Dec. 21, 1954 LE ROY D. BISHOP ET AL 2,697,528

APPARATUS FOR COUNTING TILES AND LIKE ARTICLES

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3 Sheets-Sheet 1

Fig. 1

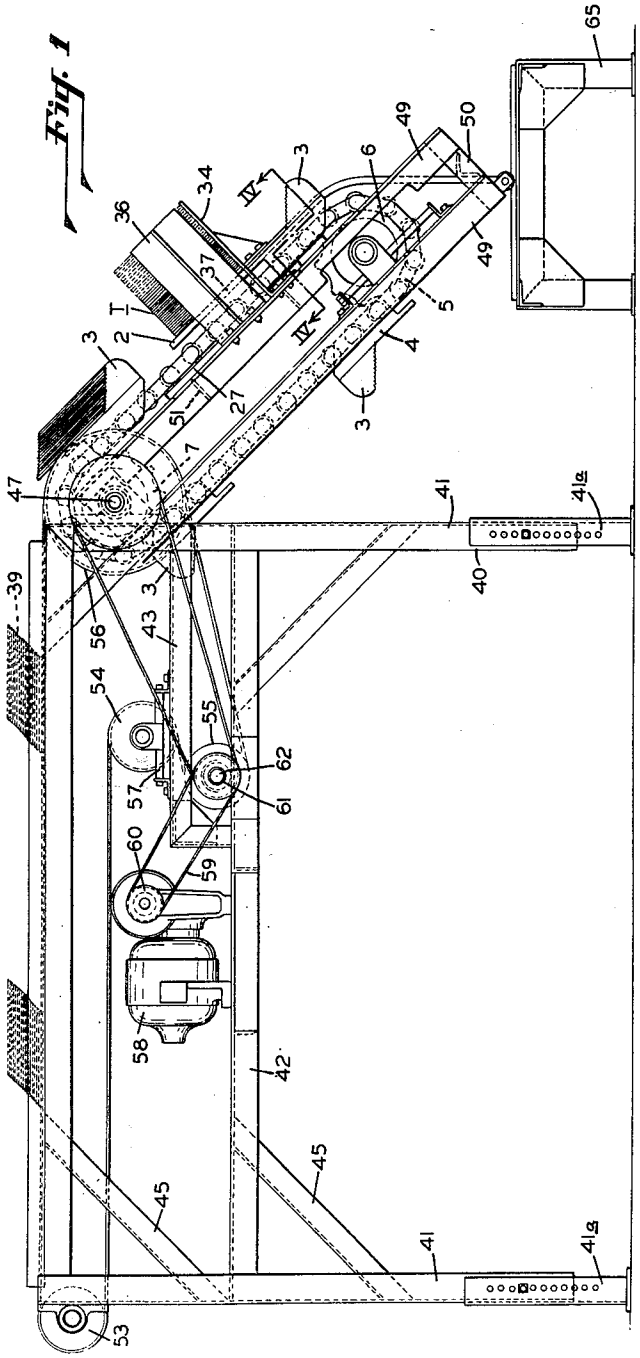
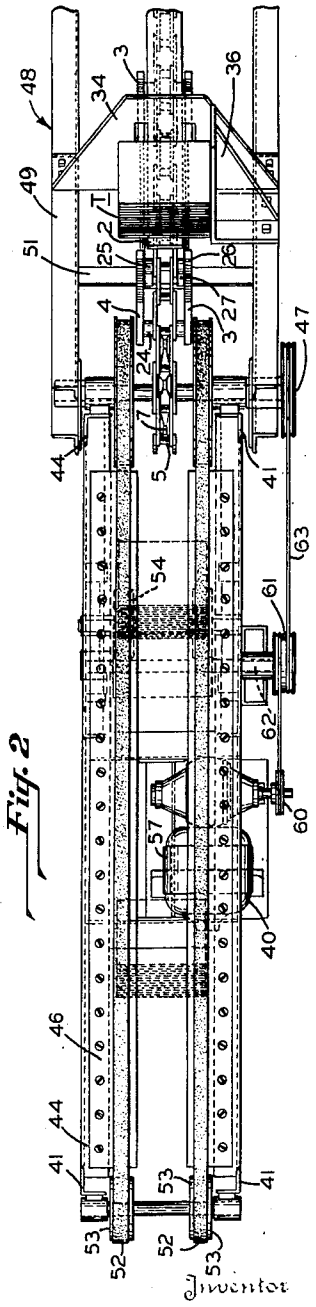


Fig. 2



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Filed Nov. 29, 1949 3 Sheets-Sheet 2

Fig. 3

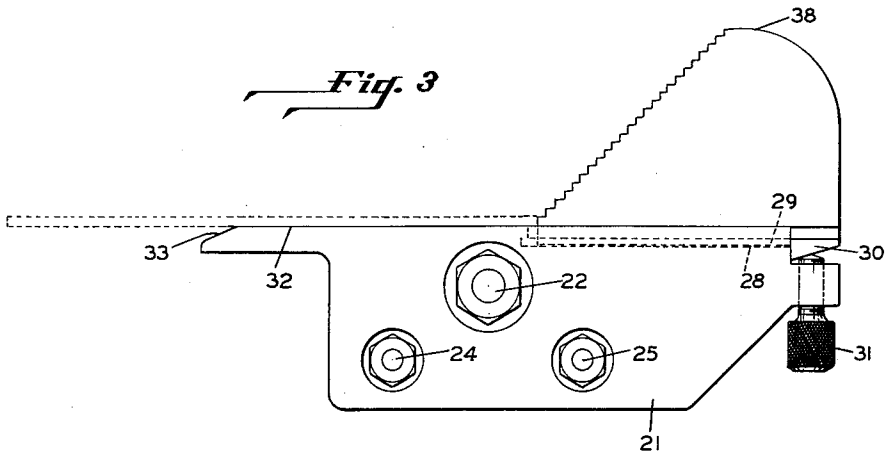


Fig. 4

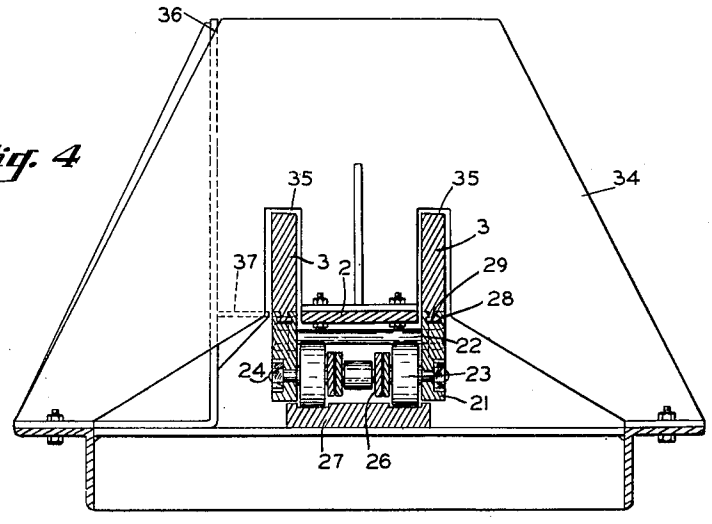
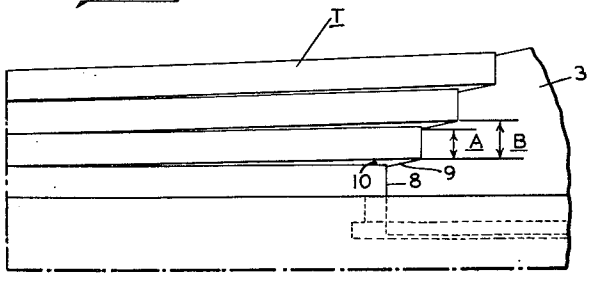


Fig. 5



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3 Sheets-Sheet 3

Fig. 6

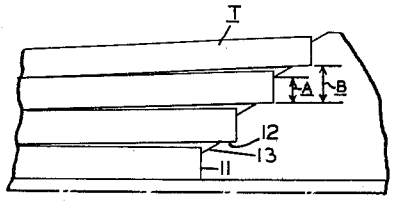


Fig. 7

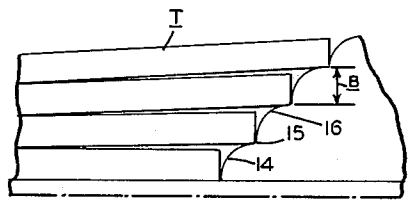


Fig. 8

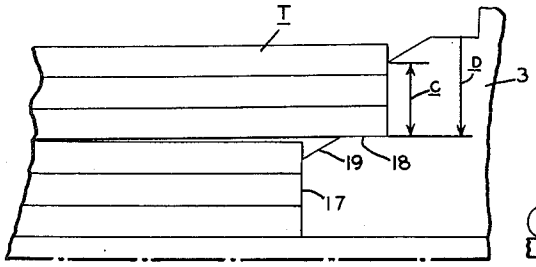


Fig. 9

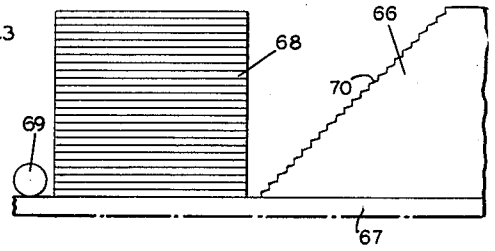
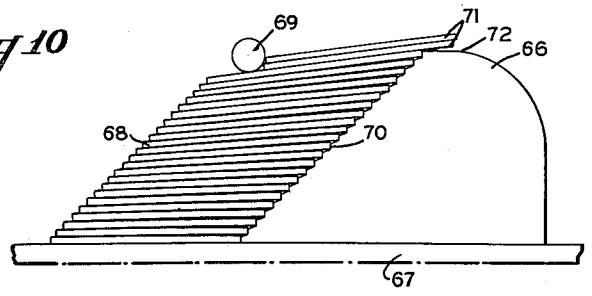


Fig 10



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APPARATUS FOR COUNTING TILES AND LIKE ARTICLES

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Application November 29, 1949, Serial No. 129,998

4 Claims. (Cl. 214—8.5)

This invention relates to an apparatus for counting tiles and like articles. The invention is particularly useful in counting flat platelike articles such as tiles which vary in thickness and cannot, therefore, be satisfactorily counted by weight or by measuring the height of a stack of the articles.

In the manufacture of tiles from asphalt compositions, synthetic resins, linoleum, and the like, the product is generally calendered into a sheet which is subsequently died out to the desired dimensions. It is not possible to maintain extremely accurate thickness dimensions in a calendering operation on a plastic mass; and as a consequence, the sheets vary in thickness to a considerable extent. In asphalt tile, for example, where the desired dimension is ⅛ inch or .125 inch, the sheet may vary in thickness from .115 to .140 inch, a total tolerance of 0.25 inch. Common practice has been to stack the tiles in the shipping carton until the carton is filled, but this has resulted in short count in instances where the tiles as a whole averaged above the minimum thickness; and, where the tiles averaged below the minimum thickness, the boxes contained more than a full count. Conventional counting devices which measure the height of a stack or depend for count upon the weight of a stack are unsatisfactory for the same reasons as the practice of filling the shipping carton to a desired level.

An object of our invention is to provide a tile or like article counting device which will accurately count the individual tiles regardless of allowable deviations in thickness of the tiles from a given standard.

Another object of the invention is to provide a counting device which will accurately count tiles or like articles in a stack and will deliver the counted articles as a stack for convenient handling in packaging the counted tiles.

Other objects of the invention will become obvious from a consideration of the following disclosure of a number of embodiments of the invention.

In the attached drawing:

Figure 1 is a side elevational view of a counting device of the present invention;

Figure 2 is a top plan view of the device of Figure 1;

Figure 3 is a detailed side view of one of the counting plates mounted upon a carriage side plate;

Figure 4 is a sectional view taken on the line IV—IV of Figure 1;

Figures 5, 6, 7, and 8 are detailed diagrammatic views to enlarged scale illustrating various types of counting plates; and

Figures 9 and 10 are diagrammatic views illustrating a modified method and apparatus for counting tiles.

Referring first to Figures 1 and 2 where there is shown an automatic device for counting tiles T disposed in a stack, the device includes essentially a support **2** for the stack of tiles T and a plurality of counting plates **3** mounted upon carriages **4** secured to a roller chain **5** trained about sprockets **6** and **7**.

The counting plates **3** are stepped and are preferably formed with a single step for each of the titles to be counted. Where ninety-six tiles are to be inserted into each carton, the plates may have twenty-four steps as shown in Figure 3. This provides a stack of convenient size for handling by a workman who will place the stacks in the shipping carton. The preferred style of counting plate is shown in Figure 5 to an enlarged scale. It includes risers **8** which constitute stops against which the articles to be counted may be abutted and inclined lands **9** which constitute article-separating or elevating surfaces

which extend from the top of one riser to the bottom of the next upper riser. In order to provide for the reception of a single tile in each of the steps of the counting plate, the risers are dimensioned so that each one is less in height (when disposed as shown in Figure 5) than the minimum thickness dimension of the articles being counted. For example, in counting ⅛ inch tile where the minimum thickness is in the order of .115 inch, the individual risers **8** will be .115 inch or less in height. This has been indicated as dimension A in Figure 5. This will insure that each tile T when in engagement with a riser **8** will have its upper surface **10** disposed above the top of the riser **8** which it engages and thus will permit the tile disposed thereabove and in engagement with the inclined surface **9** to slide into engagement with the next riser. The spacing from the bottom of one riser to the bottom of the next riser (when disposed as shown in Figure 5) is equal to or greater than the maximum thickness of the articles being counted. In the example of ⅛ inch tile with a plus .015" tolerance, the distance from the bottom of one riser to the bottom of the next will be .140 inch or more. This has been indicated as dimension B in Figure 5. This insures that each tile will rest in position against its riser **8** and extend from the bottom thereof to a point above the top but below the bottom of the next upper riser, and thus, regardless of the differences in thickness of the individual tiles within the limits provided for, each step will receive a separate tile and each tile may be separated slightly from adjacent tiles where they are supported by the steps, as shown in Figures 5 to 7.

The risers **8** and the lands **9** may take a number of different shapes, but it is preferred to have the risers disposed generally at right angles to the plane of movement of the counting plates as they engage the tiles and the lands **9** inclined from the top of one riser to the bottom of the next to provide an elevating and separating surface for lifting the individual tiles into position sequentially as the counting plates **3** move into engagement with the stack of tiles T on the support **2**. This style of counting plate is shown in Figures 1, 2, 3, 5, 9, and 10.

A modified style of counting plate is shown in Figure 6 where risers **11** are perpendicular to the plane of movement of the plate, and lands **12** are provided which are parallel to the plane of movement of the plate and at right angle to the risers **11**. The risers **11** and lands **12** are connected by inclined elevating and separating surfaces **13** forming part of the lands between adjacent pairs of risers. The relationship between dimensions A and B and the minimum and maximum allowable tile thickness dimensions is the same as in Figure 5.

Figure 7 illustrates a further modification in which the risers and lands are in the nature of arcuate steps **14** which provide stops **15** where the adjacent arcuate steps **14** intersect. In this structure the spacing between stops **15**, indicated as dimension B, is greater than the maximum thickness of the tiles T and, of course, the curved surfaces **16** constitute the elevating and separating surfaces connecting the various article stops **15**.

In some instances it may be found desirable to count the articles in multiples rather than singly, and in Figure 8 there is illustrated a counting plate **3** having risers **17**, lands **18**, and inclined elevating surfaces **19** connecting the risers and lands. The height of the risers **17**, measured as dimension C in Figure 8, will be determined by the minimum thickness of the multiple number of articles to be counted. In Figure 8 the device is designed for counting in multiples of three; and, assuming that ⅛ inch tiles are being counted having the minimum thickness of .115 inch, the risers **17** will be .345 inch high or less (when disposed as shown in Figure 8), but more than .230 inch, the minimum thickness of two tiles. The distance from the bottom of one riser to the bottom of the next riser, measured as distance D in Figure 8, will be greater than the maximum thickness of the multiple number of tiles to be received in each step. In a ⅛ inch tile counter where the tiles may be as much as .140 inch thick, the distance D will be equal to or greater than .420 inch. The multiple number of titles which can be counted in each step with accuracy will depend upon the thick-

ness of the tiles and the tolerance limits. Where the tolerance limits are .025 inch, as in the 1/8 inch tile example used in illustrating the invention, multiples up to four tiles may be counted in an individual step.

Any of the various styles of counting plates may be mounted in the carriages of the device shown in Figure 1.

The counting plates 3 are preferably provided in complementary pairs as shown in Figure 2 and each pair is mounted on a carriage 4 in such manner that the counting plates move in unison. They may be spaced laterally a few inches apart so as to engage the tiles an inch or two from the edges. The preferred carriage arrangement is shown in Figures 3 and 4. It includes a pair of side plates 21 joined by a shouldered spacer bar 22. These side plates 21 constitute the frame of the carriage 4 and are mounted on four wheels 23 carried by two axles 24 and 25, one of which may be seen in Figure 4. The axles 24 and 25 pass through links 26 of the chain 5 as shown in Figure 2. A trackway 27 is provided below the support 2 upon which the wheels 23 ride. The trackway 27 extends under the support 2 throughout a portion thereof as shown in Figures 1 and 2, and the wheels 23 ride on the trackway during the actual counting operation. The trackway maintains the counting plates on their respective carriages in fixed relationship with respect to the support 2 during counting.

Since in many installations the device will be used to count articles of different thicknesses on successive runs such, for example, as 1/8 inch tile on one run and 3/16 inch tile on another run, an arrangement is provided for facilitating the insertion and removal of the counting plates 3 from the side plates 21. In the embodiment shown in Figures 3 and 4, an inverted T-shaped slot 28 is provided in each of the side plates 21, and each of the counting plates 3 is provided with an inverted T-shaped projection 29 adapted to be received within slot 28. A wedge-shaped stop 30 is secured to each of the counting plates 3 and limits the inward movement of the plate with respect to the side plate 21 and serves also as a wedging surface against which a screw 31 which is threaded into the side plate 21 may be thrust to lock the plate 3 onto its side plate 21. This provides a very simple arrangement for inserting and locking the counting plates onto the carriage.

The pairs of side plates 21 have surfaces 32 projecting forwardly of the counting plates and they serve to support the counted stack of tiles as it is carried away from the support 2. It will be observed by reference to Figure 4 that the side plates 21 of the carriages 4 are positioned to move freely outside of the support 2. The surfaces 32 of the plates 21 decline as indicated at 33 to permit free entrance of the carriage under the stack of tiles T with a slight lifting of the stack off the support 2 as the surfaces 32 engage the lowermost tile in the stack.

The stack of tiles T is preferably disposed in an inclined position as shown in Figure 1, and the counting plates 3 are moved into engagement with the stack disposed in such inclined position. This facilitates the sliding of the tiles over one another as they are received within the steps of the counting plates. In order to properly support the stack T in inclined position, an end plate 34 (Figure 4) is provided having two slots 35 in it and through which the counting plates 3 may pass. An adjustable side plate 36 is provided having a flat supporting shelf 37, the upper surface of which is parallel with and in the plane of the top of the support 2. The tiles T are positioned on the support 2 and the shelf 37 with one of their edges resting against the end plate 34 and another edge in engagement with the inside surface of the side plate 36 as shown in Figure 1. The stack of tiles T always contains a greater number of tiles than the number counted by each counting plate. A workman maintains a constant supply of tiles in the stack.

As the carriages bring the counting plates into engagement with the stack, the lowermost tile in the stack abuts against the lowermost riser 8 as shown in Figure 5, for example, and that tile is driven forwardly with respect to the tiles in the stack. The next tile in the stack engages the surface 9 and is elevated until it comes into engagement with the riser 8 above the inclined elevating surface 9 and the operation is repeated throughout the extent of the stepped counting plate, one counted tile being received in each step. The upper end 38 of each of the counting plates 3 is rounded as indicated in Figure 3; and when one tile has been received in each of the steps, the plates slide under the tiles thereabove in the stack. Those tiles remaining in the stack fall by gravity as the carriage moves forwardly, the tiles coming to rest upon the support 2 for engagement by the next carriage and its counting plates. The workman continues to maintain a constant supply of tiles in the stack.

In the preferred automatic device, an arrangement is provided for conveying the counted stacks 39 to a position where workmen may package them in shipping cartons. In the embodiment of Figure 1, there is a framework 40 which includes four angle iron legs 41, a shelf 42, a platform 43, a table 44, and appropriate cross bracing 45. The table 44 is provided with conveyor belt supporting guides 46. The counting plate carriage conveyor mechanism is pivoted to the frame 40 about a pivot shaft 47, the carriage conveyor framework 48 including upper and lower angle iron members 49, connecting plates 50 and cross supports 51.

A pair of conveyor belts 52 is provided and each of the belts extends along the top of the table 44, one on each side thereof (Figure 1). The conveyors 52 are trained over pairs of pulleys 53, 54, 55, and 56, pulley 54 being mounted for adjustment on slides 57 to apply proper tension to the conveyor belts 52. A geared head motor 58 is provided for driving the conveyor belts 52 through belt 59 trained over pulley 60 on the geared head motor and a pulley 61 fixed to a shaft 62 which carries pulleys 55 over which the conveyor belts 52 are trained. This motor 58 also serves to drive the sprocket 7 of the counter plate carriage conveyor through a belt 63, pulley 64, and a pulley 64 attached to the pivot shaft 47 to which sprocket 7 is also affixed. The motor may be geared to drive the sprocket 7 to provide for movement of the counting plate carriages at a linear speed of fifty-eight feet per minute and to drive the conveyor belts 52 at a speed of about one hundred sixteen feet per minute. Instead of a belt and pulley driving arrangement, a chain and sprocket drive may be provided.

Where tiles of different character are to be counted, it may sometimes be found desirable to change the angle of repose of the tiles. In the embodiment illustrated in Figure 1, this may be accomplished by providing adjustable supporting leg extensions 41*a* for the framework 40 which permit the framework to be raised and lowered and the counting plate carriage mechanism to be pivoted. A suppoting framework 65 for the lower end of the counting plate conveyor mechanism is provided. When the framework 40 is raised, the counting plate conveyor mechanism may be pivoted and its end lowered to change the angle of repose of the tiles T in the stack on the support 2. By changing the angle of repose, the distribution of the weight of the stack on the support 2 and the rear plate 34 may be altered, and the resistance to movement of the tiles in the stack upon engagement with the counting plate 3 may be varied for best results.

The method of the invention also may be practiced by hand. In a hand-counting arrangement a single counting plate may be employed and brought into engagement with a stack of tiles or other articles to be counted. Relative movement between the stack and the counting plate is effected to bring the tiles into engagement with the counting plate to dispose one tile in each of the steps of the plate. A type of hand-operated arrangement is shown in Figures 9 and 10 wherein a counting plate 66 is secured to a table 67, and a stack of tiles 68 is disposed on the table. A hand-operated roller 69 is employed to move the stack of tiles 68 into engagement with the counting plate 66, disposing one tile in each of the steps 70 of the plate 66. Those tiles 71 in excess of the desired number are slid over the top 72 of the counting plate 66 and are removed from the stack.

Where reference is made to articles to be counted, we intend to include single articles as shown in Figure 5, for example, and groups of articles as shown in Figure 8, for example.

We claim:

1. In a device for counting tiles and like articles which vary in thickness between maximum and minimum dimensions, a stepped plate having a plurality of substantially vertically disposed risers spaced apart in a vertical direction a distance measured from the bottom of one riser to the bottom of the next adjacent riser which is greater than the maximum thickness of the articles to be count-

ed, said risers each being of less height in a vertical direction than the minimum thickness of the articles to be counted, and a plurality of lands connecting said risers, a portion at least of each land being disposed as an inclined plane leading from the top of a riser and constituting an article-separating surface, along which article-separating surfaces said articles slide and thereby are separated and elevated into position in engagement with said vertically spaced risers.

2. In a device for counting tiles and like articles which vary in thickness between maximum and minimum dimensions, a stepped plate having a plurality of substantially vertically disposed risers spaced apart in a vertical direction a distance measured from the bottom of one riser to the bottom of the next adjacent riser which is greater than the maximum thickness of the articles to be counted, said risers each being of less height in a vertical direction than the minimum thickness of the articles to be counted, and a plurality of article-separating surfaces each disposed as an inclined plane and each leading from the top of one riser to the bottom of the next adjacent riser and along which said articles slide and thereby are separated and elevated into position in engagement with said vertically spaced risers.

3. In a device for counting tiles and like articles which vary in thickness between maximum and minimum dimensions, a stepped plate having a plurality of substantially vertically disposed risers spaced apart in a vertical direction a distance measured from the bottom of one riser to the bottom of the next adjacent riser which is greater than the maximum thickness of the articles to be counted, said risers each being of less height in a vertical direction than the minimum thickness of the articles to be counted, and a plurality of lands connecting adjacent pairs of risers, each land including an article-supporting surface disposed substantially at right angles to an adjacent riser and an article-separating surface disposed as an inclined plane leading from the top of another adjacent riser to said article-supporting surface

and along which article-separating surfaces said articles slide and thereby are separated and elevated into position in engagement with said article-supporting surfaces of said lands and said vertically spaced risers.

4. In a device for counting tiles and like articles in groups, which articles vary in thickness between maximum and minimum dimensions, a stepped plate having a plurality of substantially vertically disposed risers spaced apart in a vertical direction a distance measured from the bottom of one riser to the bottom of the next adjacent riser which is greater than the maximum thickness of a group of the articles to be counted, said risers each being of less height in a vertical direction than the minimum thickness of said group of articles to be counted, and a plurality of lands connecting said risers, a portion at least of each land being disposed as an inclined plane leading from the top of a riser and constituting an article-separating surface, along which article-separating surfaces said groups of articles slide and thereby are separated and elevated into position in engagement with said vertically spaced risers.

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