Jan. 14, 1958 A. W. G. ERVINE 2,819,575

ARTICLE ARRANGING MECHANISM

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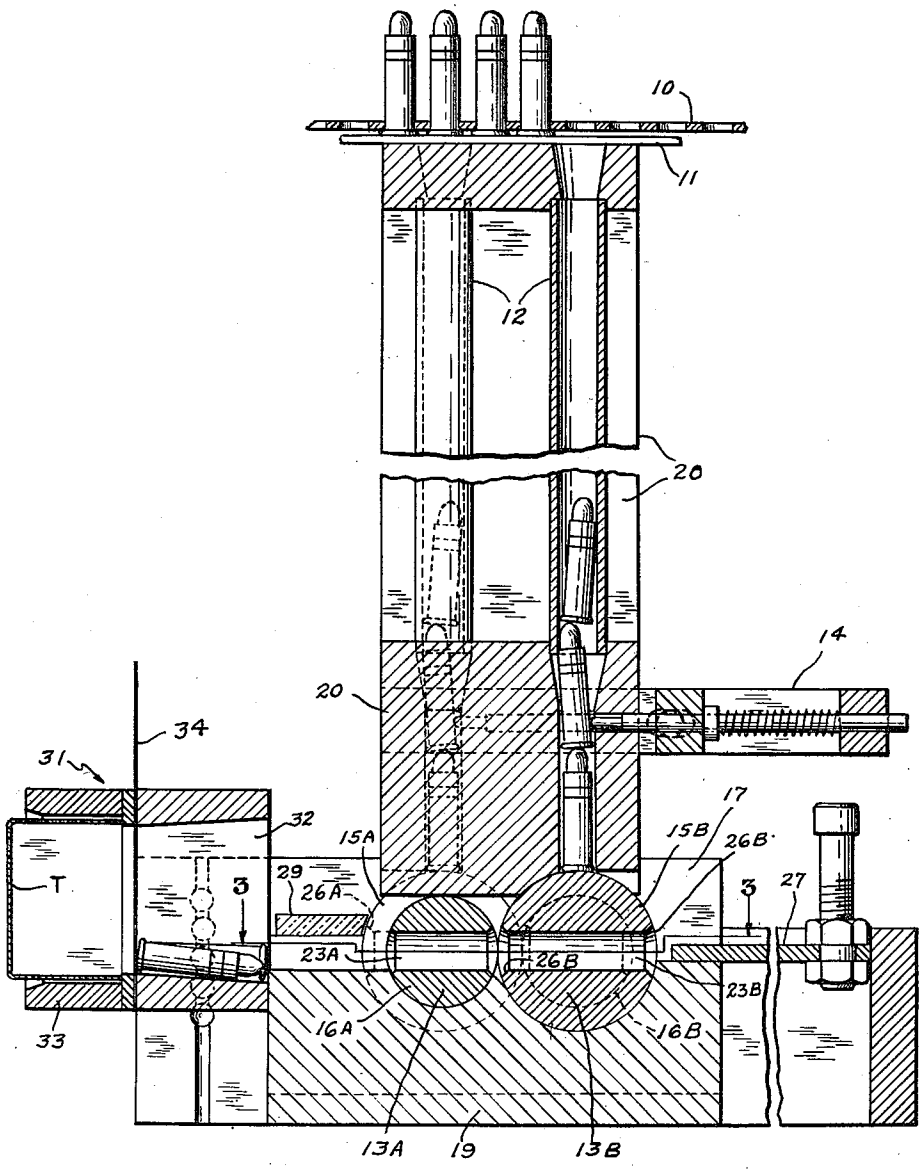
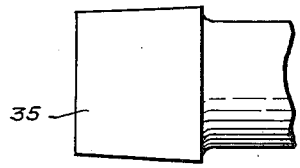


Fig. 1



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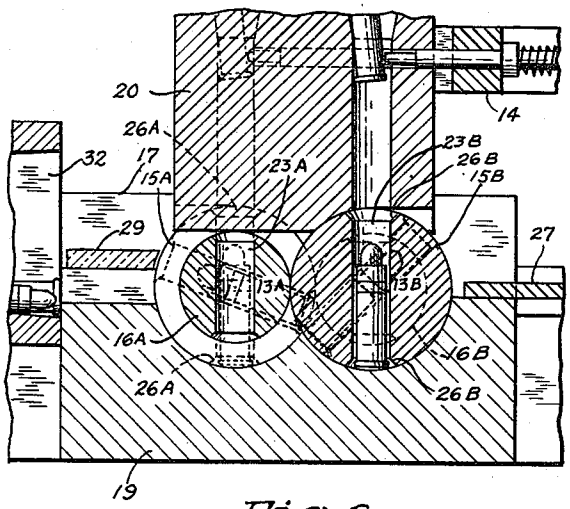


Fig. 2

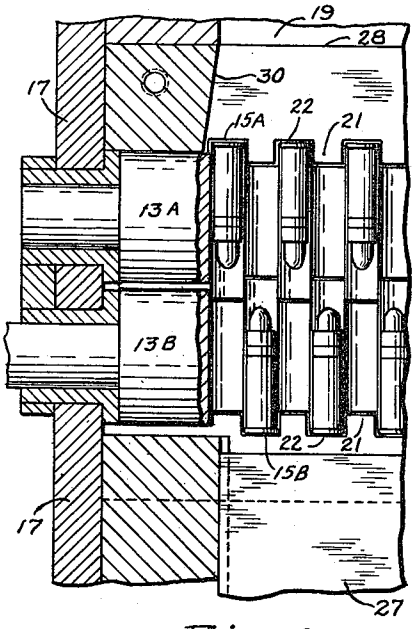


Fig. 4

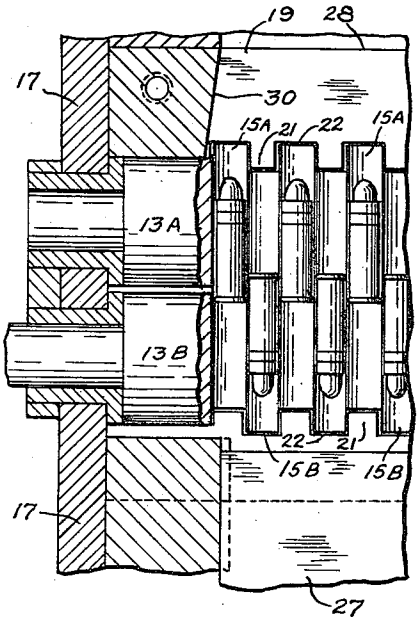


Fig. 3

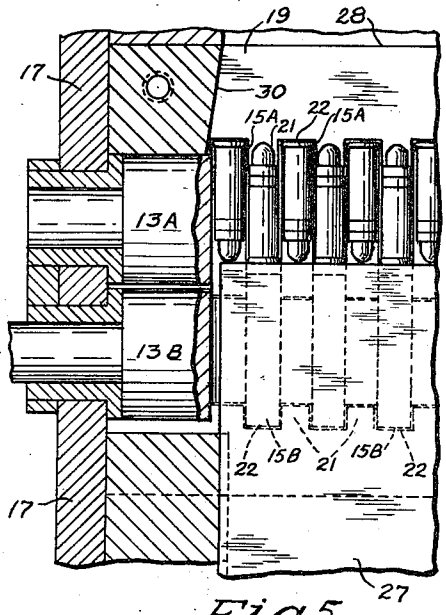


Fig. 5

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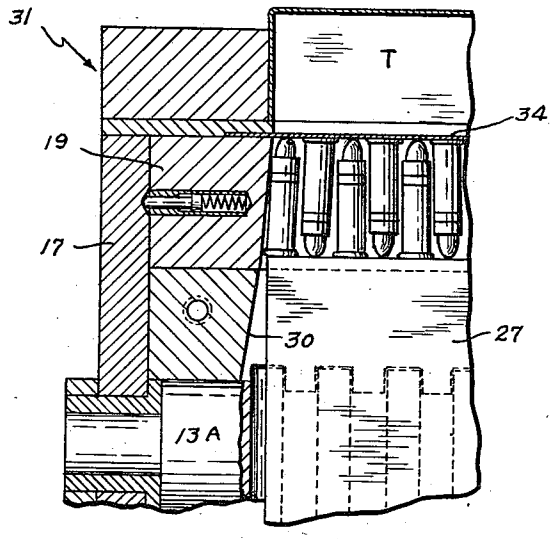


Fig. 6

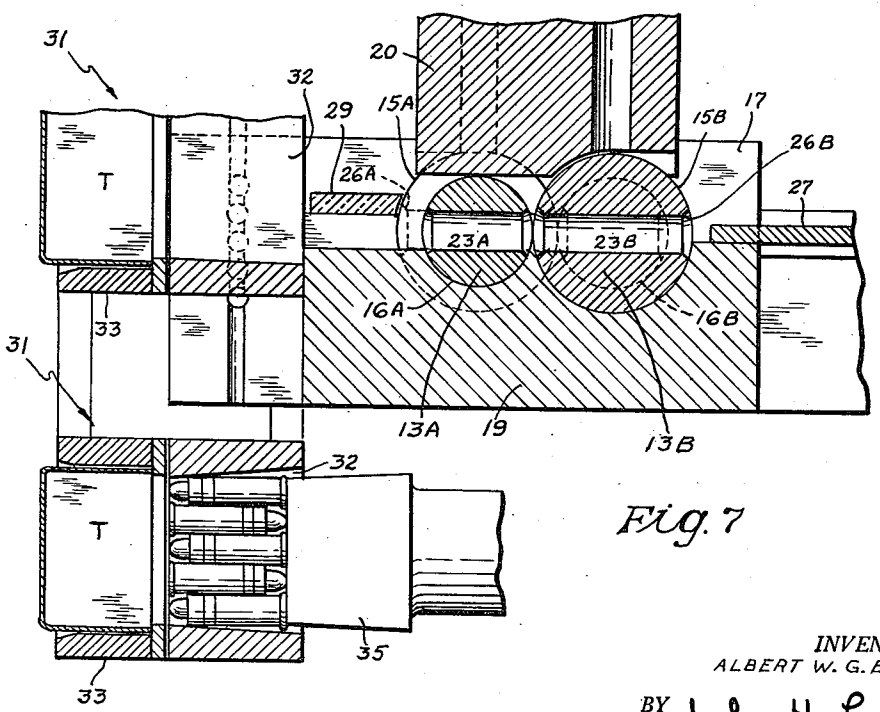


Fig. 7

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ARTICLE ARRANGING MECHANISM

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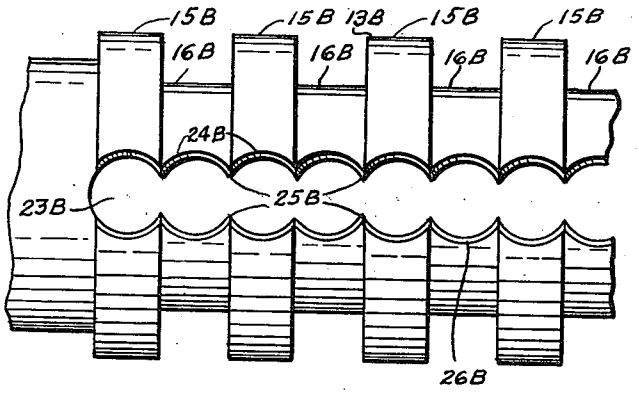


Fig. 8

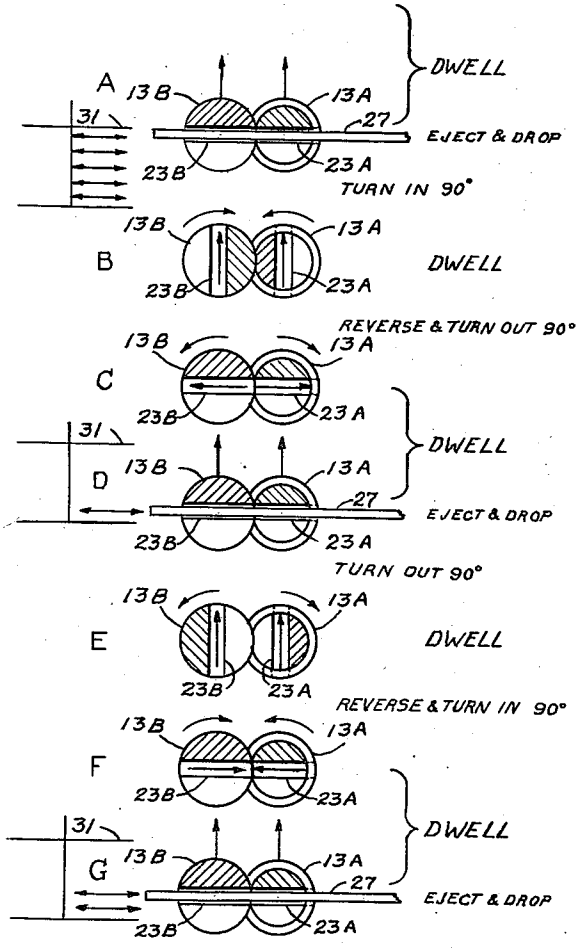


Fig. 9

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ARTICLE ARRANGING MECHANISM

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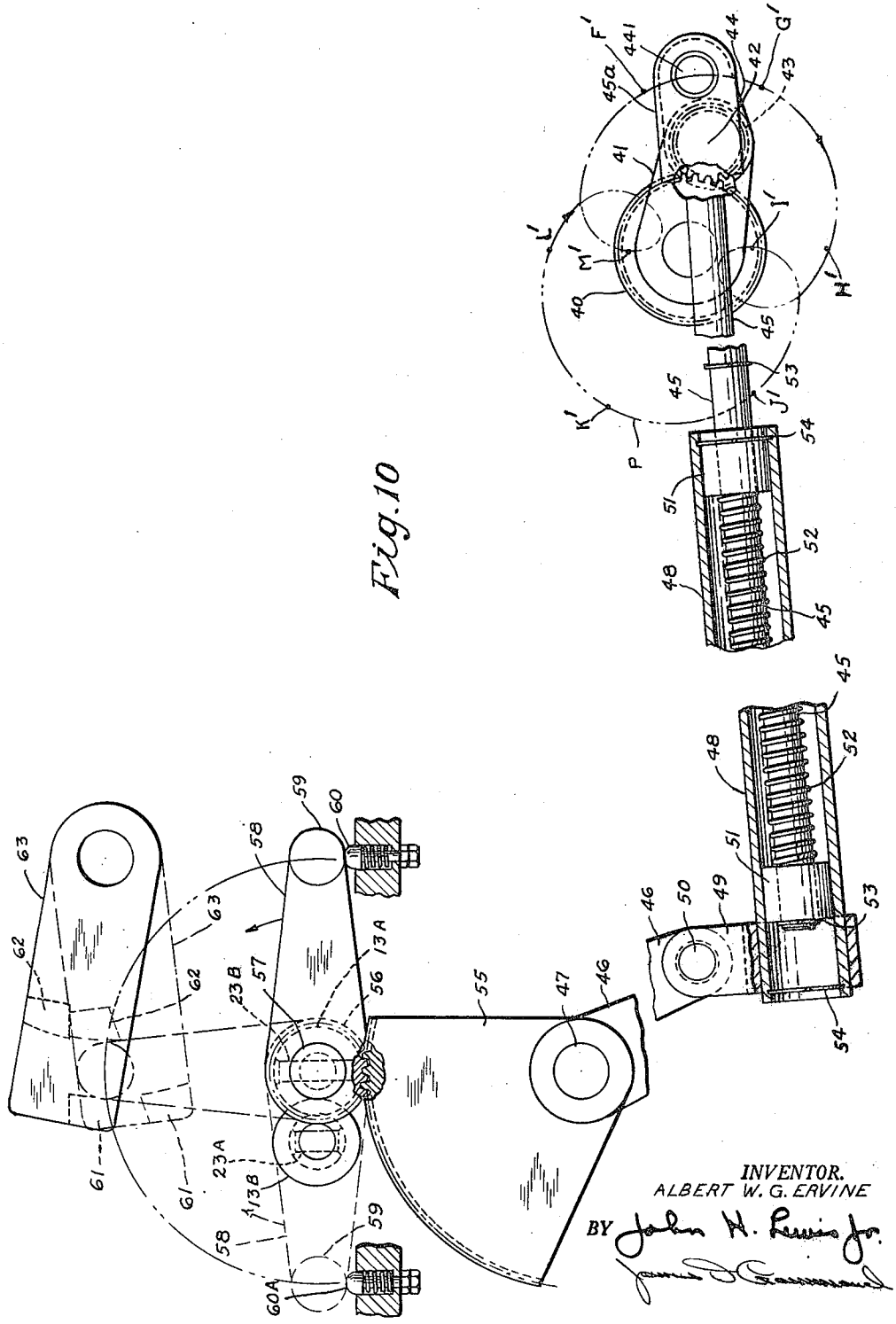


Fig. 10

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United States Patent Office

2,819,575

Patented Jan. 14, 1958

2,819,575

ARTICLE ARRANGING MECHANISM

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Application February 20, 1956, Serial No. 566,653

16 Claims. (Cl. 53—143)

This invention relates to the packaging of elongated longitudinally asymmetric articles and particularly to the orienting of such articles for packaging in side-by-side relation and in rows each of which presents a head-and-tail sequence.

The invention will be described with particular reference to the orienting and packaging of rimfire cartridges having the general configuration illustrated in the drawings. Such cartridges are ordinarily sold in packages of the tube and tray type, each tray containing a rectangular arrangement of 50 cartridges in five rows of ten cartridges each, or ten rows of five cartridges each, depending on the angle from which the loaded tray is viewed. It is essential that both the rows of five and the rows of ten be in head-and-tail sequence—that is, that the priming mixture containing rim of any cartridge be opposite the bullet of all adjacent cartridges.

According to the present invention, ten cartridges are arranged in a row in head-and-tail sequence and this row is moved into a receptacle which is then indexed to a position in which a second row can be superposed on the first row. In such second row, the position of the cartridge in a given location lengthwise of the row must be the reverse of the position of the cartridge in the corresponding location in the first row, in order to provide head-and-tail sequence crosswise of the package. Devices hitherto proposed for this purpose have been found ineffective for the reason, among others, that they were dependent upon moving one or more cartridges by a thrust transmitted by other cartridges. The configuration of the cartridge is such that this is always difficult. An attempt to move a row of cartridges by applying force to the end cartridge of such row results in displacement of the members out of the row due both to the curvature of the surface upon which one cartridge engages another and to the fact that diameters vary. For example, with rimmed cartridges rim diameter is considerably in excess of body diameter and greatly in excess of the bullet tip diameter. Difficulty is also encountered in thrusting a column of cartridges endwise, particularly when two ogival bullets engage each other.

The present invention contemplates apparatus in which each individual cartridge is directly engaged by thrust members which move it to a desired position, as distinguished from attempting to move either a column or a row by the engagement of a thrust member with the end of such column or row.

In the drawings:

Fig. 1 is a fragmentary vertical section of apparatus embodying one form of the present invention. One row of cartridges has been delivered to the tray holder and the cartridge ejector has been retracted after such delivery.

Fig. 2 is a fragmentary vertical section of a part of the mechanism shown in Fig. 1, showing the orienting rolls in one of the positions in which they receive cartridges from the feed tubes, as indicated in B or E of Fig. 9.

Fig. 3 is a fragmentary horizontal section substantially

on the line 3—3 of Fig. 1, showing the position of cartridges in the orienting rolls resulting from a 90° outward rotation of the orienting rolls, as indicated between B and C of Fig. 9.

Fig. 4 is a view substantially similar to Fig. 3, showing the position of the cartridges in the orienting rolls resulting from reverse rotation thereof, as indicated between E and F of Fig. 9.

Fig. 5 is a view similar to Figs. 3 and 4 but showing the ejector advanced to a position in which cartridges in the orienting roll adjacent the ejector have been moved into the second orienting roll. The cartridges are oriented as they are in Fig. 4.

Fig. 6 is a view similar to Figs. 3, 4, and 5, showing the ejector fully advanced, a complete row of cartridges in head-and-tail sequence having been transferred into the tray holder. The cartridges are oriented as they are in Fig. 3.

Fig. 7 is a vertical section showing a fully loaded tray holder.

Fig. 8 is a detached fragmentary elevation of one of the orienting rolls.

Fig. 9 is a diagram showing the succession of positions and movements of one of the orienting rolls.

Fig. 10 shows somewhat diagrammatically an inclined cycloidal drive for the orienting rolls.

The invention contemplates a multiple unit machine arranged for the simultaneous loading of a plurality—say, five trays. The units are identical and are powered from a common source—hence, a description of one unit will suffice. A rectangular 5 x 10 package will be described, but it will be understood that neither the number of the cartridges per row nor the number of rows are material. Cartridges are delivered to the orienting and packaging device fom any suitable conveyor containing an ordered arrangement, either bullet-down or head-down. Fig. 1 shows a fragment of a perforated conveyor belt 10 in which cartridges are held by a suitable support plate 11 terminating adjacent the mouths of a set of tubes 12 through which cartridges are dropped head-down to the orienter. Tubes 12 are arranged in two sets of five each, one set delivering cartridges to orienting roll 13A and the second set delivering to orienting roll 13B. A suitable escapement device indicated at 14 controls the delivery of cartridges in timed relation to the movement of the orienting rolls to be described.

The orienting rolls are substantially identical and the reference numerals applied thereto differ only by the addition of the letters A or B which denote the particular roll.

Each orienting roll is divided longitudinally into alternating large diameter sections 15A or 15B and small diameter sections 16A or 16B, and the orienting rolls are so spaced from each other that the large diameter sections of each roll enter and substantially fill the small diameter sections of the opposite roll. Both the large and small diameter sections of the rolls are wider than the largest diameter of the cartridges. The orienting rolls are supported for rotation in side plates, one of which is shown as 17, and between a base block 19 and a top block 20, which blocks are provided with alternating projections 21 and notches 22, the notches receiving the large diameter portions 15A or B of the respective orienting rolls. Each orienting roll is provided with a longitudinal diametral slot 23A and 23B, each such slot being formed by a series of intersecting parallel diametral holes so that the margin of each slot presents a series of arcs shown for orienting roll 13B in Fig. 8 as 24B, meeting in cusps 25B. Roll 13A has similar cusps 25A defined by arcs 24A. The diameter of each arc or semi-cylindrical surface is such as to enable the head of a cartridge to drop freely into

the recess formed by an opposed pair of such arcs, and the spacing of opposed cusps 25A or 25B is less than the body diameter of a cartridge. Thus, there are in each orienting roll a series of connected pockets, each adapted to receive a cartridge and retain it against lateral displacement. These pockets, however, communicate with each other, thus allowing the movement of the row of cartridges contained therein by a unitary ejector to be described.

Where rimless cartridges are to be handled, it is not necessary that the rolls have the interlocking large and small diameter sections, for the problem of interlocking the rims of rimmed cartridges is not present. For such an application the rolls may be plain cylinders in their outer form with the same internal formation of connected pockets.

This spacing of the cartridge receiving pockets corresponds with the spacing of the alternating large diameter and small diameter sections of each orienting roll, there being one such pocket within each large diameter section and communicating therewith intermediate pockets in each small diameter section. Each end of each pocket in a large diameter roll section is chamfered or enlarged, as shown at 26A and 26B, to facilitate the movement of cartridge heads therethrough. The ends of pockets 23A in the small diameter sections of roll 13A which receive cartridges from roll 13B are similarly chamfered. When the orienting rolls are in the position illustrated in Fig. 2, each pocket in each large diameter section of each roll stands directly below and communicates with one of the feed tubes 12, it being noted that the large diameter parts 15B of the one roll are opposite the small diameter parts 16A of the opposite roll and that cartridges are delivered from the tubes only to the pockets in the large diameter sections of each orienting roll.

The position of the orienting rolls illustrated in Fig. 2 (also B of Fig. 9) may be taken as the beginning of their cycle of movement. Slots 23A and 23B are vertically disposed and contain the arrangement of head-down cartridges above described. Suitable means are provided for synchronously (but not necessarily simultaneously) and reversely rotating the two orienting rolls outwardly through an arc of about 90 degrees to bring the slots 23A and 23B into horizontal position (Figs. 1 and 7 and C and D, Fig. 9), the cartridges in the two rolls respectively assuming the relationship shown in Fig. 3, in which cartridges in the respective rolls are oppositely faced and the cartridges in each roll stand opposite an empty pocket in the opposite roll. As the cartridges turn into this position they ride on the bottom of the surface defined in the base blocks 19 and if one roll is turned slightly ahead of the other as indicated in Fig. 2, the rims readily pass each other into the interlocking relationship shown in Fig. 3.

The means for forming the two sets of cartridges contained in orienting roll slots 23A and 23B respectively into a single row in alternating head-and-tail sequence and for removing such row as a unit preparatory to packaging may comprise an ejector plate 27 suitably mounted for rectilinear movement in the plane established by the orienting roll slots when in horizontal position. The initial advance movement of the ejector plate from its retracted position illustrated in Figs. 1, 2, 3, and 4 transfers the cartridges in the pockets of orienting roll slot 23B into the empty pockets in orienting roll slot 23A in the small diameter sections of orienting roll 13A, thus filling all of the pockets in this roll and establishing a row in head-and-tail sequence, as illustrated in Fig. 5. It should be noted, however, that the cartridges so transferred in Fig. 5 are those oriented by the reverse position of the rolls indicated in Fig. 4. Further advance of ejector 27 transfers the row thus established into a tray holder to be described. It will be noted that the pusher plate directly engages each individual cartridge of the row as distinguished from transmitting its thrust from one cartridge to another. Immediately in front of orienting roll 13A (which contains the completed row of cartridges) is a short passage defined by an upwardly facing surface 28 on base block 19, a cover plate 29, and side walls 30, which side walls converge outwardly from the orienting roll. In the roll the cartridges are slightly spaced from each other by the cusps 25A, and the convergence of the side walls 30 initiates their movement into contact with each other while support surface 28 and cover 29 prevent displacement out of line.

Adjacent the end of the passage defined by 19, 28, 29, and 30 is a tray holder identified generally by the numeral 31. The tray holder comprises a mouth portion 32 adapted to receive successive rows of cartridges ejected from the orienting rolls and communicating with a cell 33 adapted to receive and support the cartridge receiving package or tray T. The walls of the mouth 32 may converge toward the opening of cell 33 and the walls of said cell are preferably so spaced as to form a shoulder of a width substantially equal to the thickness of the material of the walls of tray T, to obviate the catching of the rims of cartridges against the margins of such walls. A movable partition 34 is interposed between adjacent parts of mouth 32 and cell 33 and affords a temporary stop for cartridges in said mouth as it is being filled by the delivery of successive layers of cartridges thereto. Suitable means (not shown since they form no part of the present invention) are provided for indexing the tray holder downward after the delivery of each row of cartridges thereto to enable the placement of one row upon another until the mouth has been completely filled, after which the tray holder is indexed to a position opposite a pusher 35 which is then advanced (Fig. 7) to transfer the complete set of cartridges accumulated in the mouth 32 into the tray in cell 33, completely filling such tray in a single movement. The fully advanced position of ejector 27 is shown in Fig. 6, it being noted that the orientation of the cartridges fully advanced thereby is that resulting from the rotation of the orientating rolls to the position shown in Fig. 3.

To provide for an alternating head-and-tail sequence transversely of the tray, as well as lengthwise of the tray, it is necessary to provide that in successive rows the orientation of each cartridge lengthwise of the row be the reverse of the orientation of the cartridge in the same lengthwise position in the preceding row. To accomplish this, the rotation of the orienting rolls, from cartridge receiving (Fig. 2) position to cartridge delivery (Figs. 1 and 7) position, in each of a succession of operations is made the reverse of the rotation of such rolls in the next preceding operation.

A desirable cycle of movements of either orienting roll is diagrammatically illustrated in Fig. 9. The cartridge-receiving slots 23A and 23B are represented by a pair of parallel lines superimposed on the circles designating the rolls, and the position of a cartridge nose is represented by the arrow points. From the position A the rolls are turned inwardly 90° to the vertical cartridge receiving position B where the rolls dwell while the cartridges fall into the slots. The rolls are then reversed and rotated outwardly 90° to the cartridge delivering positions C and D, where the rolls dwell again. The cartridges in the slots in the two rolls respectively are now arranged nose-outwardly as shown in Fig. 3, and ejector 27 is operated to empty the slots, and deliver the cartridges to the tray holder 31, all as above described. The rolls may then be rotated an additional 90° outwardly, bringing the slots to vertical position E, corresponding to position B except for 180° displacement, and during a dwell in this position additional cartridges are dropped from the feed tubes 12. The rolls are next reversed and rotated inwardly 90° to horizontal position F, and the cartridges in the respective slots are arranged points inwardly as shown in Fig. 4, in which the cartridge in any one pocket is oriented reversely of its orientation in the D position correspond-

ing to Fig. 3. The ejector 27 is again operated (position G), emptying the slots into the tray holder 31 which has been stepped down one cartridge diameter. The cycle thus completed has superposed a second row of cartridges upon a first row in the tray holder 31, each cartridge of such second row being reversely oriented with respect to the cartridge directly beneath it as well as with respect to adjacent cartridges in the same row. Position G, it will be noted, is identical with position A, and, as the cycle is repeated, a third row is superposed on the second row, and so on until the tray holder is full.

To obviate interference between the heads of cartridges in the rolls respectively as they are moved from Fig. 2 position to Fig. 3 position, one of the rolls, say 13A, is rotated somewhat ahead of roll 13B (as shown in broken lines in Fig. 2), so that the heads of cartridges in roll 13B follow and pass between the bodies of cartridges in roll 13A.

It will be noted that the cycle above described requires for each orienting roll a 90° rotation, a dwell, an additional 90° rotation in the same direction, a dwell, a reverse 90° rotation, a dwell, an additional 90° rotation, and a dwell. Any suitable source of power, and any appropriate arrangement of gearings, cams and levers, may be provided for this purpose; as well as for the movement of ejector, tray filling pusher and tray indexing. A preferred arrangement for moving each of the orienting rolls in the manner described is an inclined epicycloid somewhat diagrammatically illustrated in Fig. 10. The full line position shown in Fig. 10 corresponds to E in Fig. 9. Fixed gear 40 is concentric with a driven arm 41 having pivoted thereon at 42 the cycloidal gear 43 carrying crank 44 which is of greater length than the radius of cycloidal gear 43. The cycloidal gear has half the number of teeth of the fixed gear so that it makes two revolutions on its own axis in one passage around the fixed gear. Pivoted to cycloidal crank 44 at 441 is a block 45*a* having joined thereto a connecting rod 45 which actuates a crank 46 joined to an arbor 47.

A two-way spring device interposed between connecting rod 45 and crank 46 enables the connecting rod to move longitudinally as controlled by the cycloidal crank 44 when the movement of crank 46 is blocked to effect the aforementioned dwells in the movement of the driven orienting roll. Said spring connection is of conventional construction. It may comprise a housing 48 provided with a transverse extension 49 pivoted at 50 to crank 46, said housing receiving spaced piston-like heads 51 movably mounted on connecting rod 45 and urged apart by spring 52. Snap rings 53 limit the movement of members 51 relative to the connecting rod, and snap rings 54 limit their movement relative to housing 48.

Joined to arbor 47 is a gear segment 55 which drives a pinion 56 secured to an arbor 57 which carries one of the orienting rolls, say 13A. Since, as above described, the two rolls do not move exactly in unison, a separate similar drive is provided for roll 13B, and the following description is specific to roll 13A. A stop arm 58 secured to said arbor 57 is provided with a lateral projection 59 adapted to engage cushioning stop buttons 60 and 60A mounted in a fixed member, thereby locating the orienting roll in either of two cartridge receiving positions (B and E, Fig. 9), arm 58 being held against a stop 60 by compression of spring 52 while cycloid crank 44 continues to move. Projection 59, likewise, engages either of two lugs 61, 62 which project laterally from a stop lever 63, which is moved from its full line position (Fig. 10) to its broken line position in timed relation to the movement of cycloid arm 41, to hold the stop arm and orienting roll in its cartridge delivering position A, D, or G of Fig. 9, or Fig. 1, or 7, and release it after the desired dwell.

The path of the cycloidal crank pin 441 is shown as a long and short dash line P on Fig. 10, wherein said pin 441 is in its extreme rightward position, the stop arm 58 being engaged with right hand stop 60, and the orienting roll being in cartridge receiving position, E of Fig. 9. The spring 52 is somewhat compressed between the left hand piston member 51 and the right hand piston member 51 which is in engagement with right hand snap ring 54. As the crank pin 441 approached this position, stop arm 58 engaged the right button 60 at about the point F' and spring 52 began to be compressed. As the crank pin 441 advances from the position shown, compression in spring 52 is diminished to about the point G', from which point the stop arm 58 begins its counterclockwise movement. When the pin 441 reaches the point H' opposite the axis of fixed gear 40, orienting roll 13A has rotated inwardly 90° to cartridge delivering position, Figs. 1, 3, and 7, and F and G, Fig. 9. Stop arm 58 engages the lug 61 on stop lever 63, and spring 52 is compressed between the right hand piston 51 and the left hand piston 51 which is then in engagement with the left hand snap ring 54, while pin 441 travels the indicated path from H' to I', and in this interval ejector 27 is advanced and withdrawn. At about point H' stop lever 63 is rocked from the full line position to the broken line position withdrawing lug 61 from the path of movement of stop arm projection 59, permitting said stop arm 58 to complete its counterclockwise movement into contact with left stop button 60A. This takes place as the cycloidal crank pin 441 reaches the point J'. Stop arm 58 and orienting wheel 13A remain stationary in cartridge receiving position B, Fig. 9, until crank pin 441 reaches the point K. Thereafter, stop arm and orienting wheel are reversed and rotated outwardly 90° to cartridge delivering position, C and D, Fig. 9 (also Fig. 4), represented by the point L', which, like point I', is opposite the center of sun gear 40. Stop arm and orienting roll remain stationary until crank pin 441 reaches the point M', at which point stop lever 63 is restored to its full line position, permitting further clockwise rotation of the orienting roll and its stop arm 58 to the full line position, thus completing the cycle.

It will be obvious that the various mechanisms described are susceptible to a variety of modifications.

What is claimed is:

1. Apparatus for arranging longitudinally asymmetric articles side-by-side in a row in head-and-tail sequence comprising means for holding the articles to be arranged uniformally oriented and end-to-end in a series of columns, a pair of orienting rolls each comprising a diametral slot, means for delivering in article form each of alternate members of said series of columns to each of said slots, means for retaining articles in diametral positions in said slots, means for reversely rotating said orienting rolls to bring said slots into alignment, and unitary ejector means adapted to enter and pass through said slots and eject therefrom a row of articles in head-and-tail sequence.

2. Apparatus according to claim 1, in which said articles are of circular cross-section, said article holding means are tubes of circular cross-section, and the margins of said slots comprise series of arcs of a radius substantially equal to the maximum radius of said articles, each pair of oppositely displaced arcs of said margins respectively defining an article receiving pocket.

3. Apparatus according to claim 2, in which each of said orienting rolls comprises alternating longitudinal sections of maximum diameter and reduced diameter, the maximum diameter sections of each roll lying within the reduced diameter sections of the other roll.

4. Apparatus according to claim 3, in which alternate article holding tubes are in axial alignment with the enlarged diameter portions of said orienting rolls respectively, each tube being adapted to deliver an article into one of the article receiving pockets in the associated orienting roll.

5. Apparatus according to claim 4, in which opposed arc-joining cusps on said slot margins respectively are spaced by an amount less than the body diameter of the articles being oriented, whereby each of said articles is held against lateral movement.

6. Apparatus according to claim 5, comprising escapement means for controlling the delivery of articles from said tubes to said rolls.

7. Apparatus according to claim 6, comprising a tray holder, and means for supporting said tray holder in position to receive a row of articles ejected from said orienting rolls by said ejector.

8. Apparatus according to claim 7, in which said tray holder is indexed relative to said ejector to poistion said tray holder to receive successive rows of articles in superposed relation.

9. Apparatus according to claim 8, in which said tray holder comprises a mouth having converging walls and adapted to receive articles delivered by said ejector, a tray receiving cell in substantial alignment with said mouth, and a removable partition normally separating said cell and said mouth.

10. Apparatus according to claim 9, comprising a covered passageway between said mouth and the adjacent orienting roll through which a row of articles is pushed by said ejector, said passage having side walls which converge toward said mouth and being of a length not substantially greater than the length of the articles being packaged.

11. Apparatus according to claim 9, comprising a pusher having substantially the cross-sectional configuration of the tray mouth and adapted to move into the tray the set of articles accumulated in said mouth by successive operations of said ejector.

12. Apparatus for arranging workpieces in a plurality of superposed rows in head-and-tail sequence, comprising a roll provided with diametric workpiece receiving pockets, means for holding said roll in a first workpiece receiving position, means for rotating said roll to a workpiece delivering position and for holding said roll in said position, means for further rotating said rolls in the same direction to a second workpiece receiving position and for holding said rolls in said position, means for reversely rotating said rolls to said workpiece delivering position and holding said rolls in said position, and means for restoring said rolls to the first workpiece receiving position and holding said rolls in said position.

13. Apparatus according to claim 12, in which said roll rotating means comprises an epicyclic pinion and connections from said pinion to said roll.

14. Apparatus according to claim 13, in which said connections comprise a crank and crank pin secured to said epicyclic pinion, the radius of movement of said crank pin being greater than the radius of said pinion.

15. Apparatus according to claim 14, in which said connections comprise means to enable the stopping of said roll while said crank pin continues its movement.

16. Apparatus according to claim 15, comprising a stop arm secured to and moving with said roll and a movable stop lever comprising lugs adapted to be carried by the movement of said lever into and out of the path of movement of said stop arm.

References Cited in the file of this patent

UNITED STATES PATENTS

2,406,176	Vergobbi	Aug. 20, 1946
2,555,861	Reynolds et al.	June 5, 1951