

Nov. 13, 1951

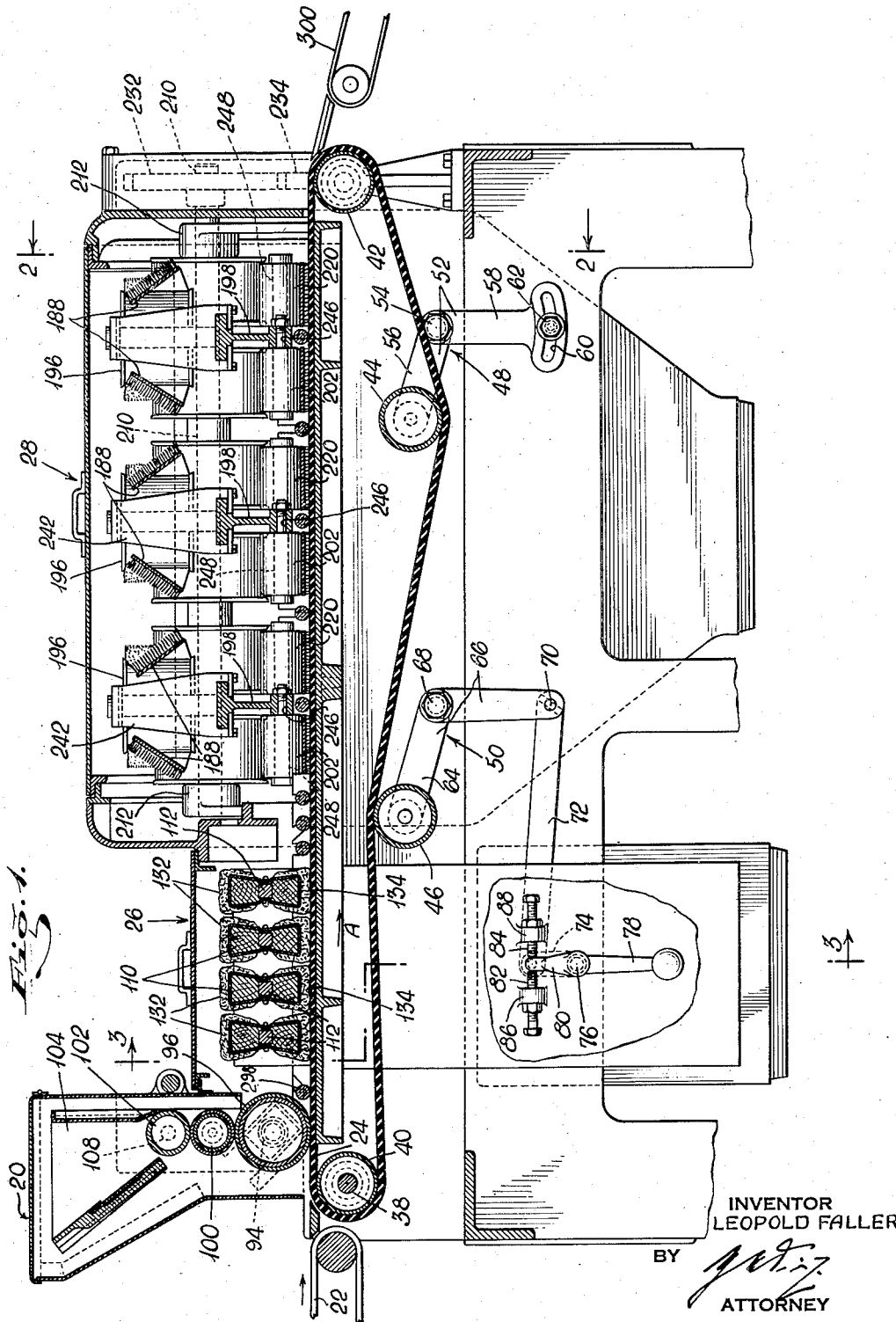
L. FALLER

2,574,633

BRONZING MACHINE

Filed April 16, 1948

5 Sheets-Sheet 1



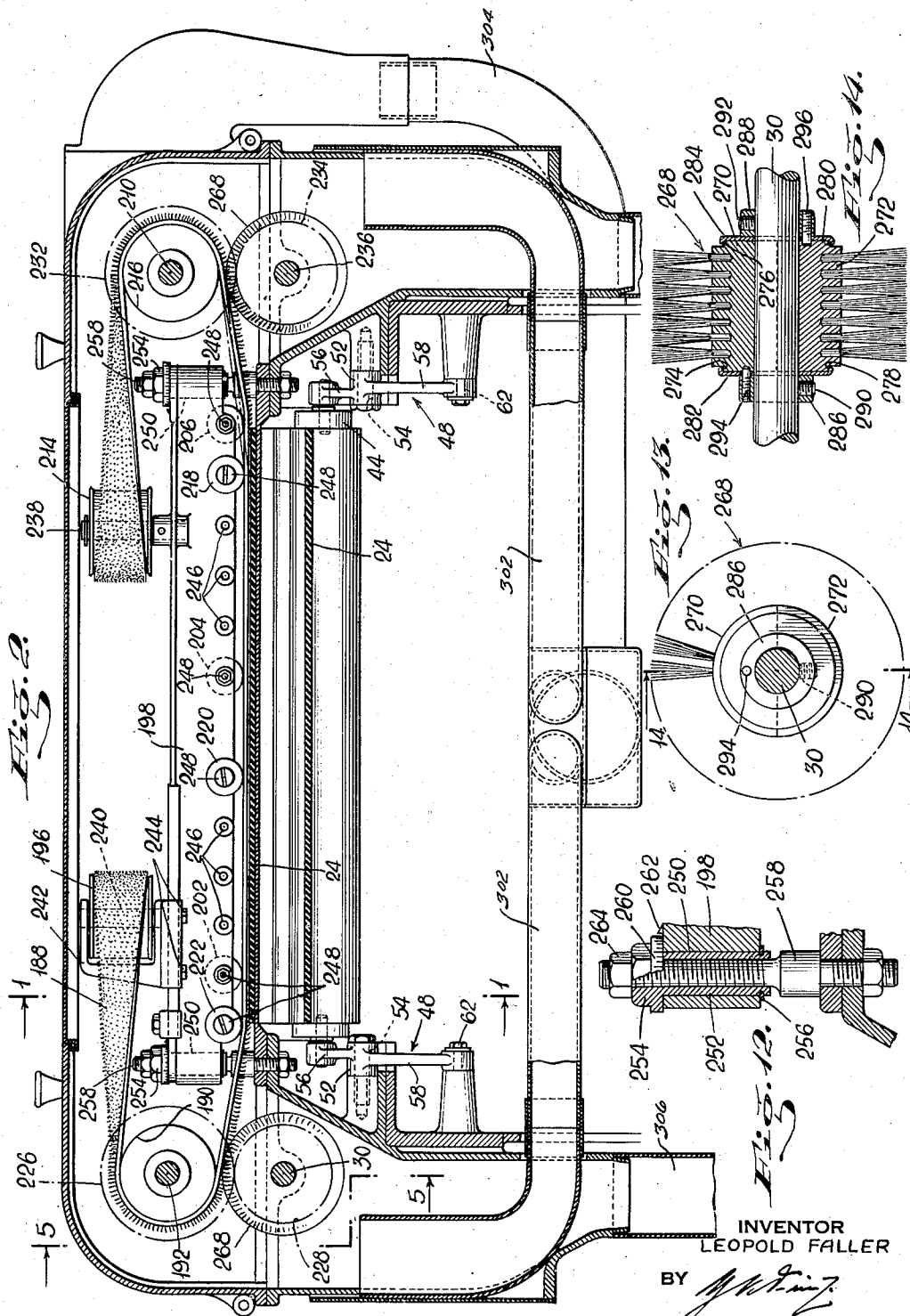
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5 Sheets-Sheet 2



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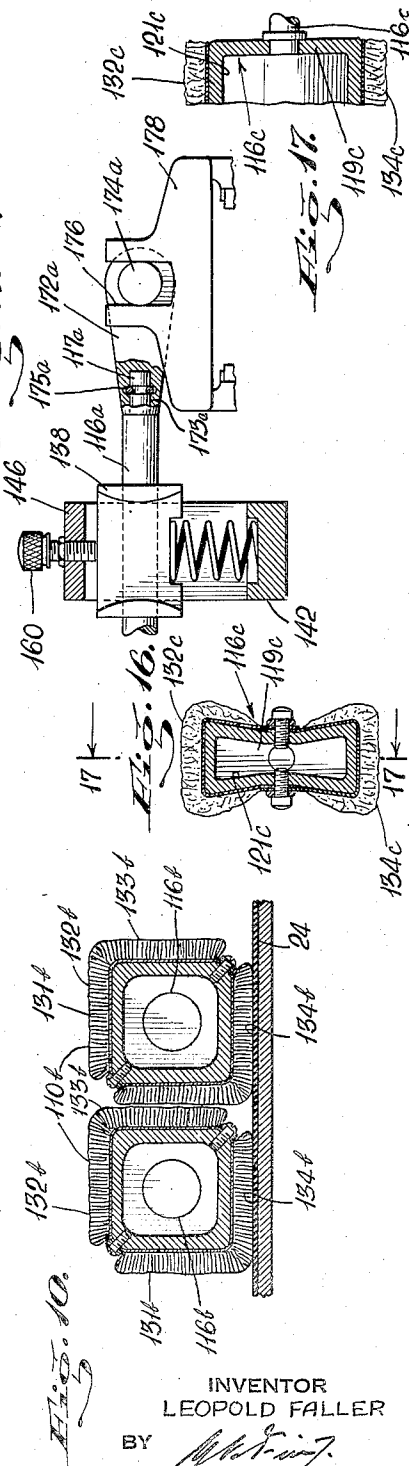
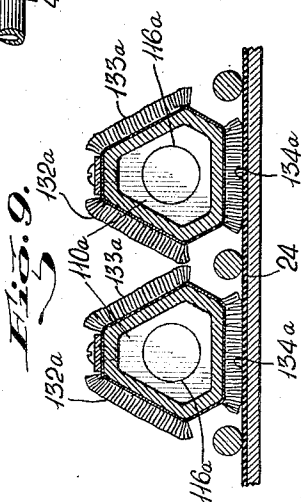
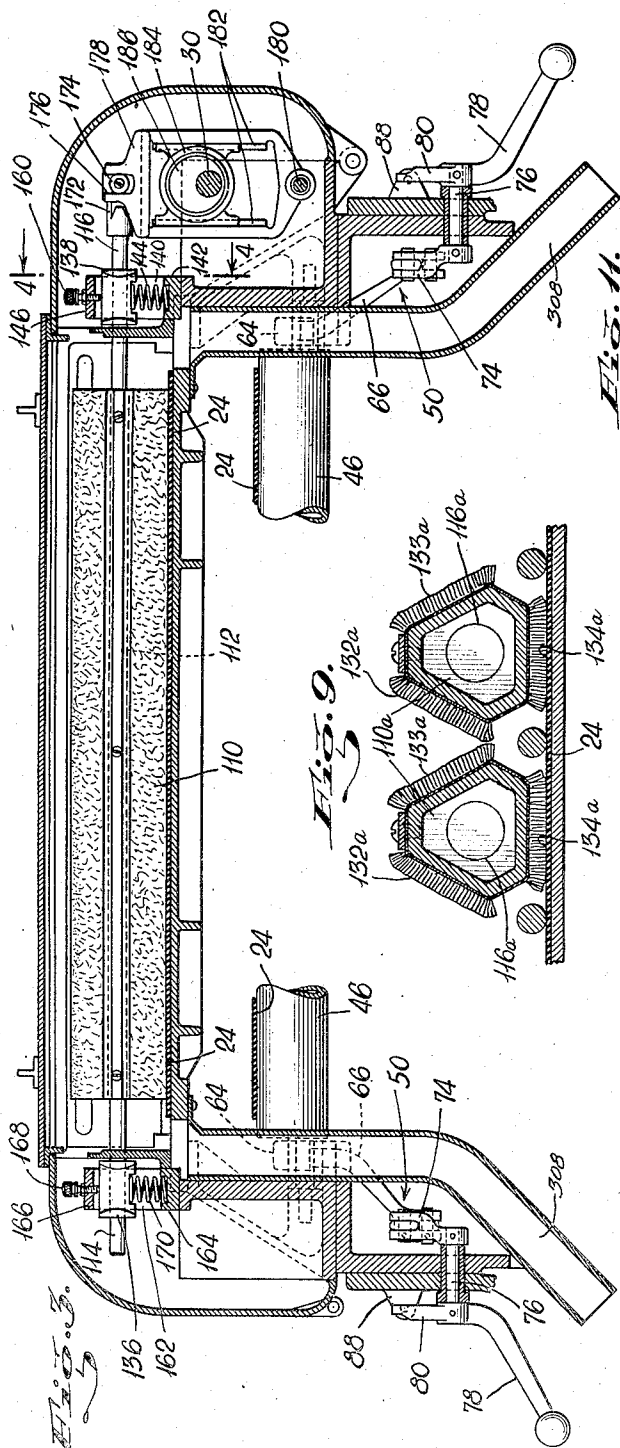
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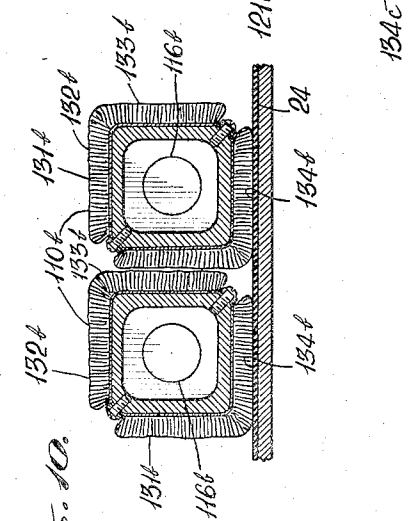
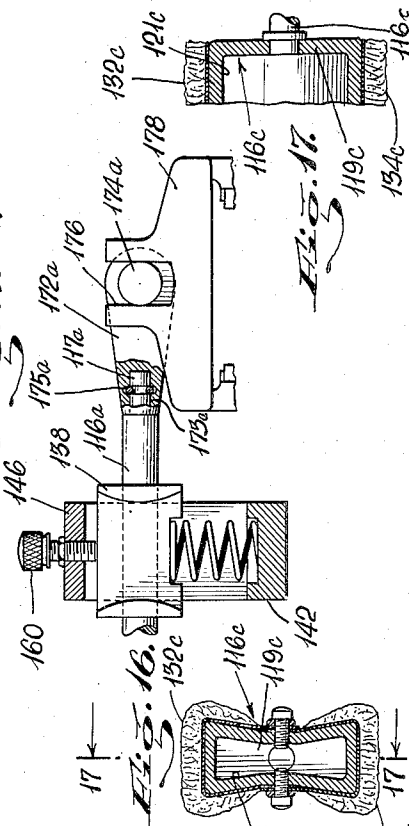
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Filed April 16, 1948

5 Sheets-Sheet 3



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UNITED STATES PATENT OFFICE

2,574,633

BRONZING MACHINE

Leopold Faller, Brooklyn, N. Y.

Application April 16, 1948, Serial No. 21,478

21 Claims. (Cl. 91—59)

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This invention relates to an applying machine, and more particularly to a so-called bronzing machine for applying powders and especially metallic powders to the faces of sheets.

An object of the present invention is to provide a bronzing machine, by means of which a substantial saving in the metallic powder to be used for coating sheets or the like can be obtained.

A further object of the present invention is to provide a bronzing machine, by means of which powder coated sheets of high quality may be obtained.

Another object of the present invention is to provide a bronzing machine, wherein the burnishing surfaces of the burnishers may be readily kept dry or at such a low humidity, that highly polished surfaces may be obtained and that the burnishers do not smear powder onto such parts of the sheets which shall not be coated with the powder.

A further object of the present invention is to provide a bronzing machine, wherein the dusting bands arranged for removing excess metallic powder from the sheets may be readily adjusted to the thickness and size of the sheets passing through the machine.

With the above and other objects of the invention in view, the invention consists in the novel construction, arrangement and combination of various devices, elements and parts, as set forth in the claims hereof, certain embodiments of the same being described in the specification and being illustrated in the accompanying drawings forming part of this specification, wherein:

Fig. 1 is a fragmentary vertical sectional view of a bronzing machine according to the invention, said section being taken along line 1—1 shown in Fig. 2, and a portion of the front wall of the machine being shown in an elevational view,

Fig. 2 is a sectional view taken on line 2—2 of Fig. 1,

Fig. 3 is a sectional view taken on line 3—3 of Fig. 1,

Fig. 4 is a fragmentary sectional view taken on line 4—4 of Fig. 3,

Fig. 5 is a fragmentary sectional view taken on line 5—5 of Fig. 2,

Fig. 6 is a sectional view taken on line 6—6 of Fig. 5,

Fig. 7 illustrates in an enlarged scale the connection between an end portion of a burnisher and a power-driven rockable actuating element,

Fig. 8 is a vertical sectional view of a burnisher,

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Fig. 9 is a vertical sectional view of a different embodiment of burnishers which may be used in a bronzing machine according to the invention,

Fig. 10 is a vertical sectional view of still another embodiment of burnishers which may be used in a bronzing machine according to the invention,

Fig. 11 illustrates a different type of a connection between the end portion of a burnisher and its rockable actuating element,

Fig. 12 is a fragmentary sectional view illustrating a micrometer device for adjusting a holding-down bridge cooperating with a dusting band of the machine,

Fig. 13 is an elevational view of a rotary brush cooperating with a dusting band,

Fig. 14 is a sectional view taken on line 14—14 of Fig. 13,

Fig. 15 is a diagrammatical view illustrating the setting of the holding-down rollers on the holding-down bridges in accordance with the size of the sheet passing through the machine,

Fig. 16 is a vertical sectional view of another embodiment of a burnisher, and

Fig. 17 is a sectional view taken on line 17—17 of Fig. 16.

Referring to Fig. 1, 20 generally indicates the supplying or depositing section of the bronzing machine, wherein a metallic powder for example bronze powder, is supplied to sheets fed to the machine by a conveying band 2 and placed in the machine on a conveying belt or conveyor 24 for passage through the machine in the direction of the arrow A.

26 generally indicates the coating section of the bronzing machine, wherein predetermined surfaces of the sheets placed on the conveyor 24 are coated with the metallic powder and the thus coated surfaces are burnished.

28 generally indicates the cleaning section of the bronzing machine, wherein excess metallic powder is removed from those portions of the sheets which shall not be coated with the metallic powder.

As best shown in Figs. 2, 3, 5 and 6, a main driving shaft 30 is journaled in suitable bearings of the frame of the machine. Said main driving shaft 30 may be rotated by means of a motor (not shown) through the medium of a belt 32 trained around a pulley keyed to the right-hand end of the driving shaft 30, as viewed in Figs. 5 and 6. A bevel gear 34 keyed to the left-hand end of said main driving shaft 30 is in mesh with a bevel gear 36 keyed to a transverse shaft 38 journaled in suitable bearings of the machine.

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As best shown in Figs. 1 and 5 a driving roller 40 engaged with the conveying belt 24 is keyed to said transverse shaft 38, so that upon a rotation of said transverse shaft 38 the upper side of the conveying belt 24 receiving the sheets fed to the machine by the conveying band 22 is moved in the direction of the arrow A. The conveying belt 24 is further trained around an idling roller 42 rotatably arranged at the delivery end of the machine and around tensioning rollers 44 and 46 carried by the tensioning mechanisms 48 and 50 respectively.

As best shown in Figs. 1 and 2 the tensioning mechanism 48 comprises two bell-crank levers 52, each of which being swingably mounted at 54 at a side of the machine. The tensioning roller 44 is rotatably arranged in the arms 56 of the bell-crank levers 52. The arms 58 of the bell-crank levers 52 are provided with a slot 60 receiving the stem of an adjusting screw 62, by means of which the bell-crank levers 52 may be held in a predetermined position.

The tensioning mechanism 50 is best shown in Figs. 1 and 3. The tensioning roller 46 is rotatably arranged in arms 64 of bell-crank levers 66 swingably mounted on each side of the machine at 68. The downward extending arm of each bell-crank lever 66 is pivotally connected at 70 with one end of a connecting rod 72, the other end of which is pivoted to an arm 74 keyed to a shaft 76 rotatably arranged in the frame of the machine. A handle 78 having an upwardly extending arm 80 is keyed to the end of the shaft 76 projecting outwardly from the wall of the machine. Said upwardly extending arm 80 extends into a space between two set screws 82, 84 screwed into threaded bores of lugs 86, 88 arranged on the wall of the machine. When the set screws 82, 84 are in the position shown in Fig. 1, the arm 80 and the handle 78 as well as the tensioning roller 46 are firmly held in the position shown in Fig. 1 so as to subject the conveyor 24 to a predetermined tension. If it is desired to adjust the tension in the conveyor 24, one of the set screws 82, 84 is turned so as to make space for a movement of the arm 80 and the handle 78 resulting in a corresponding displacement of the tensioning roller 46, whereupon the handle 78 is again held in its set position by turning the other set screw until the arm 80 is again firmly gripped by the said set screws 82, 84.

As shown in Fig. 5, the transverse shaft 38 carries also a gear 90 in mesh with a gear 92 keyed to a shaft 94 rotatably arranged in the machine. As best shown in Fig. 1, said shaft 94 carries a supplying roller 96 of the supplying section 20. Said supplying roller 96 is arranged for supplying the metallic powder to the sheets placed on the conveyor 24. In order to adjust the position of the supplying roller 96 relative to the surface of the conveyor 24 in accordance with the thickness of the sheets fed to the machine, the bearings carrying the shaft 94 may be adjusted by means of the adjusting mechanism generally indicated by 98 in Fig. 5. The supplying section 20 further comprises two rotatable rollers 100, 102. The latter is arranged at the delivery end of a funnel 104 receiving the supply of metallic powder. The amount of metallic powder to be supplied from the funnel 104 through the rollers 102, 100 and 96 to the sheets fed to the machine may be regulated by an adjustable counter weight 106 (see Fig. 5) acting on the shaft 108 carrying the roller 102.

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According to Fig. 1 the coating section 26 of the bronzing machine comprises four burnishers 110. Each burnisher 110 includes a rod 112, which is of substantially square cross section in its center part and has round end portions 114 and 116 as best shown in Figs. 3, 7 and 8. Wooden blocks 118, 120 are rigidly attached to diametrically opposite surfaces of the square center portion of the rod 112, preferably made of steel. Fabrics 122, 124 having fur lining 126, 128 are laid around said wooden blocks 118 and 120 and are attached to the rod 112 by means of screws 130. Thus, each burnisher 110 is provided with two surfaces 132, 134, which may be alternatively used for burnishing the coated surfaces of the sheets placed on the conveyor 24.

As best shown in Figs. 3, 4 and 7 the round end portion 114 of each burnisher 110 is slidably and rotatably engaged with a bore of the block-like bearing 136. Likewise, the round end portion 116 of each burnisher 110 is slidably and rotatably engaged with a block-like bearing 138.

As best shown in Figs. 2, 4 and 7 each bearing 138 of the series of bearings 138 is slidably but axially immovably arranged in a vertical slot 140 of a guiding member 142 rigidly secured to the frame of the machine. Each bearing 138 rests on a spring 144, one end of which is arranged in a recess of the guiding member 142.

The bearings 138 may be held in the slots 140 of the guiding member 142 by means of a locking plate 146 shown in a disengaged position in Fig. 4 and shown in an engaged position in Figs. 3, 5 and 7. The left-hand end of the locking plate 146 (as viewed in Fig. 4) may be engaged with a recess 148 of a holding element 150 secured to the guiding member 142. The right hand end of the locking plate 146 is provided with a slot 152. A locking screw 154 swingably mounted at 156 on the guiding member 142 may be engaged with said slot 152 when the locking plate 146 is in the locking position shown in Fig. 5. A locking nut 158 engaged with the locking screw 154 may be used for holding the locking plate 146 in its locking position.

The locking plate 146 is further provided with four threaded bores, each of which receiving a set screw 160. When the locking plate 146 is brought into its locking position shown in Figs. 3, 5 and 7, each set screw 160 may be brought into engagement with a bearing 138 so as to urge same against the action of the spring 144 into a predetermined position so as to bring the burnishers into a predetermined position relative to the conveying belt 24, as required by the thickness of the sheets to be transported through the machine. Thus, the position of the burnishers may be individually adjusted by the set screws 160.

The series of bearings 136 (see Fig. 3) engaged with the end portions 114 of the burnishers 110 at the other side of the machine are in the same manner slidably and adjustably arranged in slots 162 of a guiding member 164 mounted on the frame of the machine. The locking plate 166 disengageably mounted on the guiding element 164 is provided with a series of set screws 168 each of which being arranged for setting the associated bearing 136 in a predetermined position against the action of a spring 170.

The right hand end portion 116 of each burnisher 110 (as viewed in Fig. 3) is provided with a head 172 rigidly connected with said end portion 116. As best shown in Figs. 3, 5 and 7, each head 172 of the end portion 116 of each burnisher 110 is provided with a pin 174 or the like at each

side thereof. Each pin 174 is slidably engaged with a recess 176 of the forked end of a rocking element 178 swingably mounted on a shaft 180 of the machine. In the embodiment shown in the drawings, the recesses 176 are open at the top so that the pins 174 may be disengaged from said recesses for a purpose to be described hereinafter. However, if the pins 174 are engaged with the recesses 176 as shown in the drawings, there is a positive connection between the rocking elements 178 and their associated burnishers 110, so that the latter will be reciprocated in a direction transversely of the direction of the movements of the sheets placed on the conveyor belt 24, when the rocking elements 178 are oscillated about their pivot 180.

As best shown in Figs. 3 and 7, each rocking element 178 has two guiding bars 182 exchangeably mounted thereon by means of screws or the like. The pair of guiding bars 182 of each rocking element 178 is slidably engaged with a sliding block 184 which, in turn, is positively engaged with an eccentric sheave 186 keyed to the main driving shaft 30. Preferably, the eccentric sheaves 186 are set in such a manner on the main driving shaft 30 that the four burnishers 110 are reciprocated in a staggered manner.

The large sliding surfaces of the guiding bars 182 result in a smooth operation of the machine and cause only little wear and tear of the eccentric drives.

As known in the art, those portions of the surface of sheets which shall be coated with a metallic powder, for example, a bronze powder, are provided with a layer of a so-called "goldsize" before the sheets are fed into the bronzing machine. For example, a goldsize is applied to certain portions of the sheets in a printing press (not shown in the drawings) which delivers the thus sized sheets to the conveying belt 22, shown in Fig. 1. When the sized sheets enter the bronzing machine, obviously, the burnishers 110 are brought into contact with the sized portions of the sheets and tend to absorb to a certain degree the goldsize in their burnishing surfaces, whereby the burnishing surfaces become humid. If the humidity of the burnishing surfaces exceeds a certain degree, the polishing effect of said burnishers will be reduced and the humid burnishers rub the metallic powder also onto such portions of the sheet surfaces which should not be coated with the metallic powder. Such a disadvantageous condition of the burnishers can be readily eliminated in the bronzing machine according to the invention.

If the bronzing machine according to the invention was in operation for a certain time and the burnishing surfaces 134 of the burnishers 110, which are in the active position facing the conveyor 24 become rather humid, the machine is stopped. Thereupon, the locking plates 146 and 166 are disengaged from the guiding members 142 and 162 respectively. Now, each burnisher 110 can be lifted to a certain degree (the bearings 136 and 138 sliding in the slots of the guiding members but remaining engaged with said slots) until the pins 174 are disengaged from the slots 176 of the associated rocking element 178. After said disengagement has taken place, the burnisher 110 is rotated in the bearings 136 and 138 through an angle of 180°, so that now the previously inactive and dry burnishing surface 132 comes into the position facing the conveyor 24. Thereafter, the burnisher 110 may be lowered, the pins 174 coming again in engagement

with the slots 176 of the rocking elements 178 and the bearings 136 and 138 sliding downwardly in the slots 162 and 140 of the guiding members 164 and 142. Then the locking plates 166 and 146 are again engaged with the guiding members 164 and 142 and held in their locking position by the swingable locking device (154, 158). As the adjustment of the set screws 160 and 168 respectively has not been changed, it will be readily understood that after above described turning of the burnishers 110, the now active burnishing surface facing the conveyor 24 will be in the same position as the previously active burnishing surface now being disposed at the upper portion of the burnisher.

Above described turning of the burnishers may be accomplished in a short time of 1-2 min.

Now the bronzing machine may be operated again for a certain time. If the now active burnishing surfaces are becoming too humid, the now inactive burnishing surfaces are again sufficiently dry so that said now inactive burnishing surfaces may be brought into an active position for further use by the same manipulation and rotation of the burnishers as described above.

The burnisher 110c shown in Figs. 16 and 17 has two burnishing surfaces 132c and 134c similar to the burnisher 110 shown in Figs. 1, 3 and 8. However, the burnisher 110c is made of a hollow body 119c closed at its ends by end walls 117c. A rod or end portion 116c is inserted at each end of the burnisher into a bore of the end wall 117c and is rigidly connected thereto in any suitable manner. One of said rods 116c is provided with a head similar to the head 172 of the end portion 116 of the burnisher 110 for engagement with a rocking element 178.

Fig. 9 illustrates another embodiment of burnishers 110a which may be used in a bronzing machine according to the invention. The hollow burnishers shown in Fig. 9 have three burnishing surfaces 132a, 133a, 134a being arranged at angles of 60° relative to each other. The burnishing surface 134a of the burnishers 110a is shown in the active position facing the conveying belt 24.

In a preferred embodiment, the round end portion 116a of each burnisher passing through the bore of a bearing 138 of the bronzing machine as shown in Fig. 11 has a cylindrical stud 117a of reduced diameter. A head or connecting element 172a having a cylindrical bore 173a is rotatably arranged on said stud 117a of the end portion 116a. The head 172a and the stud 117a are held in engagement with each other by suitable means, for example, by a resilient split-ring 175a. A pin 174a is arranged on each side of the head 172a. Each pin 174a is slidably engaged with a recess 176 of the forked end of a rocking element 178 in the same manner as the pins 174 of the burnisher 110 shown in Fig. 3 are engaged with the open recesses 176 of the rocking elements 178.

Thus, when a burnisher 110a (see Fig. 9) shall be rotated so as to bring its formerly active burnishing surface 134a into an inactive position and to bring its burnishing surface 133a into an active position facing the conveyor belt 24, after the disengagement of the locking plate 146 (see Fig. 11) from the guiding member 142, the burnisher 110a is lifted together with the bearing 138 to such an extent, that the burnisher may be rotated in its bearings. If during such a rotation the pins 174a of the head 172a are still in engagement with the slots 176 of the rocking ele-

ment 178, the end portion 116a of the burnisher 110a will be rotated relative to the head 172a. If during such a rotation the pins 174a of the head 172a are out of engagement with the slots 176, the head 172a may be readily turned relative to the end portion 116a after the performance of the rotation of the burnisher 110a so as to bring the pins 174a being in coaxial alignment with each other in engagement with the slots 176 of the forked end of the rocking element 178.

As will be readily understood, the arrangement of a head 172a rotatable relative to the round end portion 116a of a burnisher may also be employed for a burnisher having only two burnishing surfaces opposite each other, as shown in Figs. 1, 8 and 16, for example. If such an arrangement is used, the slots of the rocking elements 178 could also be closed at the top; of course, they must be sufficiently long enough so as to permit the necessary lifting of the burnishers for the performance of a rotation thereof.

Fig. 10 illustrates a further embodiment of burnishers 110b which could be used in a bronzing machine according to the invention instead of the burnishers 110. The hollow burnishers 110b shown in Fig. 10 have four burnishing surfaces 131b, 132b, 133b, 134b arranged at an angle of 90° relative to each other, the burnishing surface 134b being shown in active position facing the conveyor belt 24.

The cleaning section 28 (see Fig. 1) comprises three endless dusting bands 188 of leather having a plush lining. As best shown in Figs. 1, 2, 5 and 6, each dusting band 188 is trained around a driving pulley 190 arranged on a shaft 192 journaled in suitable bearings 194 of the machine, a pulley 196 arranged on a bridge 198 adjustably mounted in the machine, a pulley 200 arranged on said shaft 192, a series of holding-down rollers 202, 204, 206 adjustably arranged at one side of the bridge 198, a pulley 208 arranged on a shaft 210 journaled in suitable bearings 212 of the machine, a pulley 214 arranged on said bridge 198, a pulley 216 arranged on the last-mentioned shaft 210, and a series of holding-down rollers 218, 220, 222 adjustably arranged on said bridge 198. According to Fig. 5, the hub 224 of each driving pulley 190 is keyed to the shaft 192; furthermore, a gear 226 in mesh with a gear 228 keyed to the main driving shaft 30 is keyed to said shaft 192. Therefore, when the main driving shaft 30 of the machine is rotated by the motor through the belt drive 32, the shaft 192 is, likewise, rotated causing a rotation of the driving pulleys 190 which, in turn, cause a movement of the dusting bands 188 in a direction transversely of the direction of the movement of the sheets through the machine.

Each of the pulleys 200 is rotatably but axially immovably arranged on the shaft 192.

As best shown in Fig. 6 the hub 230 of each pulley 208 opposite the last-mentioned pulley 200 is keyed to the shaft 210, so that the latter is rotated when the pulley 208 is driven by the dusting band 188. A gear 232 keyed to said shaft 210 is in mesh with a gear 234 (see Fig. 2) keyed to a shaft 236 journaled in suitable bearings of the machine.

Each pulley 216 (see Figs. 2 and 6) is rotatably but axially immovably arranged on the shaft 210.

Each pulley 214 (see again Figs. 2 and 6) is rotatably arranged on a shaft 238 secured to the bridge 198.

Each pulley 196 is rotatably arranged on a shaft 240 carried by a bracket 242 slidably and

adjustably mounted on the bridge 198. The bracket 242 may be displaced toward and away from the center of the machine and may be held in its adjusted position by means of screws 244. As will be readily understood, the tension in a dusting band 188 may be adjusted by an adjustment of said bracket 242 carrying the pulley 196.

According to Figs. 1 and 2 each bridge 198 is provided with a series of holes 246 arranged along the length of the bridge across the machine. Each of above-mentioned holding-down rollers 202, 204, 206, 218, 220, and 222 is rotatably arranged on a stud 248 having a head at one of its ends and having a screw-thread at its other end. Each of said studs 248 may be selectively inserted into one of the holes 246, so that the holding-down rollers 202, 204, 206, 218, 220, 222 may be arranged at predetermined distances from the center of the machine for a purpose to be described hereinafter. The studs 248 carrying the holding-down rollers may be firmly held in the bores 246 of the bridge 198 by means of nuts screwed onto the threaded end of the studs.

According to Figs. 2 and 12 each bridge 198 has a bore 250 at each end thereof. A sleeve 242 rotatably arranged in such a bore has a head 254 resting on the upper surface of the bridge 198. The sleeve 252 carries at its lower end a split-ring 256 or the like abutting against the lower surface of the bridge 198, so that the sleeve 252 is axially immovable relative to the bridge 198. The inner bore of the sleeve 252 is provided with a fine gauge thread which, in turn, is in engagement with a corresponding thread on a bolt 258 rigidly secured to the frame of the machine. Furthermore, the head 254 of the sleeve 252 is provided with a scale 260 arranged for cooperation with a pointer 262 mounted on the bridge 198. The sleeve 252 which can be rotated in the bridge 198 but cannot be axially displaced relative thereto as mentioned above acts as a micro-meter device. A rotation of said sleeve 252 will cause a lifting or lowering of the bridge 198 gripped between the head 254 and the split-ring 256 of said sleeve, as during such a rotation of the sleeve 252 the latter being in engagement with the threaded portion of the bolt 258 will be moved upwardly or downwardly. The sleeve 252 may be held in its adjusted position by means of a locking nut 264 screwed on the threaded portion of the bolt 258.

Obviously, the micrometer device 252—258 permits a fine adjustment of the distance between the holding-down rollers 202—206 and 218—222 arranged on the bridge 198 relative to the surface of the conveying belt 24, so that the position of the dusting bands 188 held down by the holding-down rollers may be readily adjusted in accordance with the thickness of the sheets transported through the machine.

The dusting bands 188 may also be readily adjusted in accordance with the size of the sheets transported through the machine. If, for example, sheets of substantially the width of the conveying belt 24 are transported through the machine, the holding-down rollers 202—206 and 218—222 may be arranged in the manner shown in Fig. 2. If sheets 266 (see Fig. 15) of a size somewhat smaller than the width of the conveying belt 24 are transported through the machine, the holding-down roller 218, for example, may be brought into the position 218' wherein its stud is engaged with the third hole 246 of the bridge 198 from the right.

In any case, the adjustable arrangement of the

holding-down rollers on the bridges 198 permits an arrangement of the holding-down rollers in such a way that the holding-down roller first engaged by the dusting band 188 when it runs along the surface of a sheet, i. e., the holding-down roller 218 (218') on one side of the bridge 198 and the holding-down roller 202 on the other side of the bridge 198, is somewhat inside of the edge of the sheet 266 as clearly shown in Fig. 15. Thus, the dusting band 188 cannot cause damage to the edge of the sheets 266 when it runs onto them.

The holding-down rollers at the running-off side of the dusting band 188, i. e., the holding-down roller 222 on one side of the bridge 198 and the holding-down roller 206 at the other side of the bridge 198 may always remain at the very end of the bridge 198; of course, if desired, they may be connected to a different hole of the bridge 198, but in any case, said holding-down rollers should be somewhat outside the edge of the sheet 266 as shown in Fig. 15.

Moreover, depending on the size of the sheets, two (see, for example, Fig. 15), three (see, for example, Fig. 2) or more holding-down rollers may be arranged on each side of the bridge 198.

As mentioned above, the main driving shaft 30 and the shaft 236 (see Figs. 2 and 5) are rotated during the operation of the machine. The main driving shaft 30 is directly driven by the motor through the belt drive 32 and the shaft 236 is driven by the main driving shaft 30 through the train of gears 228, 226, the shaft 192, the dusting bands 188, the shaft 210 and the train of gears 232, 234. Three rotary brushes 268 are arranged on each of said shafts 30 and 236, each of said rotary brushes cooperating with that portion of a dusting band, which comes from a sheet after having excess metallic powder removed therefrom.

As best shown in Figs. 3 and 14, each rotary brush 268 comprises two halves 270, 272 carrying the brushes at their circumference. Said halves 270, 272 are provided with shoulders 274, 276, 278, 280. Flanged discs 282, 284 having a center bore engaged with the shaft 30 (or 236) are arranged at the sides of the halves 270, 272. The flanged discs 282, 284 are engaged with the shoulders 274—280 of said halves 270, 272 so as to hold same together. Set collars 286, 288 arranged next to the flanged discs 282, 284 are secured to the shaft 30 (or 236) by set screws 290, 292 or the like. Each set collar 286, 288 is connected with a half 270 or 272 of the rotary brush 268 by means of a screw 294 or 296 respectively. Thus, the body of the rotary brush 268 is positively coupled with the shaft 30 or 236. Ducts 302, 304, 306 and 308 shown in Figs. 2 and 3 are arranged for leading dust stirred up during the operation of the machine into collecting containers (not shown).

The operation of the machine is as follows:

The funnel 104 is filled with a metallic powder. The burnishers 110 are connected with the rockable actuating elements 178 as shown in the drawings. The burnishers 110 are set with their active burnishing surfaces 134 in a predetermined position relative to the surface of the conveying belt 24 by means of set screws 160, 158 in accordance with the thickness of the sheets to be transported through the machine. The position of the dusting bands is adjusted in accordance with the thickness of the sheets and the size of the sheets by means of the micrometer devices 252, 254 and by means of an adjustment of the posi-

tion of the holding-down rollers 202—206 and 218—222 on the bridges 198. When the machine is started, the conveyor 24 is moved, the powder-supplying roller 96 is rotated, the burnishers 110 are reciprocated, the dusting bands 188 are moved and the rotary brushes 268 are rotated. Sheets coming from any suitable place, for example, from a printing press, which are fed to the bronzing machine by means of the conveying belt 22 reach the conveying belt 24 and are gripped by the supplying roller 96 and a holding bar 298 (see Fig. 1). The conveying belt 24 transports the sheets to the burnishing section 26 wherein the burnishers 110 coat and polish their surfaces and continues to transport same through the cleaning section 28 wherein the dusting bands 188 remove excess metallic powder from the sheets. The sheets leaving the machine at the delivery end reach a delivery conveyor 300 by means of which they are transported to a suitable place. During the operation of the machine, excess metallic powder adhering to the dusting bands is removed therefrom by means of the rotary brushes 268.

After a certain time of operation, the machine may be stopped for turning the burnishers 110 in the manner described above so as to bring the previously active burnishing surfaces of the burnishers into an inactive position and the previously inactive burnishing surfaces into the active position. Thereafter, the operation of the machine may be continued.

I have described preferred embodiments of my invention, but it is understood that this disclosure is for the purpose of illustration and that various omissions or changes in shape, proportion and arrangement of parts as well as the substitution of equivalent elements for those herein shown and described may be made without departing from the spirit and scope of the invention as set forth in the appended claims.

What I claim is:

1. A bronzing machine comprising in combination: power driven conveying means arranged for transporting sheets through the machine in a predetermined direction, supplying means arranged for supplying metallic powder to such sheets, a series of power driven burnishing elements arranged for burnishing a metallic powder supplied to such sheets, a series of power driven dusting bands arranged for moving along the surface of said conveying means in a direction transversely of the direction of movement of sheets placed on said conveying means so as to remove excess metallic powder from such sheets, a series of holding-down bridges extending across the machine, each bridge carrying a plurality of holding-down rollers arranged for cooperation with a dusting band so as to hold same down towards said conveying means, each bridge being adjustable, and micrometer devices associated with said bridges for adjusting same in a predetermined position relative to said conveying means.

2. A bronzing machine comprising in combination: power driven conveying means arranged for transporting sheets through the machine in a predetermined direction, supplying means arranged for supplying a metallic powder to such sheets, a series of power driven burnishing elements arranged for burnishing a metallic powder supplied to such sheets, a series of power driven dusting bands arranged for moving along the surface of said conveying means in a direction transversely of the direction of movement of

sheets placed on said conveying means so as to remove excess metallic powder from such sheets, a series of holding-down bridges extending across the machine, said bridges being adjustably arranged, adjusting means associated with said bridges for adjusting same in a predetermined position relative to said conveying means, a series of holding down rollers on each bridge for cooperation with a dusting band so as to hold same down towards said conveying means, said rollers being adjustably arranged on said bridges, and setting means associated with said rollers for setting same at predetermined distances from the center of the machine.

3. A bronzing machine comprising in combination: power driven conveying means arranged for transporting sheets through the machine in a predetermined direction, supplying means arranged for supplying metallic powder to such sheets, a series of power driven burnishing elements arranged for burnishing a metallic powder supplied to such sheets, a series of power driven dusting bands arranged for moving along the surface of said conveying means in a direction transversely of the direction of movement of sheets placed on said conveying means so as to remove excess metallic powder from such sheets, a series of holding-down bridges extending across the machine, said bridges being adjustably arranged, adjusting means associated with said bridges for adjusting same in a predetermined position relative to said conveying means, a series of holding-down rollers associated with each bridge for cooperation with a dusting band so as to hold same down towards said conveying means, a plurality of coupling means arranged along the length of each bridge, and means for connecting a selected number of said rollers with selected coupling means on said bridges whereby the rollers may be set at predetermined distances from the center of the machine.

4. A bronzing machine comprising in combination: power driven conveying means arranged for transporting sheets through the machine in a predetermined direction, supplying means arranged for supplying metallic powder to such sheets, a series of power driven burnishing elements arranged for burnishing a metallic powder supplied to such sheets, a series of power driven dusting bands arranged for moving along the surface of said conveying means in a direction transversely of the direction of movement of sheets placed on said conveying means so as to remove excess metallic powder from such sheets, a series of holding-down bridges extending across the machine, said bridges being adjustably arranged, adjusting means associated with said bridges for adjusting same in a predetermined position relative to said conveying means, each of said bridges being provided with a plurality of holes along its length, a series of holding-down rollers, a series of studs rotatably carrying said rollers, and connecting means for connecting said studs with selected holes of said bridges whereby the rollers may be set at predetermined distances from the center of the machine for cooperation with a dusting band so as to hold same down towards said conveying means.

5. A bronzing machine comprising in combination: power driven conveying means arranged for transporting sheets through the machine in a predetermined direction, supplying means arranged for supplying metallic powder to such sheets, a series of power driven burnishing elements arranged for burnishing a metallic powder supplied to such sheets, a series of power driven

dusting bands for moving along the surface of said conveying means in a direction transversely of the direction of movement of sheets placed on said conveying means so as to remove excess metallic powder from such sheets, at least one power driven shaft, a series of split rotary brushes connected with said shaft and arranged for cooperation with the dusting bands, each of said split rotary brushes including a plurality of parts carrying brushes, and means for connecting the parts of a split brush with each other.

6. A bronzing machine comprising in combination: power driven conveying means arranged for transporting sheets through the machine in a predetermined direction, supplying means arranged for supplying metallic powder to such sheets, a series of power driven burnishing elements arranged for burnishing a metallic powder supplied to such sheets, a series of power driven dusting bands arranged for moving along the surface of said conveying means in a direction transversely of the direction of movement of sheets placed on said conveying means so as to remove excess metallic powder from such sheets, at least one power driven shaft, a series of split rotary brushes connected with said shaft and arranged for cooperation with the dusting bands, each of said split rotary brushes including a plurality of parts carrying brushes, each of said parts of a split brush having a shoulder at each side, flanged discs arranged at the sides of said parts, each disc having a bore receiving said shaft and being engaged by its flange with said shoulders so as to hold said parts together, and set collars secured to said shaft and to said discs.

7. In a bronzing machine the combination of: power driven conveying means arranged for transporting sheets through the machine in a substantially horizontal direction, a series of burnishing elements, a series of sets of bearings, the burnishing elements of said series of burnishing elements being reciprocable in sets of bearings of said series of sets of bearings for reciprocating movements in a direction transversely of the direction of movements of sheets placed on said conveying means, each burnishing element having at least two burnishing surfaces and being adjustable for selectively bringing one of its burnishing surfaces into an active position facing the conveying means and bringing its other burnishing surface into an inactive position, upwardly extending guiding means mounted on each side of the machine, said sets of bearings being movably engaged with said guiding means for displacement of the associated burnishing element towards and away from the conveying means, holding means associated with said bearings for holding same in a predetermined position relative to said guiding means, and a drive associated with said burnishing elements for reciprocating same.

8. In a bronzing machine the combination of: power driven conveying means arranged for transporting sheets through the machine in a substantially horizontal direction, a series of burnishing elements, a series of sets of bearings, the burnishing elements of said series of burnishing elements being reciprocable in sets of bearings of said series of sets of bearings for reciprocating movements in a direction transversely of the direction of movements of sheets placed on said conveying means, each burnishing element having at least two burnishing surfaces and being adjustable for selectively bringing one of its burnishing surfaces into an active position

facing the conveying means and bringing its other burnishing surface into an inactive position, a guiding member mounted on each side of the machine, each guiding member being provided with a series of upwardly extending slots, said sets of bearings being movably engaged with said slots of said guiding members for displacement of the associated burnishing element towards and away from the conveying means, holding means associated with said bearings for holding same in a predetermined position in said slots, and a drive associated with said burnishing elements for reciprocating same.

9. In a bronzing machine as claimed in claim 7, said bearings being in releasable engagement with said guiding means.

10. In a bronzing machine the combination of: power driven conveying means arranged for transporting sheets through the machine in a substantially horizontal direction, a series of burnishing elements, a series of sets of bearings, the burnishing elements of said series of burnishing elements being reciprocable in sets of bearings of said series of sets of bearings for reciprocating movements in a direction transversely of the direction of movements of sheets placed on said conveying means, each burnishing element having at least two burnishing surfaces and being adjustable for selectively bringing one of its burnishing surfaces into an active position facing the conveying means and bringing its other burnishing surface into an inactive position, upwardly extending guiding means mounted on each side of the machine, said sets of bearings being movably engaged with said guiding means for displacement of the associated burnishing element towards and away from the conveying means, holding means associated with said bearings for holding same in a predetermined position relative to said guiding means, a series of power driven actuating means, and at least one upwardly extending guide on each of said actuating means, each burnishing element being in positive and movable engagement with the guide of an associated actuating means of said series of actuating means.

11. In a bronzing machine as claimed in claim 10, said burnishing elements being in releasable engagement with said guides of the actuating means.

12. In a bronzing machine the combination of: power driven conveying means arranged for transporting sheets through the machine in a substantially horizontal direction, a series of burnishing elements, a series of sets of bearings, the burnishing elements of said series of burnishing elements being reciprocable in sets of bearings of said series of sets of bearings for reciprocating movements in a direction transversely of the direction of movement of sheets placed on said conveying means, each burnishing element having at least two burnishing surfaces and being adjustable for selectively bringing one of its burnishing surfaces into an active position facing the conveying means and bringing its other burnishing surface into an inactive position, a guiding member mounted on each side of the machine, each guiding member being provided with a series of upwardly extending slots, said sets of bearings being movably engaged with said slots of said guiding members for displacement of the associated burnishing element towards and away from the conveying means, holding means associated with said bearings for holding same in a predetermined position in said

slots, and a series of power driven actuating means, each actuating means having at least one upwardly extending slot, and each burnishing element being in positive and movable engagement with the slot of an associated actuating means of said series of actuating means.

13. In a bronzing machine as claimed in claim 12, said bearings being in releasable engagement with the slots of the guiding members, and said burnishing elements being in releasable engagement with the slots of the actuating means.

14. In a bronzing machine as claimed in claim 7, each of said burnishing elements being rotatably arranged in its associated bearings whereby after a displacement away from the conveying means the burnishing element may be rotated relative to its bearings for bringing one of its burnishing surfaces into the active position facing the conveying means.

15. In a bronzing machine the combination of: power driven conveying means arranged for transporting sheets through the machine in a substantially horizontal direction, a series of burnishing elements, a series of sets of bearings, the burnishing elements of said series of burnishing elements being reciprocable in sets of bearings of said series of sets of bearings for reciprocating movements in a direction transversely of the direction of movements of sheets placed on said conveying means, each burnishing element having at least two burnishing surfaces and being adjustable for selectively bringing one of its burnishing surfaces into an active position facing the conveying means and bringing its other burnishing surface into an inactive position, upwardly extending guiding means mounted on each side of the machine, said sets of bearings being movably engaged with said guiding means for displacement of the associated burnishing element towards and away from the conveying means, settable holding means arranged on said guiding means, said settable holding means being capable of abutting engagement with said bearings so as to hold same in a predetermined position relative to said guiding means upon a displacement of the burnishing elements towards the conveying means, and a drive associated with said burnishing elements for reciprocating same.

16. In a bronzing machine the combination of: power driven conveying means arranged for transporting sheets through the machine in a substantially horizontal direction, a series of burnishing elements, a series of sets of bearings, the burnishing elements of said series of burnishing elements being reciprocable in sets of bearings of said series of sets of bearings for reciprocating movements in a direction transversely of the direction of movements of sheets placed on said conveying means, each burnishing element having at least two burnishing surfaces and being adjustable for selectively bringing one of its burnishing surfaces into an active position facing the conveying means and bringing its other burnishing surface into an inactive position, a guiding member mounted on each side of the machine, each guiding member being provided with a series of upwardly extending slots open at the top, said sets of bearings being slidably and removably engaged with said slots of said guiding members for displacement of the associated burnishing element towards and away from the conveying means, springs arranged at the bottom of the slots of the guiding members for supporting the bearings when inserted there-

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in, a locking element detachably mounted on each guiding member, a series of adjustable setting means arranged on each locking element for cooperation with the upper surface of said bearings so as to hold same in a predetermined position in said slots against the action of said springs, and a drive associated with said burnishing elements for reciprocating same.

17. In a bronzing machine the combination of: power driven conveying means arranged for transporting sheets through the machine in a substantially horizontal direction, a series of burnishing elements, a series of sets of bearings, the burnishing elements of said series of burnishing elements being reciprocable in sets of bearings of said series of sets of bearings for reciprocating movements in a direction transversely of the direction of movements of sheets placed on said conveying means, each burnishing element having at least two burnishing surfaces and being adjustable for selectively bringing one of its burnishing surfaces into an active position facing the conveying means and bringing its other burnishing surface into an inactive position, a guiding member mounted on each side of the machine, each guiding member being provided with a series of upwardly extending slots open at the top, said sets of bearings being slidably and removably engaged with said slots of said guiding members for displacement of the associated burnishing element toward and away from the conveying means, springs arranged at the bottom of the slots of the guiding members for supporting the bearings when inserted therein, a locking element detachably mounted on each guiding member, a series of adjustable setting means arranged on each locking element for cooperation with the upper surface of said bearings so as to hold same in a predetermined position in said slots against the action of said springs, a series of power driven actuating means, and at least one upwardly extending guide on each of said actuating means, each burnishing element being in positive and movable engagement with the guide of an associated actuating means of said series of actuating means.

18. In a bronzing machine as claimed in claim 17, said burnishing elements being in releasable engagement with said guides of the actuating means.

19. In a bronzing machine the combination of: power driven conveying means arranged for transporting sheets through the machine in a substantially horizontal direction, supplying means arranged for supplying metallic powder to such sheets, a series of burnishing elements, a series of sets of bearings, the burnishing elements of said series of burnishing elements being reciprocable in sets of bearings of said series of sets of bearings for reciprocating movements in a direction transversely of the direction of movements of sheets placed on said conveying means, each burnishing element having at least two burnishing surfaces and being adjustable for selectively bringing one of its burnishing surfaces into an active position facing the conveying means and bringing its other burnishing surface into an inactive position, upwardly extending guiding means mounted on each side of the machine, said sets of bearings being movably engaged with said guiding means for displacement of the associated burnishing element towards and away from the conveying means, holding means associated with said bearings for holding same in a predetermined position relative to said guiding means, a drive associated with said burnish-

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ing elements for reciprocating same, a series of power driven dusting bands arranged for moving along the surface of said conveying means in a direction transversely of the direction of movement of sheets placed on said conveying means so as to remove excess metallic powder from the sheets, a series of holding-down bridges extending across the machine, each bridge carrying a plurality of holding-down rollers arranged for cooperation with a dusting band so as to hold same down towards said conveying means, each bridge being adjustable, and adjusting means associated with said bridges for adjusting same in a predetermined position relative to said conveying means.

20. In a bronzing machine the combination of: power driven conveying means arranged for transporting sheets through the machine in a substantially horizontal direction, supplying means arranged for supplying metallic powder to such sheets, a series of burnishing elements, a series of sets of bearings, the burnishing elements of said series of burnishing elements being reciprocable in sets of bearings of said series of sets of bearings for reciprocating movements in a direction transversely of the direction of movements of sheets placed on said conveying means, each burnishing element having at least two burnishing surfaces and being adjustable for selectively bringing one of its burnishing surfaces into an active position facing the conveying means and bringing its other burnishing surface into an inactive position, upwardly extending guiding means mounted on each side of the machine, said sets of bearings being movably engaged with said guiding means for displacement of the associated burnishing element towards and away from the conveying means, holding means associated with said bearings for holding same in a predetermined position relative to said guiding means, a drive associated with said burnishing element for reciprocating same, a series of power driven dusting bands arranged for moving along the surface of said conveying means in a direction transversely of the direction of movement of sheets placed on said conveying means so as to remove excess metallic powder from the sheets, a series of holding down bridges extending across the machine, said bridges being adjustably arranged, adjusting means associated with said bridges for adjusting same in a predetermined position relative to said conveying means, a series of holding down rollers on each bridge for cooperation with a dusting band so as to hold same down towards said conveying means, said rollers being adjustably arranged on said bridges, and setting means associated with said rollers for setting same at predetermined distances from the center of the machine.

21. In a bronzing machine the combination of: power driven conveying means arranged for transporting sheets through the machine in a substantially horizontal direction, supplying means arranged for supplying metallic powder to such sheets, a series of burnishing elements, a series of sets of bearings, the burnishing elements of said series of burnishing elements being reciprocable in sets of bearings of said series of sets of bearings for reciprocating movements in a direction transversely of the direction of movements of sheets placed on said conveying means, each burnishing element having at least two burnishing surfaces and being adjustable for selectively bringing one of its burnishing surfaces into an active position facing the conveying means and bringing its other burnishing surface

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into an inactive position, upwardly extending guiding means mounted on each side of the machine, said sets of bearings being movably engaged with said guiding means for displacement of the associated burnishing element toward and away from the conveying means, holding means associated with said bearings for holding same in a predetermined position relative to said guiding means, a drive associated with said burnishing elements for reciprocating same, a series of power driven dusting bands arranged for moving along the surface of said conveying means in a direction transversely of the direction of movement of sheets placed on said conveying means so as to remove excess metallic powder from the sheets, a series of holding-down bridges extending across the machine, said bridges being adjustably arranged, adjusting means associated with said bridges for adjusting same in a predetermined position relative to said conveying means, each of said bridges being provided with a plurality of holes along its length, a series of holding-down rollers, a series of studs rotatably carrying

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said rollers, and connecting means for connecting said studs with selected holes of said bridges whereby the rollers may be set at predetermined distances from the center of the machine for cooperation with a dusting band so as to hold same down towards said conveying means.

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