

Sept. 6, 1966

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3,271,027

STACKING DEVICE

Original Filed Sept. 4, 1962

3 Sheets-Sheet 1

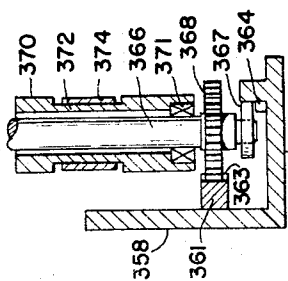
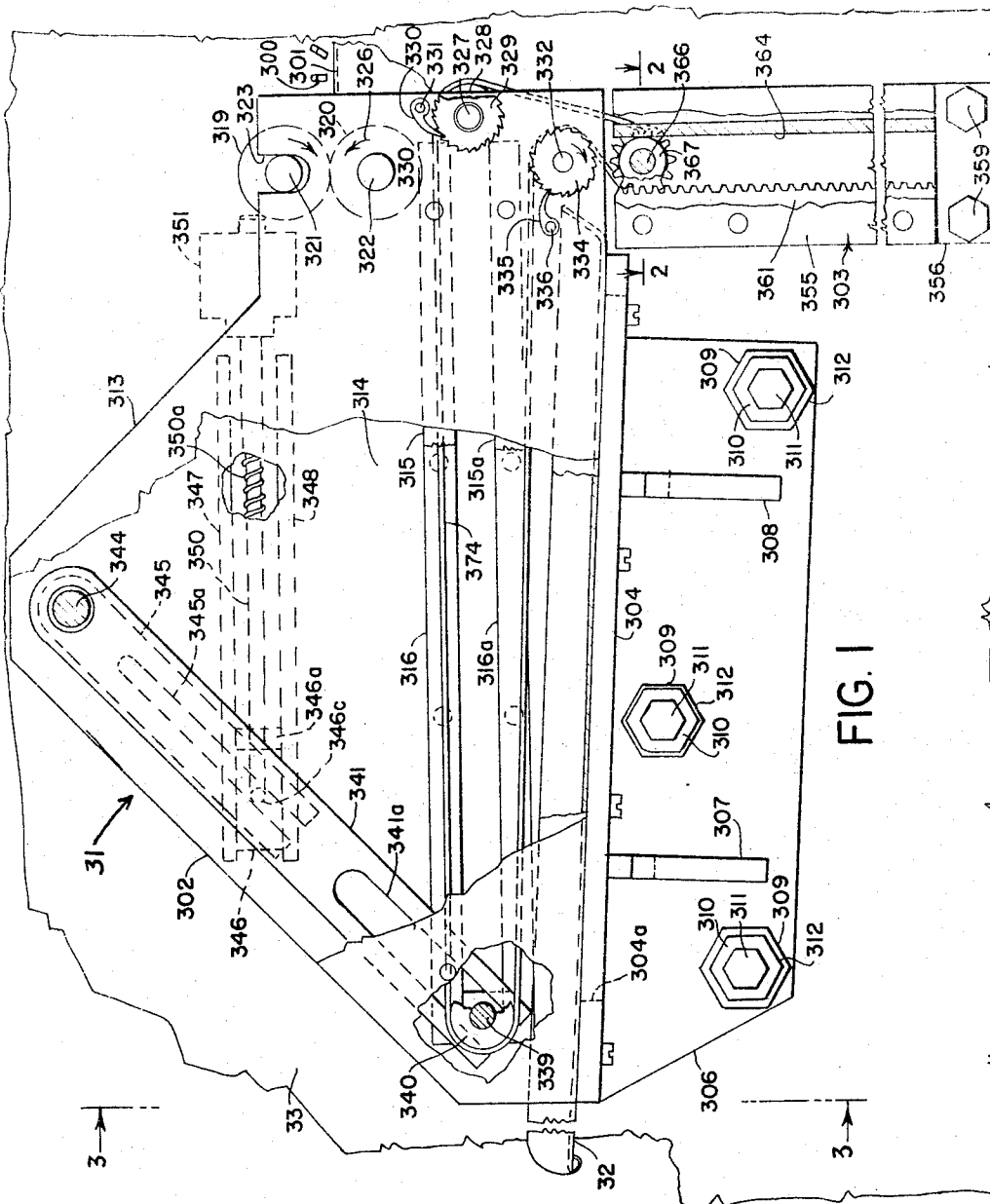


FIG. 2

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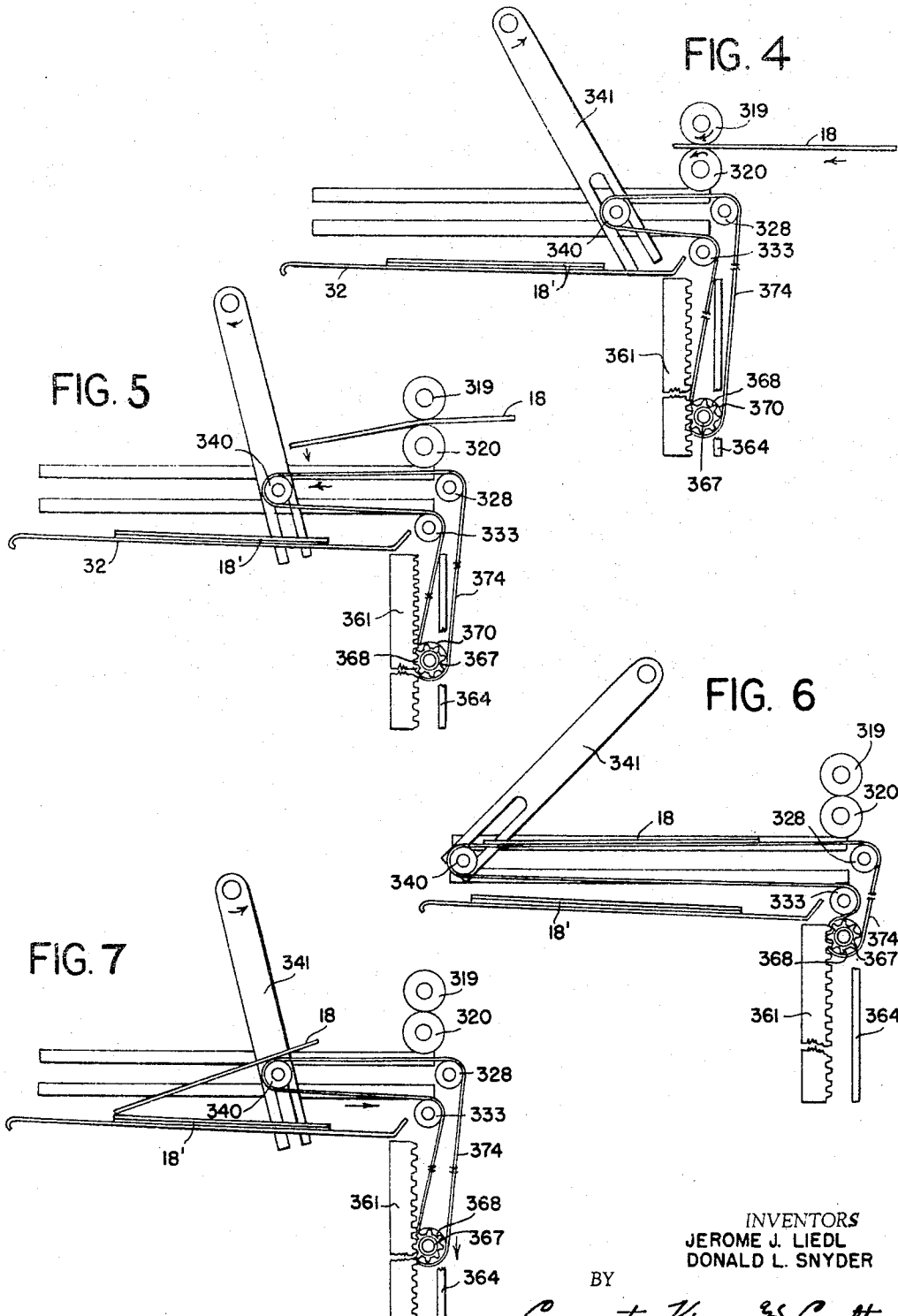
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STACKING DEVICE

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Original application Sept. 4, 1962, Ser. No. 221,039, now Patent No. 3,218,950. Divided and this application July 2, 1965, Ser. No. 469,222

3 Claims. (Cl. 271—78)

This application is a divisional application of copending application Serial No. 221,039, filed September 4, 1962, now Patent No. 3,218,950.

This invention relates to a sheet stacking device and in one aspect to a device for receiving sheet material as the same is fed out of a processing machine and for stacking the sheet material in a manner to limit any rubbing of one sheet relative to a previously stacked sheet.

The present invention provides a novel stacking device which is particularly useful in stacking articles such as planograph or lithographic plates which have a resin coated surface which may be damaged by sharp edges as they are moved across the surface. Further, abrasion by sliding one plate over another has a deleterious effect on the coated surface.

The present invention has an advantage of providing a novel stacking mechanism for stacking sheet material in a manner to prevent any scraping or scratching of the material during the stacking of such material.

The present invention is readily useable to receive and stack printing plates as they are sequentially fed out of an apparatus for exposing and/or processing such plates.

The above and further advantages of the present invention will be more apparent after reading the following detailed description which refers to the accompanying drawing wherein like reference characters refer to like parts throughout the several views and wherein:

FIGURE 1 is an enlarged elevation view of the stacking device formed in accordance with the present invention with certain parts being broken away and certain parts located interiorly being shown in phantom lines;

FIGURE 2 is a detailed sectional view taken along the line 2—2 of FIGURE 1;

FIGURE 3 is an end elevation view of the stacker shown in FIGURE 1, the view being taken generally along the line 3—3 of FIGURE 1; and

FIGURES 4, 5, 6 and 7 are diagrammatic elevation views of the stacking device showing certain parts located in various positions during an operating cycle.

Referring now to the drawing and particularly to FIGURE 1 it will be seen that the stacking device, generally designated 31 is adapted to be mounted on a support panel or wall 33 in a cantilever manner with the stacker 31 oriented to receive a plate or similar sheet material 18 at the right side of the stacker as shown in FIGURES 1, 4, 5, 6 and 7. The plate 18 as it is fed from a processing apparatus or similar apparatus may be directed across a shelf 301. The presence of the plate 18 on the shelf 301 may be detected by a photoelectric cell 300 which operates a timing device (not shown) and subsequently the unique reciprocatory stacking mechanism of the stacker 31.

The stacker 31 receives the plates 18 and stacks said plates in a tray 32. The plates 18 are stacked in a manner such that there is no sliding movement between the plates whereby the sharp edges, inherently present in the thin aluminum printing plates, will not scratch and deleteriously affect the previously exposed plates stacked in the tray 32. The stacker 31 comprises an upper frame portion generally designated 302 and a vertically positioned sub-frame 303.

Referring particularly to FIGURES 1 and 3, the upper frame 302 and the sub-frame 303 are mounted in a cantilever manner on the main support wall 33. The frame 302 comprises a main support plate 304 secured by weldments to a vertically disposed plate 306. A pair of gusset plates 307 and 308 are suitably positioned between the plates 304 and 306 to reinforce the main support plate 304 from the plate 306. The vertical plate 306 is secured to the main support wall 33 by adjustable fastening means 309 in a manner such that the plate 304 slopes downwardly from the front to the rear (left to right as viewed in FIGURE 1). The fastening means 309 facilitate alignment of the stacker 31 with the support wall 33 and shelf 301. Each fastening means 309 comprises a first bolt 310 which is center bored and threaded to receive therethrough a second bolt member 311. The bolt 310 is threaded through a suitable opening formed in the plate 306 and abuts the wall 33 at one end to position said plate from said wall in the manner desired. A lock nut 312 threaded on the bolt 310 engages plate 306 retaining the bolt 310 in its desired position. Bolt 311, threaded through the center bore of bolt 310, is turned into a threaded opening in the wall 33 thus securing the plate 306 and frame 302 thereto.

Extending upward from the main support plate 304 are transversely spaced side plates 313 and 314 which provide support for a plurality of transverse shafts as will hereinafter appear. Secured to the opposing surfaces of each of the side walls 313 and 314 are a pair of longitudinally disposed vertically spaced parallel members 315, 315a, 316 and 316a which form horizontal parallel tracks therebetween extending across each of said side plates substantially the entire length thereof. The tray 32 is disposed between the side plates 313 and 314 and is positioned on the upper surface of the main support plate 304. The tracks formed between the members 315, 315a, 316 and 316a are disposed in a horizontal plane above a plane of the tray 32.

A pair of transversely disposed feed rollers 319 and 320 are supported by the rear portion of the side plates 313 and 314 to receive therebetween the plate 18 as it is directed across the shelf 301. Roller 319 is mounted on a shaft 321 which is floatably supported in slotted openings 323 formed in the side walls 313 and 314. Roller 319 contacts and is driven by the roller 320 which is mounted on a driven shaft 322. The driven shaft 322 is suitably journaled in the side plates 313 and 314 and extends through and is suitably journaled in the support wall 33. A sprocket wheel 325 is fixed to the extended end of shaft 322 and is driven from the main drive chain which passes around said sprocket wheel. A suitable main drive chain drives the sprocket wheel 325, shaft 322 and the roller 320 in the direction indicated by the arrow 326 to feed a plate 18 forwardly into the stacking mechanism.

As the plate 18 moves forwardly through the feed rollers 319 and 320, an extensible apron is moved forwardly in the plane of the tracks formed by the strip members 315, 315a, 316 and 316a to receive said plate thereon. When the plate 18 drops from the rollers 319 and 320, it rests entirely on the apron which has been extended under the entire length of the plate. Means is then provided to retract the apron from beneath the plate allowing the same to be laid gently into the tray 32.

The apron as illustrated is formed of a pair of endless flexible belts 373 and 374 directed around a plurality of transverse rollers, two of which are movable to move said apron from a retracted position adjacent one end of the tray 32 to an extended position overlying said tray. The first movable roller, formed by a shaft 339 and spaced rollers 340, is reciprocated across the tracks and

the second movable roller, formed by a shaft 366 and a sleeve 370 moves in response to said reciprocation toward and away from one end of the tracks in a manner to be hereinafter described. The rotation of the belts 373 and 374 is limited to rotation in a single direction by a pair of shafts engaging each run of the belts between the shaft 339 and 366.

The first of these shafts limiting rotation is a transverse shaft 327 rotatably supported in the side plates 313 and 314 adjacent one end of the tracks formed by the members 315, 315a, 316 and 316a. A pair of spaced apart crowned rollers 328 are secured on the shaft 327 intermediate the ends thereof and a ratchet wheel 329 is secured to said shaft on the outboard side of the plate 313. Positioned above the ratchet wheel 329 is a pivoted pawl 330 mounted on a pin 331. The pawl 330 is positioned and arranged to engage the teeth on the ratchet wheel 329 in the usual manner providing a oneway braking device allowing only counterclockwise rotation of said ratchet wheel 329, shaft 327 and rollers 328 as viewed in FIGURE 1. Positioned beneath and adjacent one end of the track formed by the members 315, 315a 316 and 316a is a second shaft 332 limiting rotation of the belts 373 and 374. The shaft 332 is suitably journaled in the rear portion of the plates 313 and 314. Shaft 332 carries a similar pair of crowned rollers 333 and has secured thereto a ratchet wheel 334. A pawl 335 is pivotally mounted on a pin 336 and engages the ratchet wheel 334 in a conventional manner to allow only clockwise rotation of the ratchet wheel 334, shaft 332 and rollers 333.

A pair of blocks 337 and 337a, preferably formed of a material such as nylon, are disposed between and slidable in the tracks formed by the members 315 and 315a on the side plate 313, and 316a on the side plate 314, respectively. The blocks 337 and 337a are formed with a center bore to receive the ends of the movable transverse shaft 339. The shaft 339 supports a pair of crowned rollers 340 and is moved forwardly and rearwardly across the tracks by a pair of oscillating crank arms 341 and 342. The crank arms 341 and 342 are formed with slotted openings 341a and 342a respectively, in the lower free ends thereof through which said shaft 339 extends. The arms 341 and 342 are secured to and extend radially from a shaft 344 journaled in the upper portion of the plates 313 and 314, as shown in the drawings. The shaft 344 has one end thereof extending through the main support wall 33 and has secured thereto a third crank arm 345. Oscillation of the shaft 344 and the arms 341 and 342 is provided by the crank arm 345 and a reciprocating slide block 346. The slide block 346 is movable longitudinally along a track formed adjacent the wall 33 by a pair of spaced apart parallel rails 347 and 348 secured to said wall 33. The slide block 346 is provided with a projection 346a in which is formed a threaded opening 346b. The block 346 is also provided with a cylindrical projection 346c which extends into a slot 345a formed in the free end of the crank arm 345. A rotatable shaft 350 formed with helical screw threads 350a extends longitudinally parallel with the rails 347 and 348 and is threaded through the opening 346b to reciprocate the block 346 in the track formed by the rails 347 and 348. Rotation of the shaft 350 is effected by a suitable connection with a reversible direct current motor 351. The motor 351 is operated from a suitable source of direct current connected in circuit with a switching device controlled and operated by the aforementioned timer which is energized by the photoelectric cell 300 and said switching device is operated by a micro-switch (not shown) positioned at the forward end of the rails 347 and 348, and actuated by engagement of the slide block 346 therewith. Actuation of said micro-switch causes the switching device to reverse the motor 351 affording rearward movement of said block. Reciprocation of the block 346 causes oscillation of the arms 341 and 342 to move the shaft 339 and blocks 337 and

337a forwardly and rearwardly in the tracks formed in the side plates 313 and 314. Slots 304a and 304b, formed in the main support plate 304, allow unobstructed oscillation of the crank arms 341 and 342 as they carry the shaft 339 forwardly and rearwardly over the tray 32.

The lower sub-frame 303 comprises a pair of side plates 355 and 356 secured to the ends of transversely extending plate members 357 and 358. The frame 303 is supported from the wall 33 by means of bolts 359 and lock nuts 360. The bolts 359 extend through the plate 356 and are threaded into suitable openings provided in said wall 33. The lock nuts 360 serve to maintain the sub-frame 303 in proper aligned position. Secured adjacent the ends of the plates 357 and 358 are a pair of rails 361 and 362 which extend vertically and parallel with the side plates 355 and 356. The rails 361 and 362 have teeth 363 formed on the rear edges thereof forming cog rails. A second set of rails 364 and 365 are secured along the rear ends of the side plates 355 and 356. As shown in FIGURE 8, the rails 364 and 365 are formed of angle bars forming a forwardly projecting shoulder portion and a flat rolling surface.

The second movable shaft 366 is disposed transversely between the vertical side plates 355 and 356 and carries adjacent each end thereof a smooth roller 367, rotatably supported thereon, and a pinion 368 fixedly secured thereto. The rollers 367 are positioned adjacent the ends of the shaft 366 to roll up and down the rolling surface of the rails 364 and 365. The pinions 368 are positioned adjacent the rails 361 and 362 such that the teeth formed thereon intermesh with the teeth 363 formed on said rails 361 and 362. With the shaft 366 mounted in this manner, it can travel up and down the rails and will remain horizontal at all times. A sleeve 370 formed of a heavy material is journaled, by means of bearings 371 (see FIGURE 2), intermediate the ends of the shaft 366, and is provided with spaced grooves 372 in the outer surface thereof. The sleeve 370 thus sufficiently tensions each run of the belts between the shaft 339 and the shaft 366 so they will engage the shafts limiting belt rotation.

The pair of endless flexible belts 373 and 374 pass around the crowned rollers 328 on shaft 327, 340 on shaft 339, 333 on shaft 332, and around the sleeve 370 on shaft 366 in the grooves 372, as shown most clearly in FIGURE 1. The belts 373 and 374 form the apron which receives the plate 18 as it is fed into the stacker 31. This is effected by movement of the shaft 339 and the belts 373 and 374 forwardly from a retracted position as shown in FIGURE 4. The crank arms 341 and 342 move the shaft 339 at a speed such that the linear velocity of the belts 373 and 374 between the rollers 328 and 340 match the speed of the plate 18 being fed through rollers 319 and 320.

As the shaft 339 is moved forwardly, the belt is drawn around the shaft 327, causing the shaft 366 to move upwardly. FIGURE 5 shows the position of the apron after it has traveled substantially half way across the tracks formed for the shaft 339. This figure also shows the shaft 366 climbing racks 361 and 362 of the lower frame 303. As the shaft 339 reaches the forward end of the track, the plate 18 drops from the feed rollers 319 and 320 onto the belt, as shown in FIGURE 6. When the shaft 339 and the belt is in this extended position overlying the tray 32, the shaft 366 has climbed to the upper portion of the sub-frame 303. At this point the slide block 346 strikes the micro-switch (not shown), reversing the current to the motor 351 to effect rearward movement of the block 346 and the shaft 339.

Upon rearward movement of the shaft 339, the belt is retracted from beneath the plate 18. Retraction of the belt is effected by the heavy sleeve 370 on shaft 366 tending to drop the shaft to its position in the lower portion of the sub-frame 303 under forces of gravity. Upon retraction of the belts from beneath the plate 18, shaft 327 is locked and shaft 332 is permitted to rotate in a clockwise direction to peel the belt from beneath the plate

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without imparting any rearward movement of the plate relative to the tray 32 since the direction of rotation of the belts is still in the same direction. As the belts are retracted, the plate 18 then is laid in the tray 32 as shown in FIGURE 7 and the air cushion formed between said plate and the tray 32, or previously stacked plates 18, lays the plate gently onto said plates or tray.

When the plate 18 is stacked in the tray, the belts 373 and 374 are in the retracted initial position such that subsequent plates which are fed across the shelf 301 are detected by the photoelectric cell 300 to again operate the stacking mechanism.

The drive chain for driving the sprocket wheel 325 may be driven from the processor apparatus or similar device to which the stacker 31 may be associated, to operate the roller 320 at a speed corresponding to other parts of such apparatus. The roller 320 could however be driven in any other well known manner.

While one embodiment of the present invention has been described in the foregoing specification and illustrated in the accompanying drawings, it will be apparent that various omissions and substitutions and changes in the form and details of the device illustrated, and its operation, may be made by those skilled in the art without departing from the spirit and scope of the invention. It is not intended, therefore, that the present invention shall be limited to the embodiment shown nor otherwise than by the terms of the appended claims.

What is claimed is:

1. In a stacking device, a first revoluble roller, a second revoluble roller parallel to said first roller, an endless flexible web passing around said rollers defining spaced first and second runs of said web, means for placing said web under tension, means for reciprocating said first roller in a plane containing the axis thereof, and limit means engaging each run of said web between said rollers and oppositely acting to limit the rotational movement of said web about said rollers to a single direction, a first of said limit means preventing movement of the first run of the web as said first roller is moved in one direction and a second of said limit means preventing movement of the second run of the web as said first roller is moved in a direction opposite said one direction.

2. A stacking device comprising means defining a generally horizontally disposed track, a first movable roller mounted for movement across said track, a pair of rollers rotatably mounted adjacent one end of said track, a second movable roller mounted for vertical movement hav-

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ing an upper position adjacent said one end and a lower position spaced from said one end, an endless flexible web directed around each of said first and second rollers and over each of said pair of rollers and having a first generally vertical position with respect to said track when said first roller is adjacent said one end and said second roller is in its lower position and a second position generally parallel with said track when said first roller is moved across said track and said second roller is adjacent said one end, stop means engageable with said pair of rollers limiting the rotation of each roller of said pair and the advance of a portion of said web associated therewith to a single direction, and means for moving said first roller across said track to move said web from said first position to said second position and back to said first position, said movement imparting rotational movement to said web in only one direction.

3. A stacking device comprising means defining a track disposed in a first plane, a first movable roller mounted for movement across said track, a pair of rollers rotatably mounted adjacent one end of said track, a second movable roller mounted for movement toward and away from said end and having a first position adjacent said one end and a second position spaced from said one end, an endless flexible belt passing around each of said rollers and having a first position adjacent one end of said track when said first roller is adjacent said one end and said second roller is in its said second position and said belt having a second position generally parallel with said track when said first roller is moved across said track and said second roller is in its said second position, stop means engageable with said pair of rollers mounted adjacent one end of said track for limiting the rotation of each roller of said pair to a single direction, and a pair of oscillatable radial arms secured to a rotatable shaft which is mounted above said track for moving said first roller across said track.

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