Sept. 13, 1955 H. O. CADMAN 2,717,682

WORKPIECE SEPARATOR

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Fig. 3

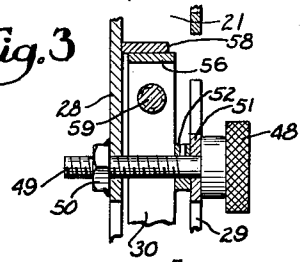
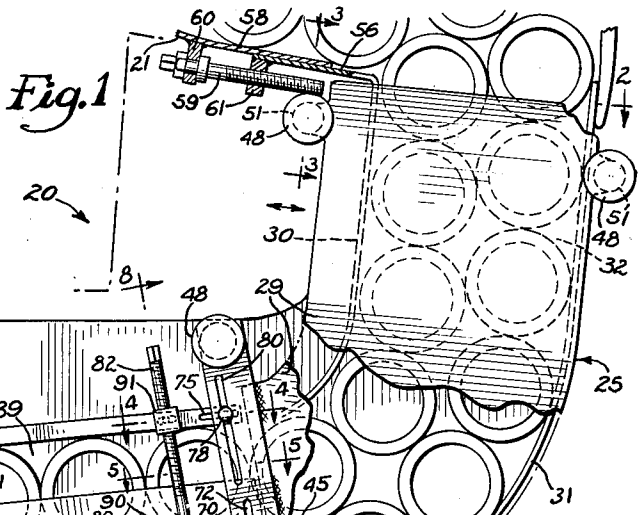


Fig. 1



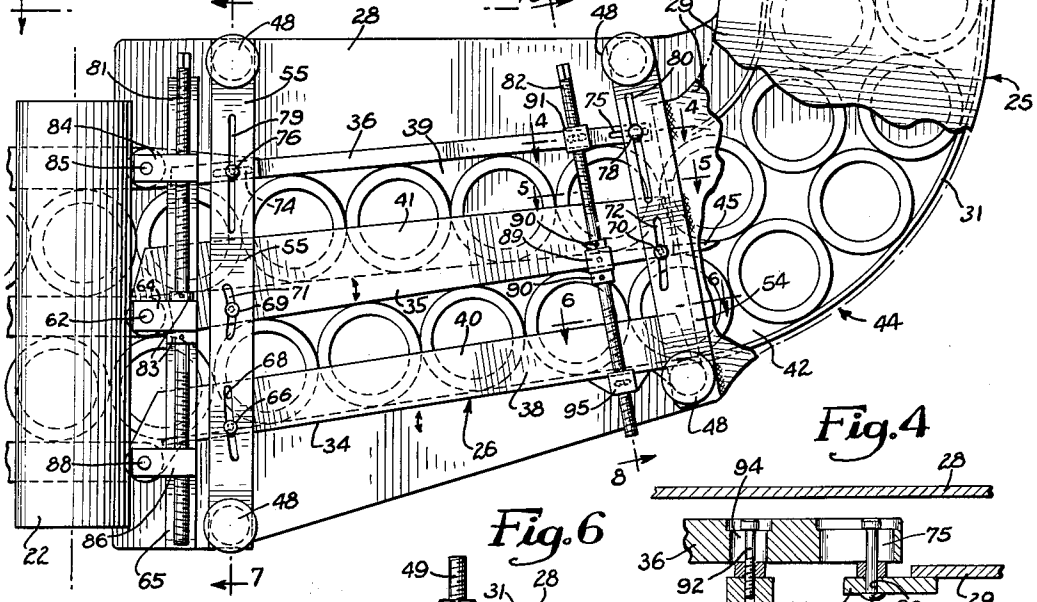


Fig. 4

Fig. 6

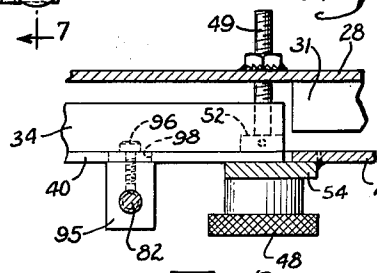


Fig. 5

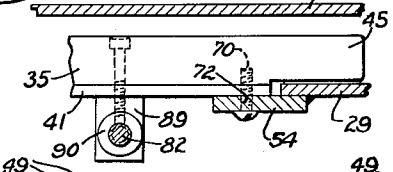
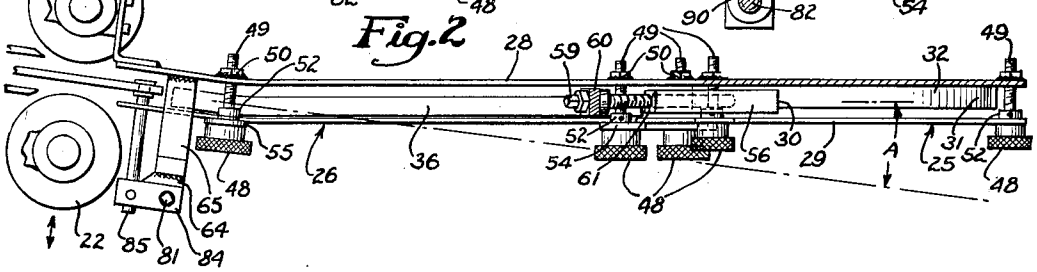


Fig. 2



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Fig. 7

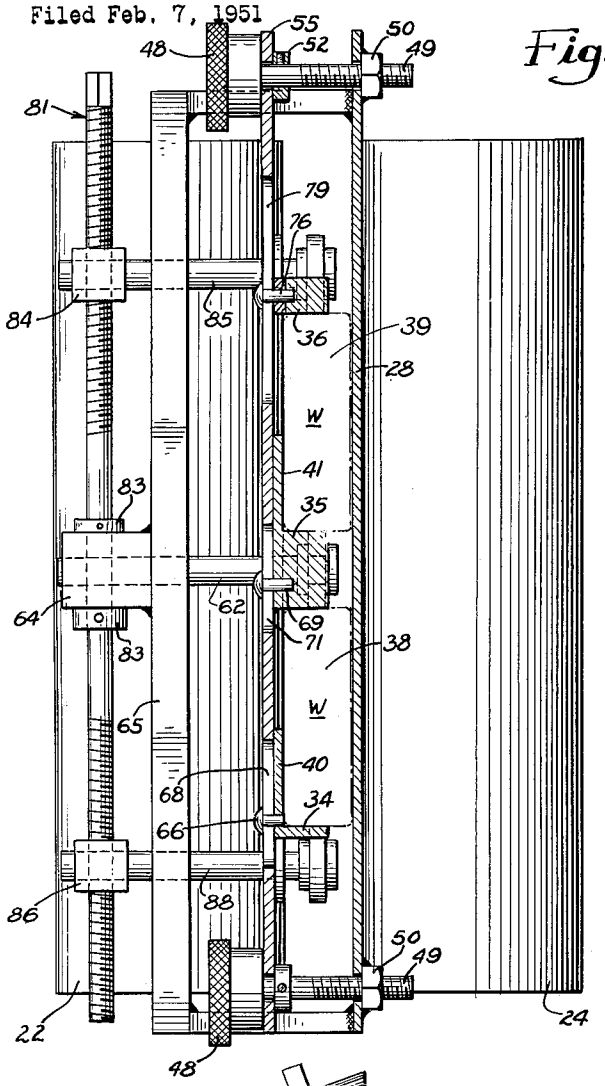


Fig. 8

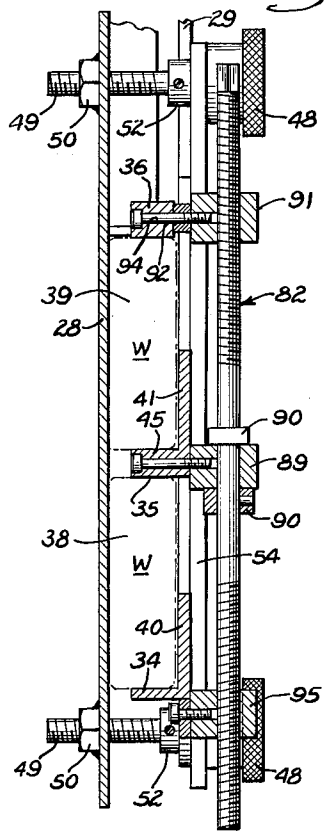
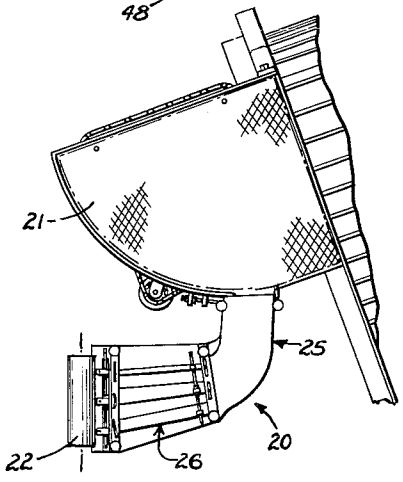


Fig. 9



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United States Patent Office 2,717,682 Patented Sept. 13, 1955

2,717,682

WORKPIECE SEPARATOR

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Application February 7, 1951, Serial No. 209,868

6 Claims. (Cl. 193—38)

The present invention relates generally to work handling devices and more specifically to a novel means for feeding annular or discoidal workpieces from a source of supply to an appropriate single or plural receiving means. The invention finds particular, but by no means exclusive, utility when used for channeling workpieces to the feeding means of a grinding machine having a pair of axially spaced abrasive wheels with opposed grinding faces.

The general aim of the invention is to provide a novel means for withdrawing annular or discoidal workpieces from a reservoir and for feeding them by gravity in plural processions to an appropriate receiver such as a grinding machine.

Another object is to provide a device of the character set forth which will be adapted to withdraw the workpieces in a continuous stream and to divide them into separate processions without jamming or otherwise retarding their flow.

A further object is to provide a workpiece divider of the foregoing type and which will be susceptible of ready accommodation to workpieces of different diameters and thicknesses.

Still another object is to provide a workpiece separator of the character set forth above and which will permit the use of suitable means for pushing the last workpieces in a batch all the way through the grinding zone of a grinding machine.

Other objects and advantages will become apparent as the accompanying detailed description proceeds, taken in the light of the accompanying drawings, wherein:

Figure 1 is a front elevation of an illustrative workpiece separator embodying the present invention.

Fig. 2 is a broken horizontal sectional view of the device shown in Fig. 1 and taken in the plane of the line 2—2.

Fig. 3 is an enlarged fragmentary sectional view through one of the adjusting elements in the illustrative separator of Fig. 1, such view being taken substantially in the plane of the line 3—3.

Figs. 4, 5 and 6 are enlarged fragmentary sectional views taken transversely through the device of Fig. 1 and in the planes of the lines 4—4, 5—5 and 6—6, respectively.

Fig. 7 is an enlarged fragmentary vertical sectional view through the lower end portion of the device of Fig. 1, such view being taken in the plane of the line 7—7.

Fig. 8 is an enlarged fragmentary transverse sectional view detailing one of the adjusting elements of the device of Fig. 1, such view being taken in the plane of the line 8—8.

Fig. 9 is a diagrammatic view showing the illustrative device of Fig. 1 in operative position beneath the reservoir of a workpiece feeding mechanism.

While the invention is susceptible of various modifications and alternative constructions, a preferred embodiment has been shown in the drawings and will be described below in considerable detail. It should be understood, however, that there is no intention to limit the invention to the specific form disclosed, but on the contrary, the intention is to cover all modifications and alternative constructions falling within the spirit and scope of the invention as expressed in the appended claims.

Referring to the drawing more particularly, there is shown in Figs. 1 and 9 a novel workpiece separator 20 adapted in this instance to withdraw workpieces W in a continuous stream from a reservoir 21 and to feed them by gravity in plural processions to an appropriate receiver. For purposes of illustration, the reservoir 21 happens to be a part of the continuous feed mechanism disclosed in my copending application, Serial No. 209,867, filed February 7, 1951. The receiver in this instance includes a pair of wringer rolls 22, 24 which may comprise the feeding means of a grinding machine having axially spaced abrasive wheels with a pair of opposed grinding faces (not shown). In general, the device 20 comprises a substantially upright chute 25 terminating in a divider section 26. The chute is adapted to receive workpieces W from the reservoir 21 and to present them to the section 26, the latter, in turn, separating them into plural processions for presentation to the wringer rolls 22, 24.

In the form shown, the illustrative workpiece separator 20 is built upon a backing plate 28 which constitutes a common side panel for the chute 25 as well as for the divider section 26. The chute 25 is defined by another side panel 29 mounted in spaced and substantially parallel relation with the backing plate 28, being bounded by laterally spaced peripheral walls 30, 31. Together, the foregoing parts define within the chute 25 a generally upright main passage 32 extending from the reservoir and terminating at the divider section 26.

Considering next the divider section 26, it will be perceived that the same comprises a bottom guide rail 34, a middle guide rail 35 and a top guide rail 36. All such rail members are downwardly inclined from the end of the chute 25 and, together with the backing plate 28, they define a pair of branch passages 38. The latter communicate at their upper ends with the main passage 32 of the chute and their lower ends terminate at the wringer rolls 22, 24. In order to prevent workpieces W from rolling out the sides of the branch passages 38, 39, the bottom and middle guide rails 34, 35 are formed with upstanding longitudinal flanges 40, 41, respectively. Such flanges are, of course, disposed in spaced apart and substantially parallel relation with the backing plate 28 so as to permit workpieces to move longitudinally of the passages 38, 39 (Figs. 1, 7 and 8).

Provision is made in the device 20 for receiving the workpieces W in a continuous stream from the reservoir 21 and for separating them into plural processions without jamming or otherwise retarding their flow. This is accomplished by forming the upright main passage 32 of the chute 25 with a laterally curved portion 42 and by initiating separation of the workpieces into plural processions at the lower terminal end of such laterally curved portion. In furtherance of such objective, the lower end portion of the chute 25 is formed with an elbow 44 defining the laterally curved portion 42 of the main passage. By the same token, the middle guide rail 35 is tapered toward its upper end and is provided with a relatively thin projecting end portion 45 constituting a divider bar. The latter preferably extends a short distance into the laterally curved portion 42 of the main passage 32. This, of course, initiates division of the main passage 32 into the two branch passages 38 and 39. In the form of the device under consideration here, the main passage 32 is formed with a width approximately equal to but slightly in excess of double the di-

ameter of one of the workpieces W, while each of the branch passages 38, 39 has a width approximately equal to but slightly in excess of a single diameter of one of such workpieces. All of the passages 32, 38 and 39 have a thickness dimension only slightly in excess of that of the workpieces.

By reason of the structure just described, it will be evident that the head of workpieces above and at the mouth of the main passage 32 will tend to arrange the workpieces into two contiguous columns, one on the right and the other on the left as viewed in Fig. 1. In the upright portion of the passage 32, successive workpieces in each column will tend to abut each other at points located substantially on the axes of travel of their centers. Due to the lateral curvature of the passage 32 at its lower end, however, the workpieces in such region will also be subjected to a component of pressure acting in a radial outward direction from the center of curvature of that portion 42 of the passage. Consequently, workpieces in the right-hand column (as viewed in Fig. 1) will tend to remain in abutment with each other and in contact with the inner surface of the laterally curved peripheral wall 31. There will be no tendency for these workpieces to pop out of the right-hand column and into the center of the passage or into the other column of workpieces. This provides a plurality of closely spaced arcuate lateral abutments against which the workpieces in the left-hand column are free to press. Since the workpieces in the left-hand column are not subject to greater forces or pressures than those in the right-hand column, it is virtually impossible for a workpiece to leave the left-hand column and push between two successive workpieces in the right-hand column. Thus, it is also virtually impossible for any of the workpieces in the main passage 32 to reach a position centrally of the passage and strike the divider bar 45 substantially head-on so as to cause a jam. The workpieces in the left-hand column will only be permitted a relatively slight amount of lateral movement in the main passage 32, varying between a position wherein adjacent workpieces in the two columns abut in side-by-side relation and a position wherein a workpiece from the one column nests against two successive workpieces in the other column. In any event, it will be noted that all of the workpieces will tend to contact the divider bar 45 substantially tangentially and without any perceptible retarding of their forward speed.

Provision is made in the device 20 for accommodating with equal facility workpieces of various diameters and thicknesses. Thus it is contemplated that the device may be set up for feeding one batch of workpieces of a particular size and, within a very short time, be conditioned for feeding a second batch having another size. Considering first the means for adjusting the device 20 for different workpiece thicknesses, it will be noted that the chute 25 and divider section 26 are provided in the present instance with a total of six adjusting knobs 48. Each such knob 48 has fixed thereto a threaded stud 49 adapted in this instance to project through an aperture in the backing plate 28 and to engage a nut 50 rigidly fixed thereto as by spot welding. Two of the adjusting knobs 48 are journaled in outturned ears 51 located along the lateral edges of the side panel 29 adjacent its upper end. As detailed in Fig. 3, each of these two knobs is retained in engagement with its corresponding ear 51 as by means of a collar 52 rigidly fixed to the threaded stud 49. Rotational adjustment of these two knobs will, therefore, result in bodily movement of the upper end of the panel 29 toward or away from the backing plate 28. At the lower end of the chute 25, the side panel 29 has rigidly fixed thereto, as by welding, a stiffener bar 54 having end portions which project beyond the normal lateral extremities of the panel 29. Another pair of adjusting knobs 48 is journaled on the end portions of the stiffener bar 54 and retained as by means of a collar 52, the threaded stud of each of the knobs 48 projecting through an alined opening in the backing plate 28 and engaging a suitable nut on the reverse side thereof. Since the stiffener bar 54 is positively connected to the upper ends of the guide rails 34, 35, 36 as well as to the lower end of the side panel 29, it will be appreciated that adjustment of its knobs 48 serves to shift all of these parts bodily relative to the backing plate 28. A second stiffener bar 55, similar to the bar 54 but of somewhat greater length, is provided adjacent the wringer rolls and has the lower end portions of the guide rails positively secured to it. Like the bar 54, the bar 55 carries in its end portions a pair of adjusting knobs 48 which are fastened in the manner previously described and which serve to effect bodily shifting of the lower ends of the guide rails toward or away from the backing plate 28.

Turning now to the means for accommodating the device 20 for use with workpieces having various diametrical sizes, it will be noted that the inner peripheral wall 30 of the chute 25 is adjustably mounted for movement toward or away from the opposite peripheral wall 31 and in effect constitutes an adjustable throat. This is effected by outward bending of the upper end portion 56 of the wall 30 and supporting the same with the portion 56 in underlying relation with the floor 58 of the reservoir (see Fig. 1). In this instance a suitable adjusting screw 59 is journaled in a bracket 60 fixed to the underside of the reservoir 21 and threadedly engages the tapped hole in a boss 61 depending from the end of the portion 56. Turning of the screw 59 in either direction results in a corresponding adjusting movement of the peripheral wall 30 toward or away from the wall 31, changing the lateral dimension or width of the main passage 32.

Having described the means for varying the width of the main passage 32 within the chute 25, consideration may next be given to the means for varying the width of the branch passages 38, 39. Accordingly, the upper end of the bottom guide rail 34 is pivoted for vertical swinging movement upon an axis substantially coincident with that of the adjusting knob 48 at the lower end of the stiffener bar 54. By the same token, the middle guide rail is mounted so that its upper end portion 45 is capable of limited vertical swinging movement about a pivot pin 62. The latter is housed within a block 64 fixed to a substantially U-shaped bracket 65 which projects outwardly from the backing plate 28 and is anchored thereto (see Figs. 1 and 7). The top guide rail 36, on the other hand, is mounted so that either or both ends thereof are capable of movement in a generally vertical direction. To permit the foregoing movements of the guide rails 34, 35, 36, slidable connections are interposed between the latter and the stiffener bars 54, 55. Thus the lower end portion of the bottom guide rail 34 carries a headed pin 66 which lies in an arcuate slot 68 in the bar 55. Similarly, the respective end portions of the middle guide rail 35 have fixed thereto headed pins 69, 70 which lie respectively in arcuate slots 71, 72 in their corresponding stiffener bars. Due to the slight angularity between the stiffener bars 54, 55, the opposite end portions of the top guide rail 36 have longitudinal slots 74, 75 which respectively house headed pins 76, 78 (Figs. 1 and 4). The latter, in turn, are adapted to lie within longitudinal slots 79, 80 in the stiffener bars 54, 55.

For the purpose of effecting the foregoing adjusting movements and retaining the guide rails in properly adjusted position relative to each other, resort may be had to adjusting screws 81, 82 each having a pair of oppositely threaded portions. The screw 81 is freely journaled in the fixed bracket 64, being retained therein as by means of collars 83. The upper portion of the screw 81 extending above the bracket 64 has threads of opposite hand from that portion below the bracket 64. The upper portion of the screw 81 threadedly engages a nut member 84 which is connected to the lower end of the top guide rail 36 by means of a transverse pin 85. Similarly,

the lower end portion of the screw **81** threadedly engages a nut member **86** which is connected to the lower end portion of the bottom guide rail **34** by means of a pin **88**. In like manner, the other adjusting screw **82** is freely journaled in a block **89** which is fixed to the upper end portion of the middle guide rail **35**, the screw **82** being retained in place as by means of collars **90** (Figs. 1 and 8). The upper end portion of the screw **82** threadedly engages a nut member **91** which is connected to the upper end portion of the top guide rail **36** by means of a pin **92** which lies in a slot **94** in the guide rail. The lower half of the screw **82** has threads of opposite hand from the upper half and threadedly engages a nut member **95** which is connected to a depending ear on the bottom guide rail by means of a pin **96** which lies in a slot **98**.

With the arrangement just described, it will be apparent that turning of the screw **81** will effect movement of the lower end portions of the guide rails **34, 36** either toward or away from the middle guide rail **35** which remains fixed. On the other hand, turning the adjusting screw **82** in one direction or the other will result in moving the upper end portion **45** of the middle guide rail toward or away from the bottom guide rail **34**, since the nut member **95** will not move along the axis of the screw **82**. Due to the opposite pitch on the two halves of the screw **82**, the upper end portion of the top guide rail **36** will move in the same direction as the portion **45** of the middle guide rail but at twice the rate and hence will undergo twice the displacement. Consequently, the width of the branch passages **38, 39** will be varied in equal increments at both their upper and lower ends.

In instances where the device **20** is used for feeding workpieces to a grinding machine having axially spaced abrasive wheels with opposed grinding faces, it is usually necessary to push the last workpieces of a batch all the way through the grinding zone. This is usually done by the use of a wooden stick. To permit such an operation to be effected, the entire lower end of the device **20** in the vicinity of the wringer rolls **22, 24** may be offset horizontally through an angle "A" as indicated in Fig. 2. By reason of this expedient, a pusher stick may easily be inserted into the lower end of either of the branch passages **38** or **39** and pushed through the wringer rolls and the grinding zone of the machine.

I claim as my invention:

1. A workpiece separator for gravity feeding to a machine tool or the like a plurality of substantially circular workpieces in plural processions, said separator comprising, in combination, a generally upright chute adapted to receive workpieces by gravity from a reservoir and disposeable in underlying relation with the same, said chute having a main passage with a lateral dimension approximately equal to but slightly greater than double the diameter of the workpieces, said chute terminating at its lower end in a laterally curved elbow which constrains the workpieces to move in a double procession on their peripheral surfaces with rolling and sliding contact with each other and with said chute, a downwardly inclined divider section substantially coplanar with said chute and disposed in alinement with the lower end of said chute for the receipt of workpieces therefrom, a divider bar running axially of said divider section, said divider bar tapering toward and extending to the discharge end of said elbow, said bar being disposed for tangential contact with the workpieces and adapted to define within said divider section a first and a second branch passage one above the other, each of said branch passages having a lateral dimension approximately equal to but slightly greater than the diameter of the workpieces.

2. A workpiece separator for gravity feeding to an appropriate receiver a plurality of annular or discoidal workpieces in plural processions, said separator comprising the combination of a generally upright chute disposable in underlying relation with a reservoir and adapted to receive workpieces therefrom by gravity, said chute having a main passage therein with a width approximately equal to but slightly greater than double the diameter of the workpieces and with a thickness approximately equal to but slightly greater than that of the workpieces, said main passage terminating in a laterally curved portion which constrains the workpieces to move in a double procession on their peripheral surfaces with rolling and sliding contact with each other and with said main passage, a plurality of downwardly inclined guide rails disposed in alinement with the lower end of said chute for the receipt of workpieces therefrom, one of said guide rails being centrally located relative to the others and tapering in an upstream direction toward and extending to the discharge end of said main passage, said one guide rail together with the others being adapted to define first and second branch passages one above the other, each of said branch passages having a width approximately equal to but slightly greater than the diameter of the workpieces and each having a thickness approximately equal to but slightly greater than that of the workpieces, and means including at least a partial side wall structure for confining the workpieces to movement within said branch passages.

3. A workpiece separator for withdrawing substantially circular workpieces from a reservoir by gravity and separating them into a plurality of processions for delivery to a grinding machine or the like having workpiece feed means, said separator comprising, in combination, a chute disposable in underlying relation with the reservoir and having a substantially upright main passage terminating in a laterally curved lower end portion which constrains the workpieces to move in a double procession on their peripheral surfaces with rolling and sliding contact with each other and with said main passage, a guide rail assembly adapted to receive workpieces from the lower end of said chute and adapted to present them to the feed means of the grinding machine, said guide rail assembly having a centrally located, tapered bar dividing said main passage and disposed into first and second branch passages for tangential as distinguished from head-on contact with the workpieces for conducting the same in separate processions to the feed means.

4. A workpiece separator for withdrawing substantially circular workpieces from a reservoir by gravity and separating them into a plurality of processions for delivery to a grinding machine or the like having workpiece feed means, said separator comprising, in combination, means defining a substantially upright main passage disposed in underlying relation with the reservoir and terminating in a laterally curved lower end portion, a plurality of downwardly inclined guide rails adapted to receive workpieces from said chute and adapted to present them to the feed means of the grinding machine, one of said guide rails being centrally located relative to the others and tapering in an upstream direction toward the discharge end of the said main passage, said one guide rail together with the others defining first and second branch passages for conducting workpieces in separate and vertically spaced processions to the feed means of the grinding machine, the lower terminal end portions of all said guide rails being offset in a generally horizontal direction to permit the feeding of a pusher stick along each said branch passage.

5. A workpiece separator for gravity feeding to an appropriate receiver plural processions of annular or discoidal workpieces, said separator comprising the combination of a generally upright chute adapted to receive workpieces by gravity from a source, said chute having an upright main passage therein with a width approximately equal to but slightly greater than double the diameter of the workpieces and with a thickness approximately equal to but slightly greater than that of the workpieces, said main passage terminating in a laterally curved lower end portion which constrains the workpieces to move in a

double procession on their peripheral surfaces with rolling and sliding contact with each other and with said main passage, an adjustable throat in said chute for varying the width of said main passage, means on said chute for varying the thickness of said main passage independently of the width thereof, a plurality of downwardly inclined guide rails disposed in alinement with the lower end of said chute for the receipt of workpieces therefrom, one of said guide rails being centrally located relative to the others and tapering in an upstream direction toward the discharge end of said main passage, said one guide rail together with the others being adapted to define vertically spaced first and second branch passages each having a width approximately equal to but slightly greater than the diameter of the workpieces and each having a thickness approximately equal to but slightly greater than that of the workpieces, and means operatively associated with said guide rails for varying both the width and thickness of each said branch passage.

6. A workpiece separator for withdrawing substantially circular or discoidal workpieces from a reservoir by gravity for feeding in plural processions to an appropriate receiver, said separator comprising the combination of a backing plate, a side panel mounted in spaced apart relation with said backing plate, adjusting means for moving said side panel bodily toward and away from said backing plate, a pair of laterally spaced peripheral walls each having longitudinal curvature, one of said walls being fixed and the other being movable relative to said backing plate and said side panel, all of said parts defining a substantially upright main passage terminating in a laterally curved lower end portion which constrains the workpieces to move in a double procession on their peripheral surfaces with rolling and sliding contact with each other and with said main passage, a plurality of downwardly inclined pivotally mounted guide rails, one of said rails being centrally located relative to the others, said one rail being tapered in an upstream direction toward the discharge end of said main passage and together with the other guide rails defining first and second branch passages adapted to receive workpieces from the laterally curved portion of said main passage, adjusting means for moving said guide rails bodily toward and away from said backing plate, and additional adjusting means for moving said guide rails toward and away from each other.

References Cited in the file of this patent

UNITED STATES PATENTS

1,101,744	Irenius	June 30, 1914
1,138,588	Augensen	May 4, 1915
1,636,235	Knowles	July 19, 1927
1,908,855	Makenny	May 16, 1933
2,004,349	Schwab	June 11, 1935
2,168,191	Bergmann	Aug. 1, 1939
2,511,266	Hube et al.	June 13, 1950