May 21, 1946. D. R. P. JACKSON 2,400,695

MACHINE FOR BOXING CARTRIDGES OR OTHER ELONGATED ARTICLES

Filed Aug. 3, 1943 4 Sheets-Sheet 1

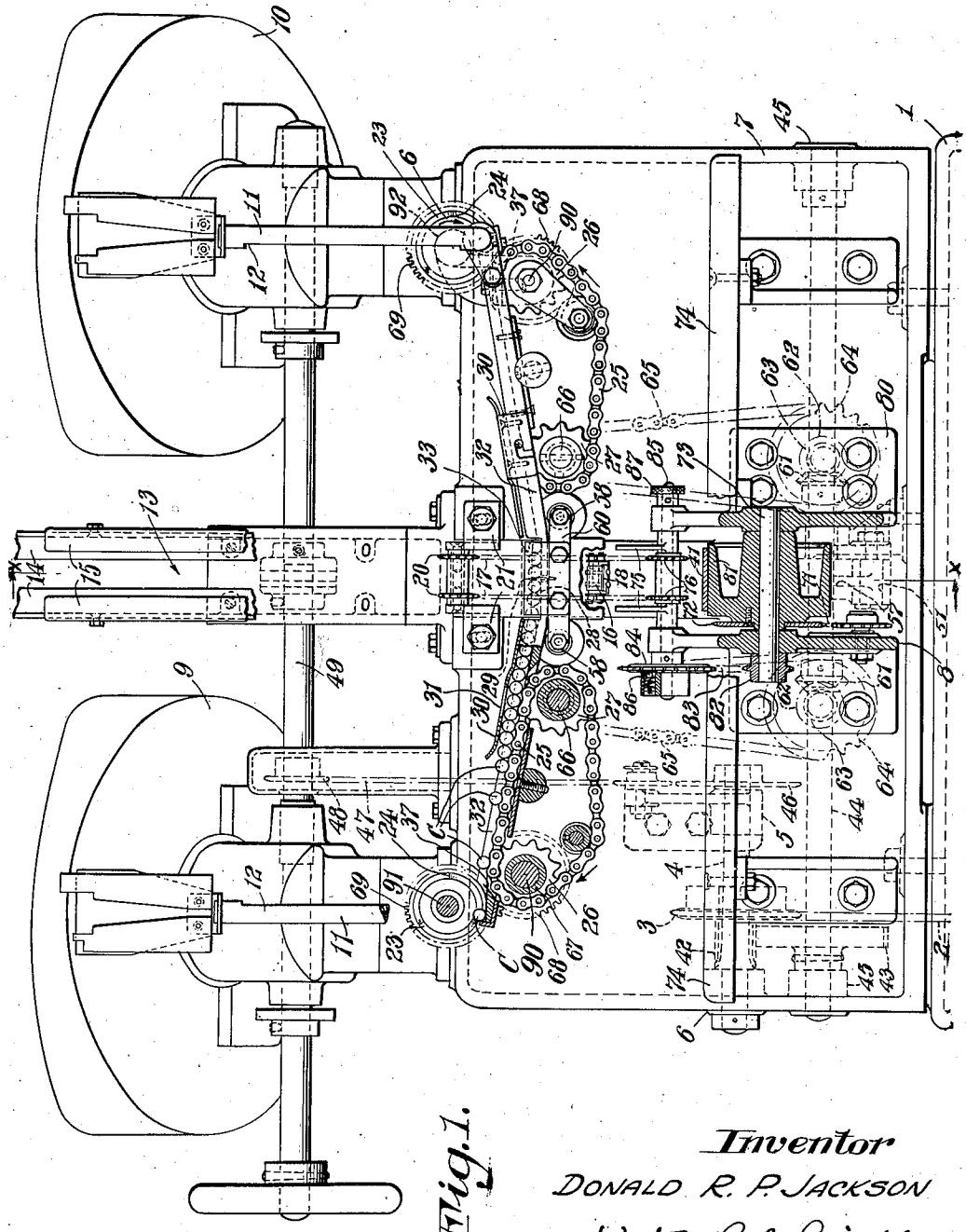


Fig. 1.

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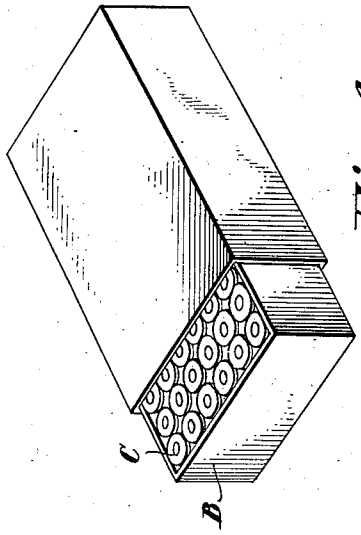



Fig. 4.



Fig. 2.

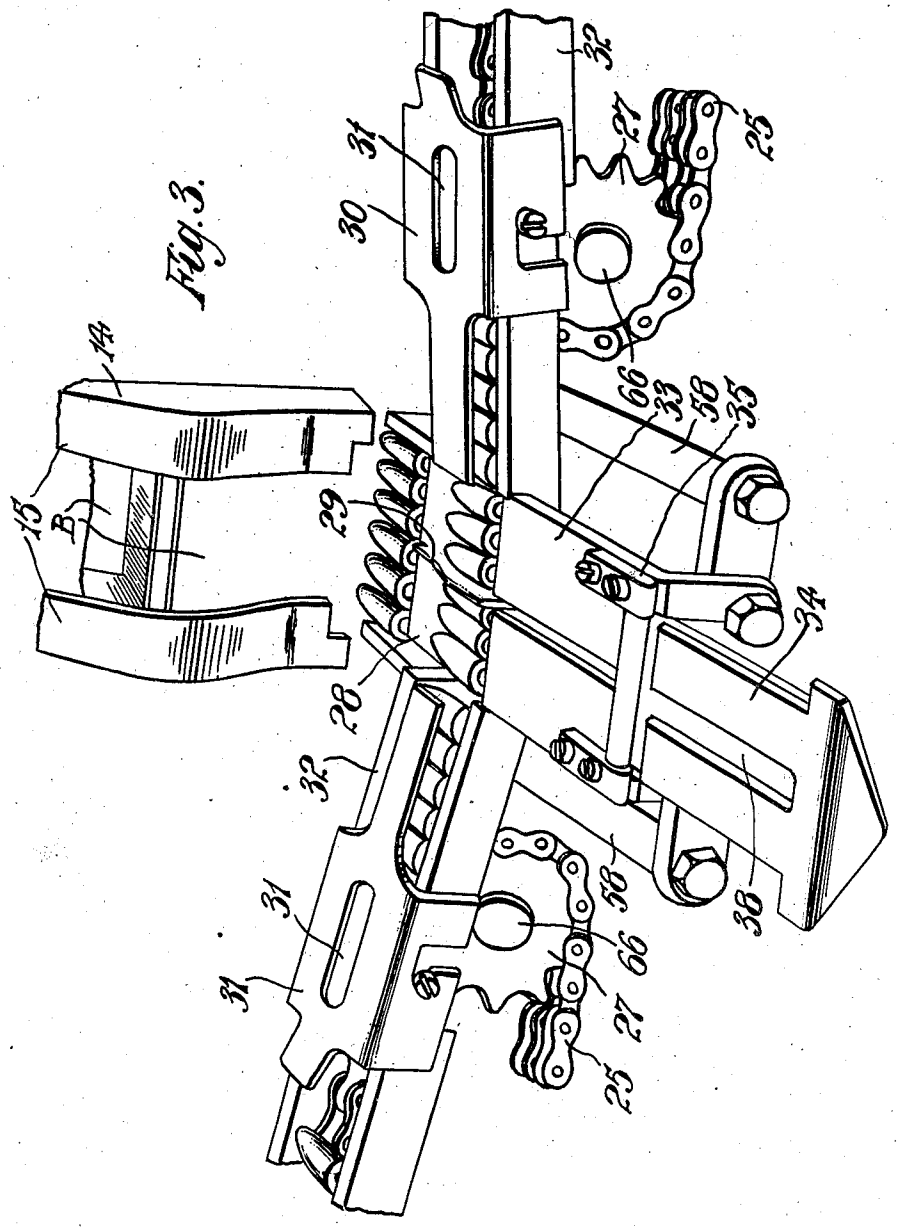
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MACHINE FOR BOXING CARTRIDGES OR OTHER ELONGATED ARTICLES

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Fig. 3.



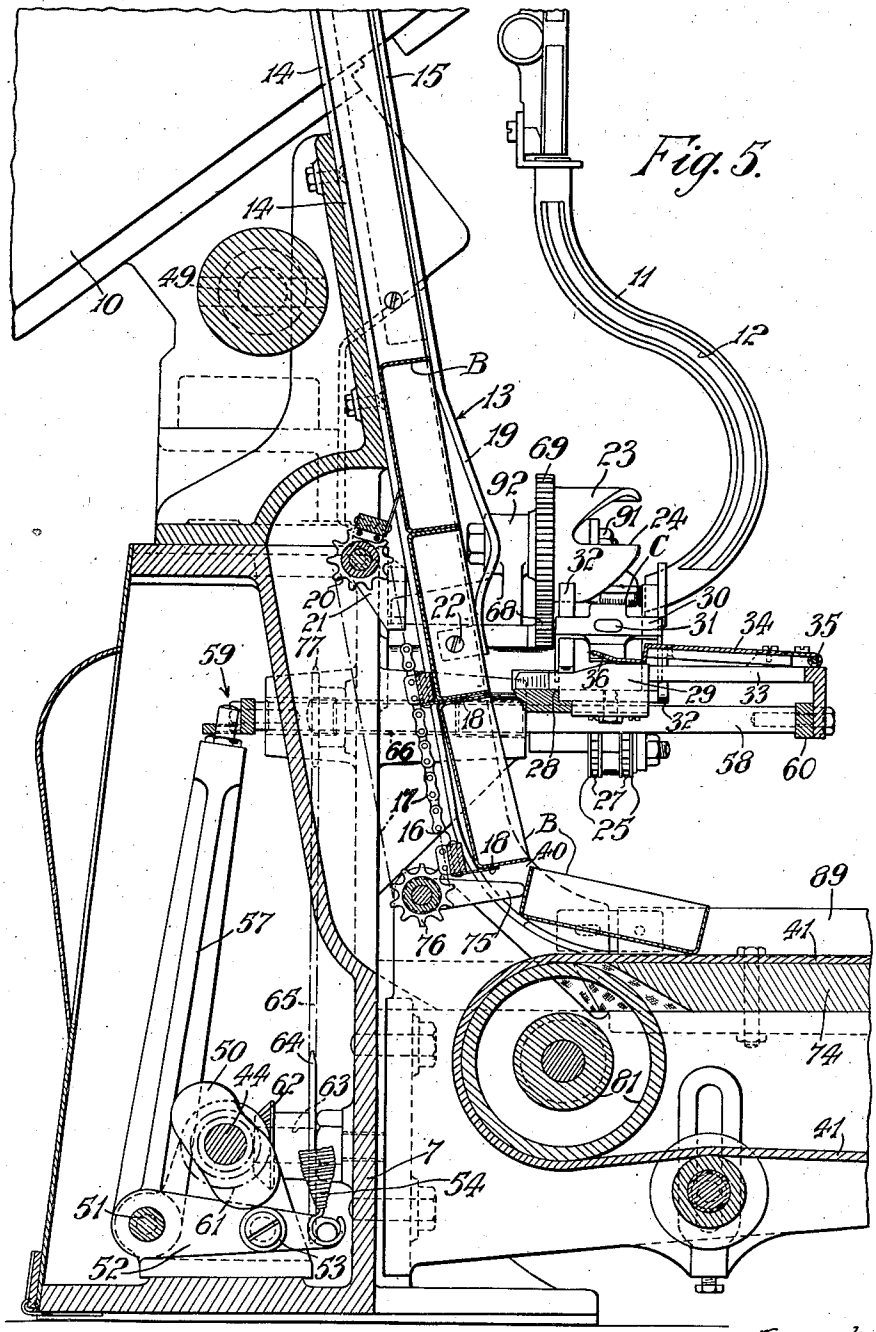

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Fig. 5.




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# UNITED STATES PATENT OFFICE

2,400,695

## MACHINE FOR BOXING CARTRIDGES OR OTHER ELONGATED ARTICLES

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Application August 3, 1943, Serial No. 497,265
In Great Britain July 24, 1942

4 Claims. (Cl. 226—2)

This invention concerns improvements in or relating to machines for boxing cartridges or other elongated articles and is applicable as described later by way of example to a machine in which cartridges are packed into rectangular boxes having loose lids, the cartridges being arranged in the boxes with their noses all pointing in the same direction, i. e., directed towards the bottom of the boxes. The cartridges in question are rimless and have the body portions of the cases substantially cylindrical, so the fact that all their noses are pointing in the same direction does not disturb the arrangement of the cartridges in the boxes, but it will be seen later that the cartridges could be disposed in the boxes with their bases directed towards the bottom, although the other arrangement is the more usual.

According to the present invention there is provided a machine for boxing elongated articles, comprising a feeding station for articles, a stack in which empty boxes are arranged to be placed one on top of the other, an endless conveyor arranged to lower the boxes in succession past the feeding station and having thin blades which are arranged to enter between successive boxes of the stack, and a curved guide on the opposite side of the stack to that on which the conveyor blades are mounted on the conveyor, wherein the curved guide is so arranged that as the blades move round into the path of the succession of downwardly moving boxes, the blades deflect the boxes away from the conveyor and engage the rear of boxes in front of those they have so deflected, and wherein the curved guide is arranged to return each deflected box over the rear of a blade which has previously moved it to one side.

A reciprocating plunger may be provided at the feeding station for feeding articles into the boxes, and means may be provided movable with the plunger to press the articles transversely to the direction of movement of the plunger to cause such articles to be properly positioned in the box. Guide-means may be provided movable with the plunger to open or distend the boxes in front of the feeding station, said guide means comprising a slidable element mounted on the plunger and resiliently urged forwardly of the plunger.

Further according to the present invention there is provided (e. g., in a machine for boxing elongated articles), apparatus for feeding a succession of elongated articles, comprising a chute down which a succession of contiguous articles move by gravity, and a remover-device located at the bottom to take the articles away in succession at spaced intervals, said device comprising a crown cam having inclined faces before pusher faces, the inclined faces being so shaped that as the cam moves, an article moves forwardly against the cam face until it is engaged by a pusher face and conveyed laterally thereby, the arrangement being such that the contiguous articles can be moved down the chute at a controlled speed. In this way sudden intermittent movements of the whole mass can be avoided thus preventing damage in the case of delicate articles or the danger of detonation where the articles are live cartridges. The cam may move cartridges on to a conveyor (e. g., a chain) which conveys cartridges laterally in succession to a platform where a row of side by side cartridges is formed. From the platform the cartridges may be moved into a box by a reciprocating plunger and means may be provided movable with the plunger to press the articles transversely to the direction of movement of the plunger to cause such articles to be properly positioned in the box. Means may be provided to open or distend the box in the neighbourhood of the row to be moved therein to facilitate the feeding of the row.

One way of carrying the invention into effect will now be described with reference to the accompanying drawings which show a machine for packing cartridges of the kind used in submachine guns, into a cardboard box. In the drawings:

Figure 1 is a front elevation of the machine with a few parts in section.

Figure 2 is a side elevation of Figure 1 partly in section.

Figure 3 is a perspective view of the devices for inserting the cartridges in the boxes.

Figure 4 is a perspective view of a box containing cartridges.

Figure 5 is a view to a larger scale, similar to Figure 2, but is a section on the line $x$—$x$, Figure 1, some of the parts shown in Figure 1 being omitted.

Referring to Figure 1, the machine is mounted on a base 1 which normally is placed on the floor and in the interior of the base there is arranged driving mechanism (not shown) consisting preferably of an electric motor having a sprocket wheel on which a chain 2 runs and drives a further sprocket wheel 3 mounted on a countershaft 4 journalled in a bearing 5 and a further bearing 6 formed in the frame 7 of the boxing machine which is fixed to the base 1. The cartridges C which as may be seen in Figure 2 are substantially parallel for the major part of their length are fed from hoppers 9 and 10, two being provided

in order to secure a satisfactory output of finished boxes. The hoppers are of the same general construction as those shown in United States application Serial No. 420,010 but modified as shown in British Patent Specification No. 547,503 where means is shown and described to cause bullets or like articles to fall from a delivery tube nose first.

From each hopper the cartridges are fed through a guide tube 11 which is, at least partly, of sinuous or S shape with the lower portion of the S so shaped that the cartridges are discharged therefrom in a substantially horizontal direction, see Figure 2. The purpose of this arrangement is partly to provide a discharge tube which offers a certain amount of resistance to the cartridge movement and thus keeps them under control, and also to feed the discharged bullets horizontally so that they can be moved on to the feeding platform of the boxing device as will appear later. The tubes 11 are slotted or cut away at one side as indicated by the reference 12 to facilitate inspection of the feeding process. A box-feeding conveyor described below is placed centrally between the hoppers 9 and 10. The conveyor comprises a track 13 which is formed by angle members 14 and 15. The base of the conveyor track (i. e., the left hand part as viewed in Figure 2) is tilted slightly backwards as shown in the figure so that it is disposed at an angle of about 10° to the vertical and when empty box members B, called hereafter for convenience "boxes," are placed on the track, the bottoms of the boxes lean against the track. The boxes are conveyed downwards by conveyor pieces 16 connected to a pair of conveyor chains 17 disposed parallel to the base of the track. In Figure 2 the chains are shown as single broken lines, a few links being indicated for clearness. The conveyor pieces comprise thin blade-like members 18 which are sufficiently long to extend from the track to a distance equal to, for example, half the thickness or depth of the boxes. When the conveyor is moving, the boxes are fed continuously downwards at such a rate that single rows of cartridges (e. g., 6 in a row) may be pushed one row after another into the open boxes as described later so that each row lies on top of the preceding row. At the position along the track occupied by an operative conveyor blade there is a certain amount of space occupied by the walls of two neighbouring boxes and the conveyor blade, but the conveyor moves at such a rate that this occupied space does not offer any obstacle to the insertion of the rows of cartridges, particularly as the noses of the bullets are tapered.

It will be noticed from Figure 2 that the boxes are stacked one on top of the other (i. e., a side wall of one box is adjacent the side wall of the next box so that the plane of the box opening lies parallel to the conveyor track) and that when the boxes are moved downwardly by the conveyor the blades extend between adjacent boxes. The way in which the conveyor blades are caused to enter between the side walls of adjacent boxes, is as follows. In the magazine or stacker formed by the angle members 14 and 15 which also form the conveyor track and in which the boxes are piled, a guide marked 19 is provided on the side of the track opposite to that at which the endless conveyor carrying the blades is arranged. This guide, which is formed by bending or bowing parts of the angle members 15 outwardly at 19, extends from the region where the blades enter the path of the moving boxes to a lower position. As the blades move into the path of downwardly moving boxes they push aside (i. e., to the right in Figure 2) the boxes which they engage and thus the boxes are moved outwards but are prevented from entirely leaving the conveyor track by the curved guide 19. The blades continue their angular movement about the top sprockets 20 of the chain conveyor and by the time the blades reach the portion of the conveyor track where the guide 19 terminates, the blades become arranged parallel to the side walls of the boxes and thus come to lie against the upper face of the box in front of that which they have pushed aside. The top sprockets 20 are supported by small brackets 21 attached to the frame 7 and will be referred to again when the driving mechanism is being described. During the downward movement of the deflected box the guide 19 returns it into its original path and thus each box in turn is moved back into contact with the parts of the members 14 which form the base of the track and behind the blade which has previously deflected it. The ends of the parts 15 which form the guide 19 are attached at 22 to the members 14.

As previously mentioned, cartridges from each hopper proceed nose foremost down the S shaped tube appertaining to said hopper, but at the end of the tube they are prevented from emerging therefrom until the proper time by a remover device 23 comprising a rotary member formed as a crown cam. The operative face of this cam engages with a cartridge emerging from the outlet end of the tube (e. g., the tube end is about ⅛" clear of the cam face). The cam is provided with a contour which is so curved that as the cam rotates, a cartridge may gradually emerge from the tube under the pressure of those above it and when the cartridge is quite clear of the tube a sharp step 24 on the cam parallel to the axis thereof sweeps the cartridge laterally out of alignment with the tube and delivers it on to a conveyor which travels in the direction transverse to that of the previous axial movement of the cartridge. The shape of the remover device will be easily understood by a comparison of Figures 1 and 2 and will be seen to consist of a three-step crown cam, the steps 24 being parallel to the axis of the device. Check springs 37 are provided to control the movement of the cartridges on to the chains.

The conveyor which receives the cartridges consists of a pair of sprocket chains 25 arranged parallel to one another and supported by sprocket wheels 26 and 27 the sprocket wheels 27 being the driving sprockets. The conveyor is so arranged that the upper surfaces of the pair of chains constitute the supporting means for the cartridges which lie on the chains and are restrained against free movement by the shape of the links. The cartridges lie on the curved sides of the links and owing to the rate of delivery from the feed tube and the speed of the conveyor chains they are spaced apart on said chains by a distance substantially as shown at the left hand on Fig. 1. The conveyor chains move downwardly from the delivery position at a small angle (e. g., about 10°) towards a feeding platform 28 on to which the cartridges are discharged. The arrangements for feeding and conveying cartridges from each of the hoppers 9 and 10 are identical.

The feeding platform 28 consists of a plate sufficiently wide to support six cartridges and is provided with a central rib 29 so that rows of cartridges from each conveyor meet at the rib and

are temporarily held up. The rib is formed as a cam on its top surface for a purpose described later, see Figure 3. When the leading cartridges are arrested by the rib, the succeeding cartridges on the conveyor chains will rapidly accumulate until there is a reserve of cartridges extending away from the feeding platform towards the feed tubes as shown immediately to the left of the platform 28 in Figure 1. To prevent these cartridges from piling up or riding over one another, top guides 30 having inspection apertures 31 are fixed to the side guides 32 of the chain conveyors. The side guides are spaced apart a distance slightly greater than the length of a cartridge and control the cartridges laterally by engaging their bases and noses should they tend to become displaced on the chains.

When a row of six cartridges has been assembled in this manner on the feeding platform, a reciprocating plunger 33 suitably slotted to clear the rib 29 and moving at right angles to the direction of movement of the cartridges, pushes the row off the platform and into one of the boxes on the chain conveyor 17, the box in question being the one which is just travelling by the feeding position. The timing arrangements are such that the boxes, which move continuously, are lowered by a distance equal to the diameter of the cartridges at each stroke of the reciprocating plunger.

A device is provided for causing each newly deposited row of cartridges to be settled or properly adjusted in the box, the device being arranged to give a light pressing or dabbing movement on top of each row as soon as it arrives in position within the boxes. The dabbing device consists of a plate 34 hinged at 35 to the reciprocating pusher and moving therewith. These parts are omitted from Figure 1. The forward end of the plate is bent down and then upwardly again at 36, Figure 2, so that it can enter a box without in any way disturbing the row of freshly deposited cartridges. The plate may, however, be solid and slotted as shown at 38, Figure 3, for the same purpose so that as it moves forwardly with the plunger it is supported by its end part which rides on top of the cam contour of the central rib of the feeding platform. The slot or bent part as the case may be is to ensure that only the end of the plate acts as the cam follower in order to secure the desired motion. The plate is guided in this manner and presses or dabs the freshly deposited row of cartridges and on the return stroke the plate is lifted by the cam on the rib to its normal level.

The above-mentioned operations are repeated and in due course a column of filled boxes is obtained, the lower or leading boxes of the column passing around a curved portion 40 which forms an extension of the conveyor track whereby the box is brought to a position where its base is horizontal. See Figure 2 where several succeeding boxes are shown moving round the track. As the box enters the curved part 40 it is still supported by the blade 18 beneath it for a short time. The curvature of the part 40 then causes the lower portion of the box to be moved away from said blade and arms 75 associated with the lower sprockets 76 of the box conveyor and movable therewith push the upper part of the box clear of the following blade. As a box approaches the horizontal position it becomes deposited on a travelling belt conveyor 41 or the like which carries it away, during which operation the machine attendant places the lid or other covering member on the box. As will be seen from Figure 4 the boxes shown are of the slide and shell type but the actual nature of the boxes is not material, provided that the inner part thereof is suitable for feeding down the conveyor track as previously described. Another common type of box for holding these cartridges is a box consisting of a bottom and a lid of substantially the same size as the bottom, the lid being slid over the bottom at right angles to the plane of the box opening, the finished article having a double thickness of side walls formed by the walls of the bottom and top half respectively.

The various parts of the machine above described are driven in the following manner. The countershaft 4 is provided with a small gear wheel or pinion 42 which engages with a larger gear wheel 43 fixed on a shaft 44 journalled in bearings 45 formed at each side of the frame 7. The countershaft 4 has also fixed thereto a sprocket wheel 46 on which runs a chain 47 which also passes around a sprocket wheel 48 fixed to the driving shaft 49 of the hopper devices. In Figure 2 the sprocket wheels 3 and 46 which are of substantially the same size though of different pitch are marked by the reference (3—46). Suitable overload clutches may be incorporated in this drive or in the hopper mechanism itself. On the shaft 44 there is arranged a two-throw cam 50, see Figure 2, which operates the reciprocating plunger 33 through a bellcrank lever pivoted at 51 in the frame 7. The short arm 52 of the bellcrank lever has a roller 53 mounted thereon which engages the cam 50 and a spring 54 connected to the extremity 55 of the short arm and to a pin 56 fixed to the frame 7 moves the bellcrank lever in the opposite direction. The long arm 57 of the bellcrank lever is connected to a pair of parallel rods 58 slidable in bushes in the frame 7, the connection being by means of a pin and slot device indicated at 59, Figure 2. The other ends of the parallel rods are joined by a strap 60 which is fixed to the reciprocating plunger and thus the rods serve to operate and guide the plunger as necessary.

A bevel gear wheel 61 is fixed on the shaft 44 and engages with a similar bevel gear wheel 62 mounted on a pin 63 fixed in the frame 7 and arranged at right angles to the shaft 44. A sprocket wheel 64 fixed to the bevel gear wheel 63 is connected by a chain 65 to a sprocket wheel 17, see only Figure 2. This sprocket wheel is fixed on the driving spindle 66 of the cartridge conveyor to which the sprocket wheel 27 is also fixed, a similar arrangement being provided for each of said conveyors. In Figure 2 the spindle 66 cannot be seen as it is colinear with the rods 58 and associated parts, but the construction can be readily followed by comparing Figures 1 and 2. On the sprocket hub 67 which carries the idler sprocket wheels 26 of the cartridge conveyor and which is supported on a fixed pin 90, there is arranged a gear wheel 68 which engages with a similar gear wheel 69 attached to the crown cam 23 which regulates the exit of the cartridges from the S tube. The cam and gear are supported on a pin 91 fixed in a bracket 92.

On the shaft 44 there is also fixed a small sprocket wheel 70 (Figure 2) which is connected by a chain 71 to a larger sprocket wheel 72 on another shaft 73 journalled in brackets 80 as shown in Figure 1, the brackets being attached to the frame 7 as shown in Figure 2. On this shaft there is fixed a pulley 81 which drives the delivery belt 41 and also a small sprocket wheel 82

which transmits the drive by a further chain 83 to a sprocket wheel 84 mounted on the lower shaft 85 of the box conveyor. This last mentioned sprocket wheel is provided with a clutch 86, Figure 1, shown herein as a ball clutch which will disengage in the event of a jam, but it is mainly provided for another purpose. The box conveyor naturally moves very slowly and in the event of any stoppages of the machine and in particular when the machine is being freshly started it is desirable that the speed of this conveyor shall be increased to bring the boxes rapidly to the filling position. A hand knob 87, Figure 1, is provided on the shaft 85 and the knob may be turned manually to advance the box conveyor as necessary, in which case the ball clutch is disengaged against the action of its spring.

The delivery belt 41 passes around an idler pulley 88 and between angle guides 89 which are fixed to a table 74, the latter being in turn fixed to the brackets 80.

It will be seen that by feeding the bullets base first from the hoppers they may be pushed into the boxes in the reverse direction.

What I claim as my invention and desire to secure by Letters Patent is:

1. In a machine for feeding articles, the combination with a downwardly extending first guide in which articles are stacked in superposed relation, and means to lower the articles so stacked at a controlled rate, said last named means comprising an endless conveyor having blades arranged to extend between successive articles at one side of the stack, and a second guide at the other side of the stack having a portion approaching said stack in a downward direction, said conveyor and second guide being so shaped and disposed that as the blades move successively into the path of movement of the stacked articles, each blade deflects an article away from the conveyor and toward the second guide, and overlies the article immediately preceding the article so deflected, the stack-approaching portion of said second guide being shaped and disposed to engage and displace the deflected article across the rear face of the deflecting blade to realign the article with the stack.

2. In a machine for feeding articles, the combination with a downwardly extending first guide in which articles are stacked in superposed relation, means to lower the articles so stacked at a controlled rate, said last named means comprising an endless conveyor having blades arranged to extend between successive articles at one side of the stack, and a second guide at the other side of the stack having a portion approaching said stack in a downward direction, said conveyor and second guide being so shaped and disposed that as the blades move successively into the path of movement of the stacked articles, each blade deflects an article away from the conveyor and toward the second guide, and overlies the article immediately preceding the article so deflected, the stack-approaching portion of said second guide being shaped and disposed to engage and displace the deflected article across the rear face of the deflecting blade to realign the article with the stack, the lower end of said first guide being curved to direct the articles generally horizontally, and means driven in timed relation with said conveyor for displacing successive articles so directed away from the path of movement of the succeeding blade.

3. In a machine for feeding articles, the combination with a downwardly extending first guide in which articles are stacked in superposed relation, and means to lower the articles so stacked at a controlled rate, said last named means comprising an endless conveyor having thin blades arranged to extend between successive articles at one side of the stack, and a second guide at the other side of the stack to limit displacement of said articles away from said conveyor, said second guide having a portion approaching said stack in a downward direction, said conveyor and second guide being so disposed that as the blades move successively into the path of movement of the stacked articles, each blade deflects an article away from the conveyor and toward the second guide, and engages the rear of the article immediately preceding the article so deflected, the stack-approaching portion of said second guide being shaped and disposed to return the deflected article to alignment with the stack by displacing the article across the rear face of the deflecting blade.

4. In a machine for boxing articles, the combination with a downwardly extending first guide in which empty boxes having an open side are stacked in superposed relation with the open sides facing outwardly of the stack, and means to lower the boxes so stacked at a controlled rate, said last named means comprising an endless conveyor having thin blades arranged to extend between successive articles at one side of the stack, a second guide at the other side of the stack to limit displacement of said boxes away from said conveyor, said second guide having a portion approaching said stack in a downward direction, said conveyor and second guide having a portion so shaped and disposed that as the blades move successively into the path of movement of the stacked boxes, each blade deflects a box away from the conveyor and toward the second guide, and engages the rear of the box immediately preceding the box so deflected, the stack-approaching portion of said second guide being shaped and disposed to return the deflected box to alignment with the stack by displacing the box across the rear face of the deflecting blade, and article delivery means disposed below said second guide and adjacent the open sides of the stacked boxes for delivering articles into the boxes.

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