E. H. EHRMAN.

SORTING MACHINE.

APPLICATION FILED APR. 4, 1921.

1,411,169.

Patented Mar. 28, 1922.

3 SHEETS—SHEET 1.

Fig. 1.

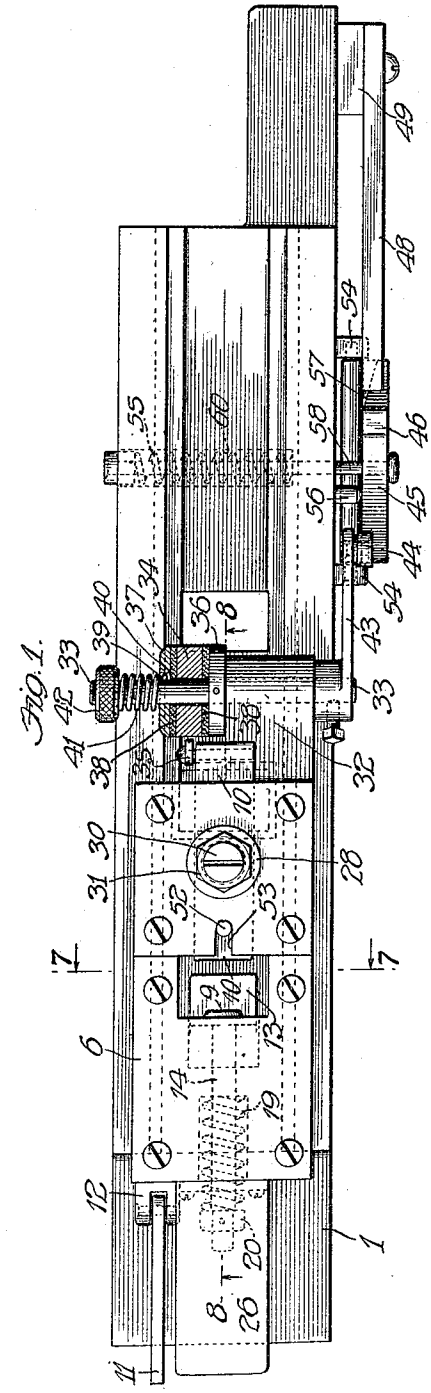
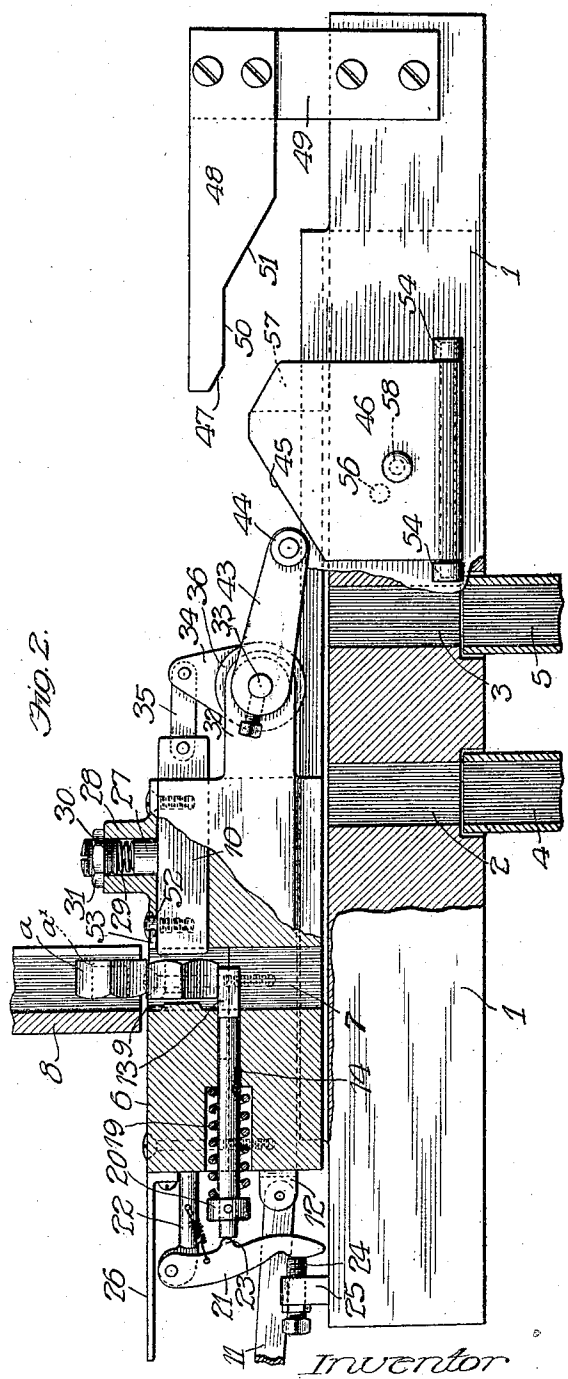


Fig. 2.



Witness

Martin H. Olsen

Inventor

Edwin H. Ehrman

By Wm. E. Waldo Atty.

E. H. EHRMAN.

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3 SHEETS—SHEET 2.

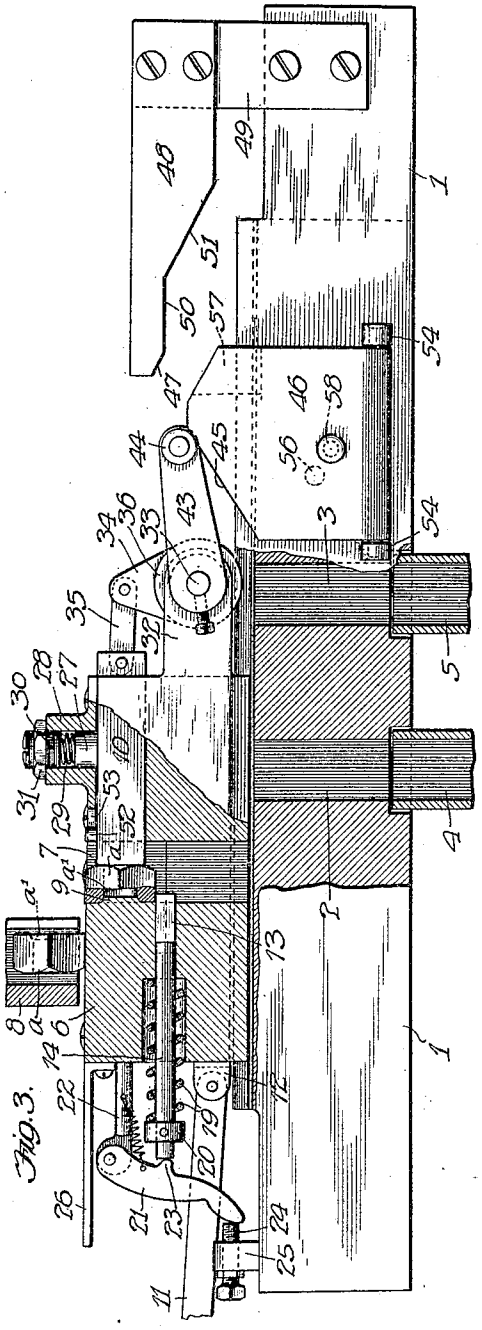


Fig. 3.

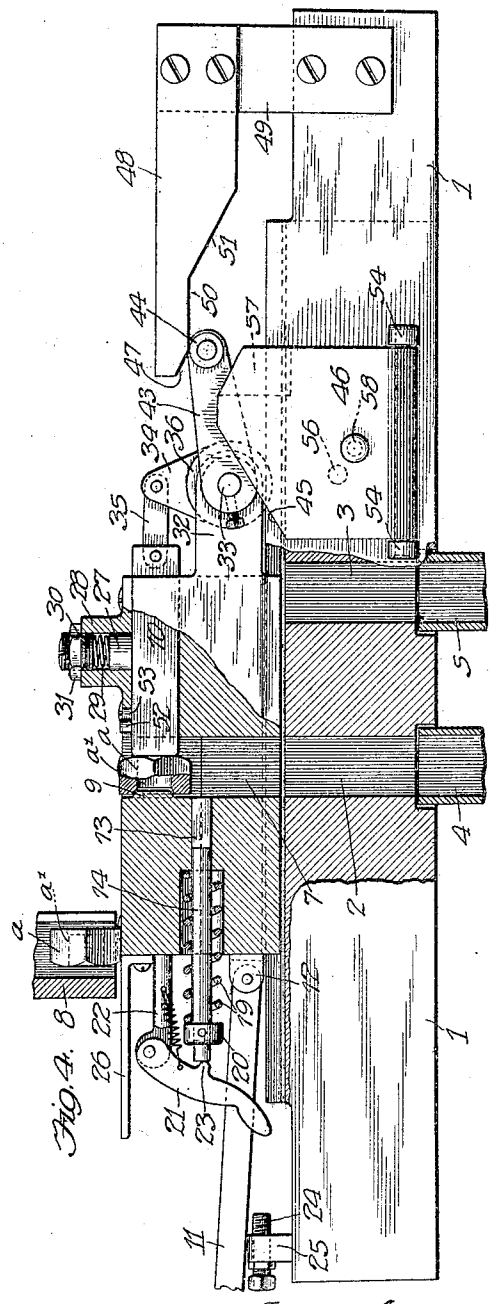


Fig. 4.

Witness
Martin H. Olsen.

Inventor
Edwin H. Ehrman
By Chas. E. Waldo.
Atty

E. H. EHRMAN.

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3 SHEETS—SHEET 3.

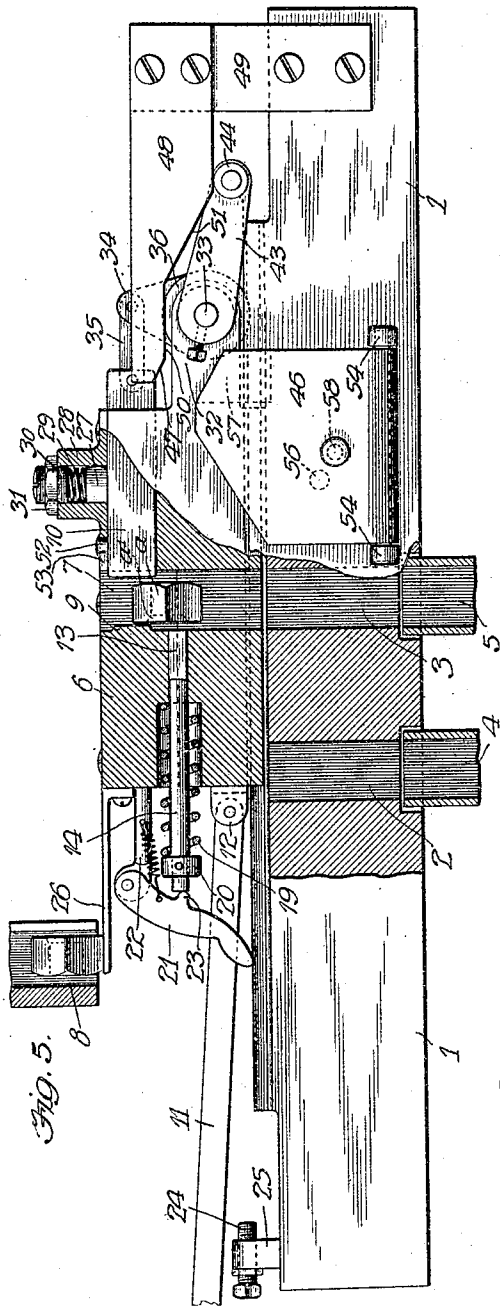


Fig. 5.

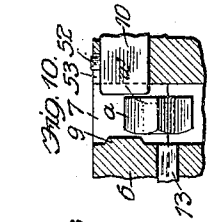


Fig. 10.

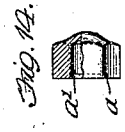


Fig. 14.

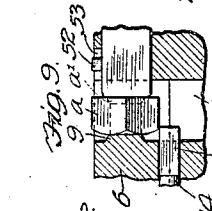


Fig. 9.



Fig. 13.

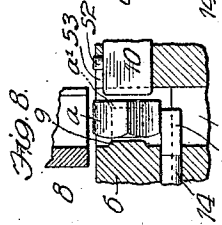


Fig. 8.

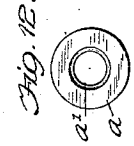


Fig. 12.

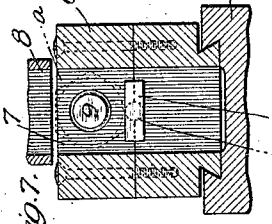


Fig. 7.



Fig. 11.

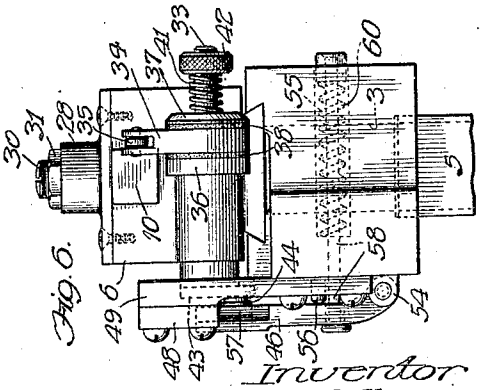


Fig. 6.

Witness
Martin H. Olsen

Inventor
Edwin H. Ehrman
By Wm. E. Waldo
Atty

UNITED STATES PATENT OFFICE.

EDWIN H. EHRMAN, OF OAK PARK, ILLINOIS, ASSIGNOR TO STANDARD SCREW COMPANY, OF HARTFORD, CONNECTICUT, A CORPORATION OF NEW JERSEY.

SORTING MACHINE.

1,411,169. Specification of Letters Patent. Patented Mar. 28, 1922.

Application filed April 4, 1921. Serial No. 458,417.

To all whom it may concern:

Be it known that I, EDWIN H. EHRMAN, a citizen of the United States, and a resident of Oak Park, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Sorting Machines, of which the following is a specification.

This invention relates to sorting machines.

The object of the invention is to provide a sorting machine for sorting articles of substantially similar shape and size provided with openings in their corresponding sides, which may extend either entirely or partway through said articles.

To effect the foregoing object, a machine of my invention comprises the various features, combinations of features, and details of construction hereinafter described and claimed.

In the accompanying drawings, in which my invention is fully illustrated,

Figure 1 is a top plan view, partly in section, of a sorting machine embodying my invention.

Figures 2, 3, 4 and 5, are substantially similar views of a machine of my invention, partly in side elevation and partly in longitudinal, vertical section, illustrating, step by step, the operation of the machine when the articles in the machine face in one direction.

Figure 6 is an end view of the machine from the right hand of Fig. 1.

Figure 7 is a fragmentary, sectional view taken substantially on the line 7—7 of Fig. 1.

Figures 8, 9 and 10 are fragmentary views, partly in elevation and partly in section, on the line 8—8 of Fig. 1, with the various operative parts shown in substantially the same positions as in Figures 2, 3 and 5, respectively, illustrating the operation of the machine when the articles in the machine face oppositely to those shown in Figs. 3 to 5; and

Figures 11, 12, 13 and 14 illustrate a number of different articles such as my improved machine may readily be adapted for sorting, Fig. 12 being an end view of the article shown in Fig. 13.

A use or application of my improved machine which is particularly contemplated, is for delivering nut-blanks from a supply magazine or hopper to a tapping machine; and for purposes of concrete and definite illustrations I have, in the drawings, shown my improved sorting machine as applied in use for this purpose, said blanks being designated *a* and being provided with holes extending entirely through the same, which for reasons presently apparent, are countersunk at one end, as shown at *a'*.

Referring now to the drawing, 1 designates the base portion of the machine upon which the operative parts thereof are mounted, said base being provided with passageways 2 and 3, the lower ends of which are in open communication with the upper ends of tubes or chutes 4 and 5 adapted for delivering nut-blanks or other articles to a tapping machine, not shown, said chutes 4 and 5 being so arranged that they will deliver said blanks to said machine in operative positions, with corresponding sides thereof faced in the same direction.

Mounted on the base 1, so as to be movable end-wise thereon, is a slide 6 formed in which is a passageway 7, which is adapted to be brought successively into register with the lower end of the discharge chute 8 of a magazine or hopper adapted for containing the nut-blanks to be sorted, and with the upper ends of the passageways 2 and 3 in the base 1.

The sorting devices are mounted on the slide 6, and comprise a projection 9 formed on one side of the passageway 7 in said slide and what may be designated a clamping member 10, mounted in a suitable bearing in the slide 6 and movable end-wise therein towards and from the projection 9.

Reciprocating movement is adapted to be imparted to the slide 6 by means of suitable connection with a source of power, not shown, said connection consisting, as shown, of a pittman 11, one end of which is pivoted to a lug 12 on said slide and the opposite end of which is connected to the crank pin of said power unit, and end-wise movement is adapted to be imparted to the clamping member 10 towards and from the projection 9 by suitable means, rendered operative by reciprocating movement of the slide 6, in the manner presently described.

The passageway 7 is controlled by a gate 13 fitted to a bearing formed in the slide 6 below the projection 9 and the clamping member 10, in such position relative thereto that when said gate is advanced so as to

project into said passageway, the hole a' in a nut-blank a supported on said gate, will be in line with the projection 9 and clamping member 10, and the top of said nut-blank will project slightly above the top of the slide 6.

As shown, the gate 13 is supported by a stem 14 formed thereon, which is fitted to a bearing formed lengthwise in the slide 6 so as to be movable endwise therein, and which extends from the rear end of said slide to the passageway 7.

Said gate 13 is maintained normally retracted out of the passageway 7 by means of a spring 19 inserted between the inner end of an enlargement of the bearing for the gate stem 14 and a collar 20 pinned or otherwise secured to the rear end of said stem, and movement is adapted to be imparted to said gate to cause it to project into the passageway 7 in position to intercept and hold a nut-blank deposited into said passageway from the supply chute 8 as the slide 6 approaches the limit of its movement rearward, by a lever 21 pivoted to a rod 22, which projects rearwardly from the slide 6, a lug on which is adapted to bear against the rear end of the gate stem 14.

Shortly before the slide 6 reaches its extreme rearward position, the lower end of the lever 21 is adapted to contact with a stop on the base 1, the relation being such that continued movement of the slide 6 to its extreme position will impart pivotal movement to the lever 21 sufficient to impart endwise movement to the gate stem 14, against the force of the spring 19, to advance the gate 13 into the passageway 7, in the manner described.

In order to provide for adjusting the pivotal movement of the lever 21 and thus the movement on the gate 13, the stop on the base with which the lower end of said lever is adapted to contact, consists of a screw 24 threaded through a lug 25 formed on said base 1.

With the construction shown, the lower end of the supply chute 8 is closed by the top side of the slide 6, which is extended rearwardly by means of a bracket 26 secured to the rear end thereof, the relation being such that, excepting when the passageway 7 is in register with the supply chute 8, the lower end of said supply chute will be closed in all positions of the slide 6 by the top side thereof or by said bracket 26.

Applied to the clamping member 10 is a friction device adapted to prevent endwise movement thereof, excepting by means especially provided for the purpose.

As shown, said friction device consists of a block 27, which is confined in a hole formed in a boss 28 on the slide 6, said block being maintained in frictional engagement with the said clamping member by a spring 29 inserted between the block 27 and the end of a screw 30 threaded into the outer end of the hole in the boss 28 in which the block is confined. Said screw 30 affords convenient means for adjusting the tension of the spring 29 to vary the friction of the block 27 on the clamping member 10, and said screw is adapted to be secured in any desired adjusted position by means of a lock-nut 31.

Endwise movement is adapted to be imparted to the clamping member 10 against the resistance of the brake block 27, in the following manner:

Rotatably mounted in a bearing formed in a projection 32 on the front end of the slide 6 is a crank-shaft 33 secured to which is a crank 34, which is connected with the clamping member 10 by a link 35.

In order that the movement of the clamping member 10 may automatically adjust itself to varying conditions of operation, the crank 34 is connected to the crank-shaft 33 by frictional means. As shown, said connection consists of collars 36 and 37 on the crank-shaft 33, interposed between which, respectively, and the faces of the hub of the crank 34, are washers 38 made of fiber or other suitable material. The collar 36 is pinned to the shaft 33 and the collar 37 is secured to said shaft by means of a pin 39 secured in said shaft and which projects into a slot or keyway 40 formed in said collar 37.

A spring 41 inserted between the outer side of the collar 37 and a nut 42 threaded to the end of the crank-shaft 33, will exert a pressure on the collar 37 which will operate, in an obvious manner, to secure the crank 34 to the crank-shaft 33 with a frictional engagement, the strength of said spring being so proportioned that the frictional engagement between said crank-shaft and crank will be sufficient to overcome the frictional resistance of the brake block 27 to endwise movement of the clamping member 10.

In the preferable construction shown, the means for imparting endwise movement to the clamping member 10 in opposite directions is as follows;—

Secured to the crank-shaft 33 is a crank-arm 43, mounted at the end of which is an anti-friction roller 44, which, as the slide 6 advances, is adapted to engage a cam surface 45 on the upper edge of a plate 46, the relation being such, that engagement of said anti-friction roller with said cam surface 45 will operate to turn the crank-shaft 33 in a direction to move the clamping member 10 towards the gauge or projection 9. Endwise movement of said clamping member 10 by the crank 34 on the crank-shaft 33 will con-

tinue until the advancing end of said clamping member contacts with a nut-blank supported on the gate 13 in the passageway 7, or until the roller 44 passes out of engagement with the cam surface 45. When from any cause, movement of the clamping member 10 is arrested—as when the end of the clamping member 10 comes into contact with a nut-blank *a* supported in the passageway 7—further rotation of the crank-shaft 33 by the crank-arm 43 will cause said crank-arm to turn relatively to the crank 34, such relative turning movement being provided for by the frictional connection of said crank to said crank-shaft. The positions of different operative parts with the clamping member 10 in position to engage a nut-blank *a* supported in the passageway 7, is shown in Figs. 2 to 4 inclusive, and Figs. 9 and 10. Figs. 2 to 4 show the nut-blank faced so that the counterbore or enlargement *a'* of the hole therein will engage the projection 9, and Figs. 9 and 10 show said nut-blank faced in the opposite direction.

As the slide 6 continues to advance the anti-friction roller 44 on the crank-arm 43 will pass out of engagement with the cam surface 45 and, when the passageway 7 in said slide is in register with the passageway 2 in the base 1, will come into contact with a cam surface 47 formed on an arm 48 of a bracket 49 secured to the base 1 of the machine. Said cam surface 47 is downwardly inclined and is adapted to depress the crank-arm 44 as the anti-friction roller 43 moves down the same, thus turning the crank-shaft 33 in a direction to retract the clamping member from contact with a nut-blank *a*, said cam surface being so proportioned that it will retract said clamping member a distance less than the height of the projection 9, thus releasing a nut-blank faced as in Figs. 9 and 10, but still maintaining the projection 9 in engagement with the hole *a'* in said nut-blank, when faced as shown in Figs. 3 and 4. Partial retraction of said clamping member with the release or otherwise of the nut-blank—depending upon the direction in which said blank is faced—is shown in Figs. 4 and 10.

After the anti-friction roller 44 passes out of engagement with the cam section 47, it traverses a neutral section 50 extending parallel with the line of travel of the slide 6. Just before the passageway 7 in said slide comes into register with the passageway 3 in the base 1, said anti-friction roller 44 engages a downwardly inclined cam section 51 on the bracket arm 48 which will operate in the same manner as the cam section 47, to further retract the clamping member 10, the relation being such that when said passageway 7 is in full register with the passageway 5, said clamping member will be retracted sufficiently to release a nut-blank faced so that the hole enlargement *a'* therein will engage the gauge 9, thus releasing said nut blank and permitting it to fall into the passageway 3 in the base 1. Also, the cam section 51 is made of such length that, when the slide 6 reaches the forward limit of its movement, the crank-arm 43 will be in its initial position, shown in Fig. 2—in which the clamping member 10 will be fully retracted.

Full retraction of the clamping member 10 is defined by a suitable stop, consisting, as shown, of a pin 52 secured in said clamping member, which is adapted to engage a rigid part of the slide 6 when said clamping member is fully retracted. As shown, said pin engages a slot 53 formed in the slide 6 and retraction of said clamping member is limited by contact of the pin 52 with the inner end of said slot.

In order that the anti-friction roller 44 may pass the cam plate 46 on the return stroke of the slide 6 to its initial position, shown in Fig. 2, without disturbing the adjustment or pivotal position of the crank-arm 43 and thus of the clamping member 10, the cam plate 46 is pivoted at its lower edge to lugs 54 on the base 1 and is maintained normally in operative position by a spring 55, applied thereto, adapted to hold said plate yieldingly in contact with a stop pin 56 secured in the base 1, and formed at the front edge of said cam plate and on the side thereof adjacent to the crank-arm 43, is a cam surface 57. Said cam surface is positioned in the path of travel of the anti-friction roller 44, as the slide 6 is retracted, the relation being such that engagement of said anti-friction roller with said cam surface, will operate to turn the cam-plate pivotally against the force of the spring applied thereto, out of the path of said anti-friction roller.

As shown, the spring 55 is a coiled spring and is applied to the cam-plate 46 in the following manner:—Extending through holes formed in said plate and in the base 1 is a rod 58, a head on which bears against the outer side of said cam-plate, said spring being inserted between the bottom of an enlargement 60 of the hole in the base and a head secured to the end of said rod 58 remote from said cam-plate. To prevent binding of the rod 58 as said cam-plate is turned pivotally against the force of the spring 55, the hole in said plate through which said rod extends is made slightly larger than said rod.

Beginning with the slide 6 in its initial position, shown in Figs. 1 and 2, in which the gate 13 has been fully advanced into the passageway 7 by pivotal movement of the lever 21 produced by contact of the lower end of said lever with the stop screw 24; the passageway 7 is in register with the supply chute 8; the clamping member 10 is in fully

retracted position so as not to obstruct said passageway 7; and the crank-arm 43 is in position corresponding to full retraction of said clamping member, the operation of my improved sorting machine is as follows, the description relating in the first instance to a nut-blank faced with the hole enlargement a' towards the projection 9. When the passageway 7 is brought into register with the supply chute 8, a nut-blank a will drop from said supply chute into said passageway 7 onto the gate 13—which, as previously explained, will bring the hole a' therein in line with projection 9 and the clamping member 10. As the slide 6 advances, the nut-blank which rests upon the nut-blank supported upon the gate 13, will pass off from the nut-blank a in the passageway 7 onto the top of the slide 6 and as said slide continues to advance onto the bracket 26 at the rear end thereof, and when said slide is again retracted, will drop into the passageway 7, as previously explained, this cycle being repeated indefinitely throughout the operation of the machine.

Also, as the slide 6 begins to move away from the stop screw 24, the lever 21 will be free to turn pivotally, thus releasing the pressure on the end of the gate stem 14 and permitting the spring 19 to retract the gate 13 out of the passageway 7, the relation being such that said gate will be fully retracted, as shown in Fig. 4, when the passageway 7 is brought into register with the passageway 2 in the base 1.

Also, as the slide begins to advance, the cam surface 45 will turn the crank-arm 43 pivotally to advance the clamping member 10 to clamp the nut-blank resting on the gate 13, between the projection 9 and the end of said clamping member, with said projection in engagement with the hole enlargement a' in said nut-blank, as shown in Fig. 3. As said crank-arm 43 passes out of engagement with the cam surface 45, the clamping member 10 will be maintained in position by the brake block 27, until the anti-friction roller 44 engages the cam section 47, which will turn the crank-shaft 33 sufficiently to retract the clamping member substantially into the position shown in Fig. 4, but not sufficiently to permit disengagement of the hole enlargement a' in the nut-blank from the projection 9, so that said slide will continue to convey said nut-blank along with it. The slide 6 continuing to advance, the anti-friction roller 44 will pass out of engagement with the cam section 47, along the neutral section 50 and, shortly before the passageway 7 comes into register with the passageway 3 in the base 1, will engage the cam section 51, which will operate, as previously explained, to fully retract the clamping member 10, thus releasing the nut-blank a, permitting it to fall through the passageway 7 into the passageway 3 in the base 1, which has been brought into full register with said passageway 7, all as shown in Fig. 5. Also, said cam section 51 will return the crank-arm 43 to its initial position shown in Figs. 1 and 2.

As the slide 6 is retracted to its initial position, the anti-friction roller 44, acting on the cam surface 57, will turn the cam plate 46 pivotally out of the path of travel of said anti-friction roller, thus permitting the crank arm 43 to pass said cam plate without disturbing the adjustment of said crank-arm and associated parts, said cam plate 46 being returned to its normal position, as soon as the anti-friction roller 44 passes out of engagement therewith, by the spring 61.

Also, as the slide approaches its position of extreme retraction, the free end of the lever 21 will come into contact with the stop screw 24, thereby advancing the gate 13 into the passageway 7 in position to receive another blank from the supply chute 8.

Again starting with the slide 6 in its initial position and assuming that the nut-blank a is facing with the hole enlargement a' away from the gauge 9, as shown in Figs. 8, 9 and 10, the operation of the machine will be identical with that heretofore described, except-ing that retraction of the clamping member 10 by the cam section 47, which will occur after the gate 13 is retracted and the passageway 2 in the base, will release the nut-blank and permit the same to drop through the passageway 7 into the passageway 2 in the base.

In the operation of my improved machine, it is obvious that the clamping position of the clamping member 10 will vary when the nut-blanks a are oppositely faced, as shown in Figs. 1 to 5 and 7 to 10, respectively, or if the thickness of the blanks varies, and that, in either case, movement of said clamping member will be arrested at different points in the travel of the slide 6 in a direction corresponding to advancement of said clamping member 10 into clamping position —or, what amounts to the same thing, at different intervals before the anti-friction roller 44 of the crank-arm 43 passes out of engagement with the cam surface 45.

Also, to insure engagement of the nut-blanks a by the projection 9 and clamping member 10, the cam surface 45 is made sufficiently long to provide for any desired over-travel of said clamping member.

Under any of the foregoing conditions, or if, from any other cause, movement of the clamping member 10 should be arrested before the anti-friction roller 44 passes out of engagement with the cam surface 45, the friction transmission by which the crank-arm 34 is secured to the crank-shaft 33, will provide for necessary slippage of said crank-

arm to permit said crank-arm to execute its full angular movement, while the clamping member will remain stationary, without strain or injury to any part of the machine.

Where slippage of the transmission occurs on advancement of the clamping member 10 into clamping position, it is also obvious that, on retraction of said clamping member, contact of the pin 52 with the end of the slot 53, which defines full retraction of said clamping member, will occur before the slide 6 reaches the limit of its advancement and before the anti-friction roller 44 passes out of engagement with the cam surface 51, and that the friction transmission through which said clamping member is actuated, will permit said slide 6 and crank-arm 43 to complete their cycle of operation while the clamping member 10 will remain stationary and other parts will be unaffected.

While I consider the machine shown in the drawings and herein described to be the preferable embodiment of my invention, because of its simplicity and the readiness with which the reciprocating movement of the slide 6 lends itself to actuation of the operative parts of the sorting devices proper, to wit, the gauge 9 and the clamping member 10, I do not desire to limit myself thereto, as other means for the accomplishment of the objects of the invention will readily suggest themselves to skilled mechanics, in view of the foregoing disclosure. In other words, considered broadly, the vital and essential feature of my invention resides in the sorting devices proper—the gauge 9 and the clamping member 10—and other features associated with said sorting devices proper are secondary and admit of a wide range of variation and modification without departing from my invention and I desire it to be understood that I consider and claim all such mechanical variations or modifications as coming within the scope of my invention.

As one such modification, I contemplate substituting for the reciprocating slide 6, a movable member rotatable about an upright axis, either continuously in one direction or with an oscillating movement, and for the actuating means for said sorting devices proper, rendered operative by movement of the movable member—either the slide 6 or said rotatable member—I contemplate substituting operating means actuated from a source of power, in no way controlled by movement of said movable member, though, of course, necessarily timed with reference to the movement thereof.

In practice, it may sometimes occur that while the projection 9 will enter to full designed engagement, only a single opening in the articles to be sorted, it will also enter into partial engagement with other openings therein. In such case, it will, of course, be necessary to increase the initial retraction of the clamping member 10 sufficiently to release an article supported by said projection and clamping member, but less than the full operative height of said projection. Any desired initial retraction of said clamping member 10 can be effected by properly proportioning the length of the cam section 47 on the bracket arm 48.

I claim:

1. In a machine for sorting articles provided with openings in their corresponding sides, the combination of a movable member, means for imparting movement thereto, means on said movable member for engaging articles to be sorted with said movable member comprising a projection and a clamping member, one thereof being movable, means to impart relative movement thereto towards and from each other, said projection and the end of the clamping member being of such size and shape, respectively, that said projection will enter to full designed engagement only a single opening in each of the articles to be sorted and the end of said clamping member will enter none of said openings, substantially as described.

2. In a machine for sorting articles provided with openings in their corresponding sides, the combination of a movable member, means for imparting movement thereto, means on said movable member for engaging articles to be sorted with said movable member comprising a projection and a clamping member, one thereof being movable, means to impart relative movement thereto towards and from each other, said projection and the end of the clamping member being of such size and shape, respectively, that said projection will enter the openings in one side only of the articles to be sorted and the end of said clamping member will enter none of said openings, substantially as described.

3. A sorting machine as specified in claim 1, in which the relative retraction of said projection and clamping member proceeds intermittently, substantially as described.

4. A sorting machine as specified in claim 3 in which the initial relative retraction of said projection and clamping member is less than the operative height of the projection, substantially as described.

5. A sorting machine as specified in claim 3, in which the initial relative retraction of said projection and clamping member is sufficient to release an article to be sorted supported between them, but less than the operative height of said projection, substantially as described.

6. A sorting machine as specified in claim 1, in which the means for imparting relative movement to said projection and clamping member comprises a friction connection, substantially as described.

7. A sorting machine as specified in claim

1, in which a stop limits and defines the extreme relative retraction of said projection and clamping member, substantially as described.

8. A sorting machine as specified in claim 7, in which the means for imparting relative movement to said projection and clamping member comprises a friction connection, substantially as described.

9. A sorting device comprising a projection and a clamping member supported so as to be relatively movable towards and from each other, said projection and the end of the clamping member being of such size and shape that said projection will enter to full designed engagement only a single opening in the articles to be sorted and the clamping member will enter none of said openings and means for imparting relative movement to said projection and clamping member towards and from each other, substantially as described.

10. Sorting devices comprising a projection and a clamping member supported so as to be relatively movable towards and from each other, said projection and the end of the clamping member being of such size and shape that said projection will enter holes formed in one side only of the articles to be sorted and the clamping member will enter none of said holes, and means for imparting relative movement to said projection and clamping member towards and from each other, substantially as described.

11. In a machine for sorting articles provided with openings in their corresponding sides, the combination of a base provided with passageways, a movably supported member provided with a passageway adapted to be brought successively into communication with the passageways in said base by a movement of said movable member, a projection on one side of the passageway in said movable member and a clamping member mounted in a bearing in said movable member in line with and movable towards and from said projection, said projection and the end of said clamping member being of such size and shape, respectively, that said projection will enter to full designed engagement only a single opening in the articles to be sorted and the end of said clamping member will enter none of said openings, means controlled by movement of said movable member for opening and closing the passageway therein adapted for supporting articles deposited in said passageway with the openings therein in line with the projection and clamping member, and means rendered operative by movement of said movable member for imparting endwise movement to said clamping member, substantially as described.

12. A sorting machine as specified in claim 11, in which the operating means for the clamping member comprises a friction connection, substantially as described.

13. A sorting machine as specified in claim 11, in which the means for operating the clamping member is constructed and arranged to alternately actuate and release said clamping member, substantially as described.

14. A sorting machine as specified, in claim 13, in which a friction is applied to the clamping member to maintain it in position when released, substantially as described.

15. A sorting machine as specified, in claim 12, in which a stop limits and defines the extreme retracted position of said clamping member, substantially as described.

16. In a machine for sorting articles provided with openings in their corresponding sides, the combination of a base provided with passageways, a movably supported member provided with a passageway adapted to be brought successively into communication with the passageways in said base by movement of said movable member, a projection on one side of the passageway in said movable member and a clamping member mounted in a bearing in said movable member in line with and movable towards and from said projection, said projection and the end of said clamping member being of such size and shape, respectively, that said projection will enter to full designed engagement only a single opening in the articles to be sorted and the end of said clamping member will enter none of said openings, means controlled by movement of said movable member for opening and closing the passageway therein adapted for supporting articles deposited in said passageway with the openings therein in line with the projection and clamping member, and means rendered operative by movement of said movable member for imparting endwise movement to said clamping member, comprising a crank-arm pivoted to the slide of the machine, connection between said crank-arm and clamping member, cam members on the base of the machine provided with spaced cam surfaces with which said crank-arm is adapted to engage successively, the first adapted for imparting pivot movement to said crank-arm to advance said clamping member towards the projection, the second adapted to retract said clamping member a sufficient distance to release an article supported thereby but less than the operative height of said projection, and the third adapted to fully retract said clamping member, substantially as described.

17. A sorting machine as specified in claim 16, in which the connection between the crank-arm and clamping member comprises a friction, substantially as described.

18. A sorting machine as specified in

claim 17, in which a stop is provided to define full retraction of said clamping member, substantially as described.

19. A sorting machine as specified in claim 11, in which the first cam section is formed on a pivoted cam member which is held yieldingly in operative position by a spring applied thereto, and in which the third cam section is adapted to return said crank-arm to its initial position, said pivoted cam member being provided with a cam surface engagement of the end of said crank-arm with which, as said slide is retracted, will impart pivotal movement to said cam member out of the path of said crank-arm, substantially as described.

20. In a machine for sorting articles provided with openings in their corresponding sides, the combination of a base provided with passageways, a slide movably supported on said base provided with a passageway adapted to be brought successively into communication with the passageways in said base by movement of said slide, a projection on one side of the passageway in said slide, and a clamping member mounted in a bearing in said slide in line with and movable towards and from said projection, said projection and the end of said clamping member being of such size and shape, respectively, that said projection will enter to full designed engagement only a single opening in the articles to be sorted and the end of said clamping member will enter none of said openings, a gate mounted in a bearing in said slide below said projection and clamping member, means controlled by movement of said slide to advance said gate into and to retract it out of the passageway in said slide, the relation being such that when an article to be sorted rests upon said gate, the opening therein will be in line with said projection and clamping member, and means rendered operative by movement of said slide for imparting endwise movement to said clamping member, substantially as described.

21. A sorting machine as specified in claim 20, in which the gate controlling the passageway in the slide of the machine comprises a stem slidably fitted to a bearing in said slide, the rear end of which projects beyond the said slide, a spring applied to said stem adapted for retracting said gate out of said passageway, a lever pivoted to said slide adapted to bear against the projecting end of the gate stem, and a stop on the base of the machine with which the free end of said lever will engage as said slide approaches its fully retracted position, the relation being such that contact of said lever with said stop will turn said lever pivotally in a direction to impart movement to said gate against the force of the spring applied thereto, to advance said gate into the passageway in said slide, substantially as described.

22. A sorting machine as specified in claim 21, in which the stop for actuating the gate advancing lever is adjustable, substantially as described.

23. The combination of sorting devices one of which is movable, and means for imparting relative movement thereto comprising a non-resilient lost-motion transmission, substantially as described.

24. Sorting devices as specified in claim 23, in which lost-motion is effected by a friction transmission, substantially as described.

25. Sorting devices as specified in claim 23, in which the lost-motion transmission is constructed and arranged to permit lost-motion of the actuated member as the actuating member approaches the limits of its operative movements, substantially as described.

26. Sorting devices as specified in claim 25, in which a stop defines the retracted position of the actuating member, substantially as described.

In witness that I claim the foregoing as my invention, I affix my signature in presence of two subscribing witnesses this 31st day of March, A. D. 1921.

EDWIN H. EHRMAN.

Witnesses:
F. H. WATT,
M. W. BUCHHOLZ.