1. The workpieces 22 are placed manually or automatically (by means not shown) into the

representative hopper 36 in the correct side-by-side position. The first piece slides by gravity down the throat 55, through the passage 35 and down into the straight, horizontal pusher opening 33. Here it is restrained from movement to the reader's left by the ball retainers 41, and from movement to the right by the left end 42 of the pusher 34. The successive workpieces 22 now pile up vertically in a side-by-side position in the hopper 36.

The entire machine 51 (shown partially), to which my feed mechanism is attached, is now motivated (by means not shown). Operating member 53 begins its motion toward the reader's right, teetering lever 47 to the position indicated by the dotted line and causing the pusher 34, by virtue of its attachment to the lever 47 through links 46, to start moving to the reader's left.

Pusher 34 contacts the first workpiece and moves it to the left with sufficient force to overcome the force exerted by the springs 13 on the ball retainers 41 resulting in their depression into the recesses 39 and 40 (see Figs. 1-2) thus to allow the workpiece to pass by the ball retainers. In the meantime, too, the pusher 34 has closed off the bottom of passage 35, thereby supporting the workpieces above and preventing them from dropping into the straight, horizontal pusher opening 33. When the first workpiece is past the ball retainers 41 the pusher 34 has reached the extreme left of its possible travel.

Further operation of the machine causes the operating member 53 to teeter the lever 47 back toward its original position, resulting in motion of the pusher 34 back to its extreme right-hand position. This action, too, causes the indexing dial 56 of machine 51 to rotate a limited amount in a clockwise direction (see Fig. 4). Dial 56 contains a number of equally spaced wells 57, each shaped to accommodate a workpiece 22. During the limited rotation just mentioned, one well is moved out of alignment with the vertical portion 23 of groove 20 and another well is moved into alignment with that groove. More details of this phase of operation will be presented later.

As the pusher 34 continues its motion back to the extreme right-hand limit of its travel, it first passes clear of the ball retainers 41 which are forced by pressure of springs 13, out of recesses 39 and 40 until they project partly into the straight, horizontal pusher opening 33. In this position balls 41 prevent the next workpiece from passing thereby when it falls in front (to the reader's left) of the pusher 34. During its travel to the right, pusher 34 also progressively unblocks passage 35. When the pusher 34 reaches the end of its travel to the right the passage 35, which contains a waiting workpiece, is fully unobstructed and the next workpiece falls by gravity into the pusher opening 33.

Continued operation causes a repetition of the cycle just described. In addition, the first workpiece which fell is pushed further along the groove 20 toward the reader's left, gradually assuming a vertical position in preparation for delivery into a well 57 located in dial 56 of machine 51 (see Figs. 5, 6, and 7).

Ultimately, the first workpiece, now in a vertical position, contacts the ball retainers 25 (see Figs. 1 and 4), and is prevented thereby from dropping from the body 15 until the proper time. As another workpiece is pushed to the reader's left from under the passage 35, this thrust is transferred from workpiece to workpiece along the groove 20 up to the ball retainers 25. Here

the force of springs 26 is overcome, the ball retainers 25 are depressed into their respective recesses by the advancing workpiece, and the workpiece is pushed past the ball retainers 25. When thus freed, the workpiece is guided by finger 29 so as to drop into a waiting well 57 of dial 56. Simultaneously springs 26 push the ball retainers 25 from their recesses 24 until they project again into the path of the next approaching workpiece.

Having received the workpiece, dial 56 again is rotated (by means not shown) a limited distance, as indicated in Fig. 4, carrying the workpiece away from my novel feeding mechanism and bringing an empty well into alignment with the feeding device in preparation for receiving another workpiece when it drops from the body 15.

Those skilled in the art will understand that there may be a number of fixed work stations spaced around the dial 56 according to the dial's diameter and to the distance between the wells 57, and that each time the dial comes to rest some manufacturing operation (e. g. drilling, boring, threading, forming, assembling, etc.) is performed upon the workpiece which is at a particular station. In other words, the intermittently moving dial carries each workpiece through a sequence of such operations, so that by the time the dial has made practically one revolution, each workpiece will have undergone a series of manufacturing steps before being unloaded or removed from the dial as a final action.

For simplicity of drawing and description none of the work stations nor activating mechanism thereof are shown, as same are well known to the prior art and are not necessary to the operation nor illustration of my invention.

This description, for illustrative purposes only, has dealt with one application of my inventive feeding mechanism, but many variations are possible without departing from the spirit and scope of my broad concept. For instance, my device, instead of receiving the workpieces in a horizontal position and feeding them in a vertical position, could receive the workpieces in a vertical position and feed them to a machine in a horizontal position. Since many variations are possible, I do not wish to be limited to the narrow confines of the application here disclosed.

From the foregoing it is evident that I have improved the efficiency of automatic machinery by providing an improved means of feeding the machinery; that I have enhanced the safety factor of ammunition handling machines by removing the possibility of accidental explosion caused by improper contact of ammunition components with one another during the feeding operation; that I have provided a feeding device which will accommodate an adequate, uninterrupted supply of workpieces constantly available for delivery to the machine; that I have, by my feeding mechanism, reduced the number of personnel heretofore required in operating and attending automatic machinery; and that I have made possible the handling of a greater number of workpieces per labor-time unit.

I claim:

1. In a device for feeding longitudinally shaped components to a machine, a hopper for containing the components and allowing them successively to drop out therefrom side by side, a main body mounted on the machine having in one portion a straight channel and continuous therewith a helically-twisted channel, a side plate secured to a lateral surface of said body and con-

taining a channel which merges and coacts with the straight channel portion of the body to receive components dropped thereinto from said hopper, a spring-loaded ball retainer mounted adjacent the entrance to the body's twisted channel for yieldably blocking passage of components thereby, a pusher member for moving components fed by the hopper one by one past said ball retainer along the twisted channel of the body, whereby to cause the components that are positioned side by side in one plane upon emerging from the hopper to be positioned side by side in a different plane as required upon delivery to another part of the machine.

2. In a device for feeding longitudinally shaped components to a machine, a hopper for containing the components and allowing them successively to drop out therefrom side by side, a main body mounted on the machine having in one portion a straight channel and continuous therewith a helically-twisted channel, a side plate secured to a lateral surface of said body and containing a channel which merges and coacts with the straight channel portion of the body to receive components dropped thereinto from said hopper, a pusher member for moving components fed by the hopper one by one from the merged side plate and straight body channels along the twisted channel of the body, and a spring-loaded ball retainer mounted in said body at an exit end of the body's twisted channel for maintaining the components in side-by-side contact within that channel until the moving force transmitted through a contiguous series of components by said pusher member is sufficient to enable one component after another to pass the retainer, whereby to cause the components that are positioned side by side in one plane upon emerging from the hopper to be positioned side by side in another plane as required upon delivery one by one to another part of the machine.

3. In a device for feeding longitudinally shaped components to a machine, a hopper for contain-

ing the components and allowing them successively to drop out therefrom side by side, a main body mounted on the machine having in one portion a straight channel and continuous therewith a helically-twisted channel, a side plate secured to a lateral surface of said body and containing a channel which merges and coacts with the straight channel portion of the body to receive components dropped thereinto from said hopper, a pusher member for moving components fed by the hopper one by one from the merged side plate and straight body channels along the twisted channel of the body, a spring-loaded ball retainer mounted in said body at an exit end of the body's twisted channel for maintaining the components in side-by-side contact within that channel until the moving force is transmitted through a contiguous series of components by said pusher member is sufficient to enable one component after another to pass the retainer, and a finger member for guiding each component which passes the retainer to the machine's next work station, whereby to cause the components that are positioned side by side in one plane upon emerging from the hopper to be positioned side by side in another plane as required upon delivery one by one to another part of the machine.

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