

Dec. 10, 1929.

G. W. LENTZ

1,739,319

SHEET STACKER

Filed Sept. 19, 1928

4 Sheets-Sheet 1

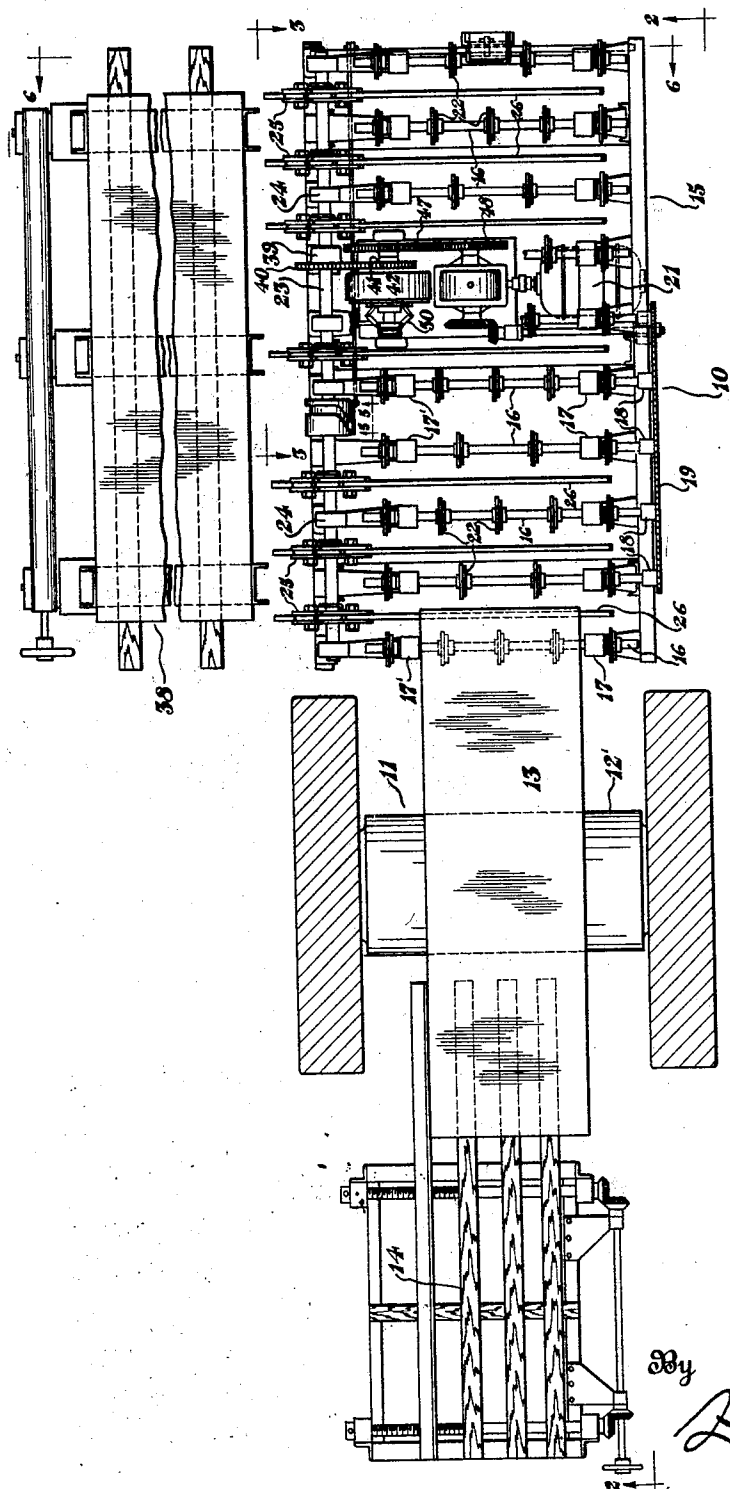


Fig. 1

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4 Sheets-Sheet 2

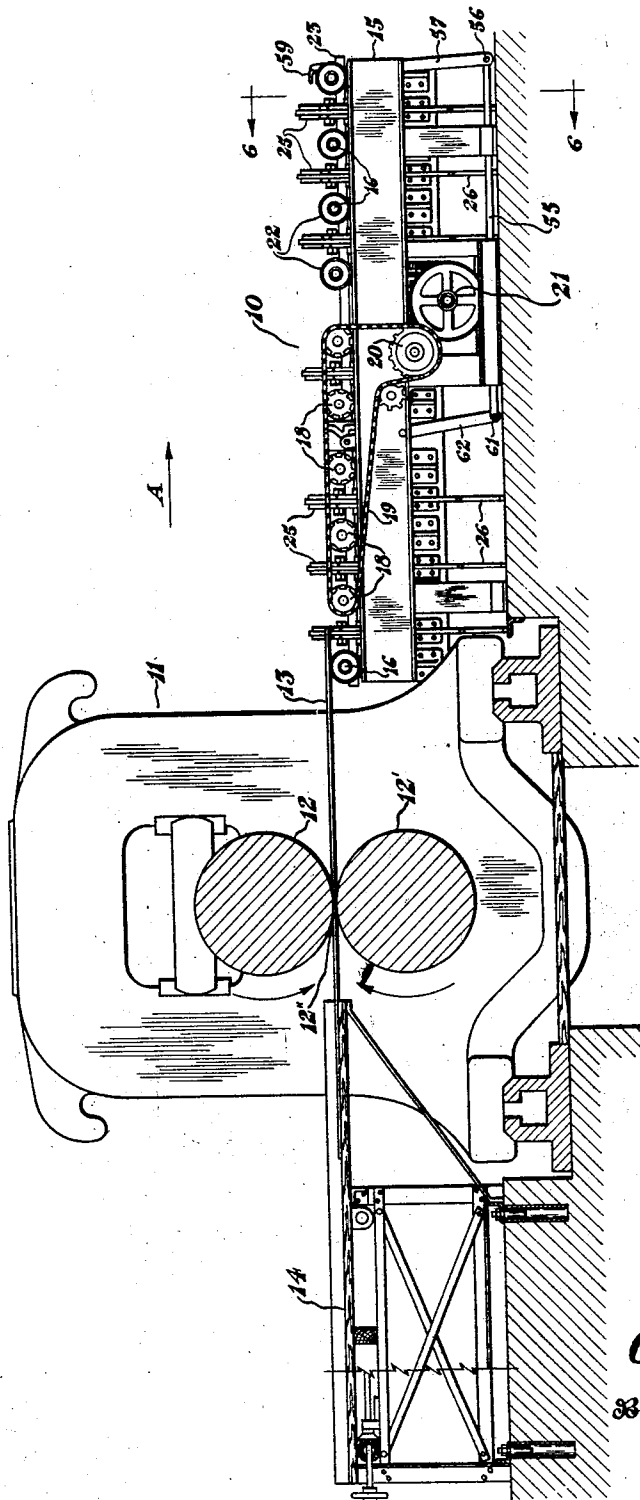


Fig. 2

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4 Sheets-Sheet 3

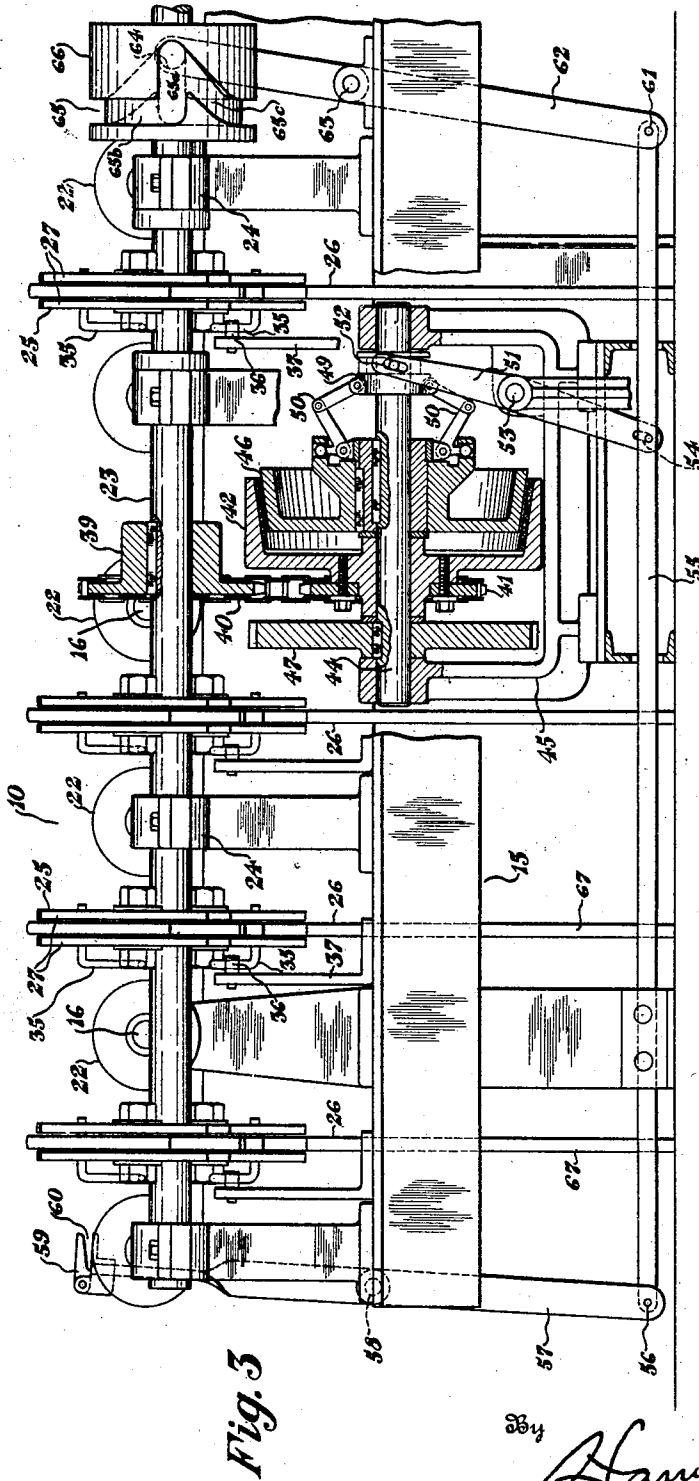


Fig. 3

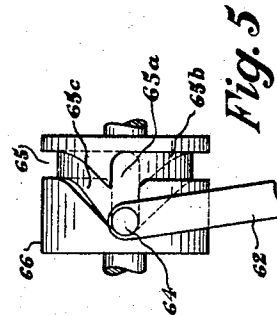


Fig. 5

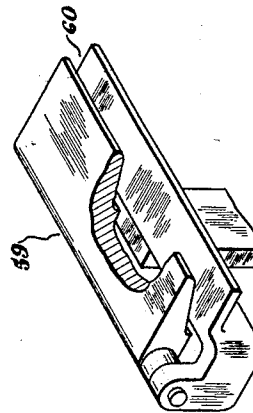


Fig. 4

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384

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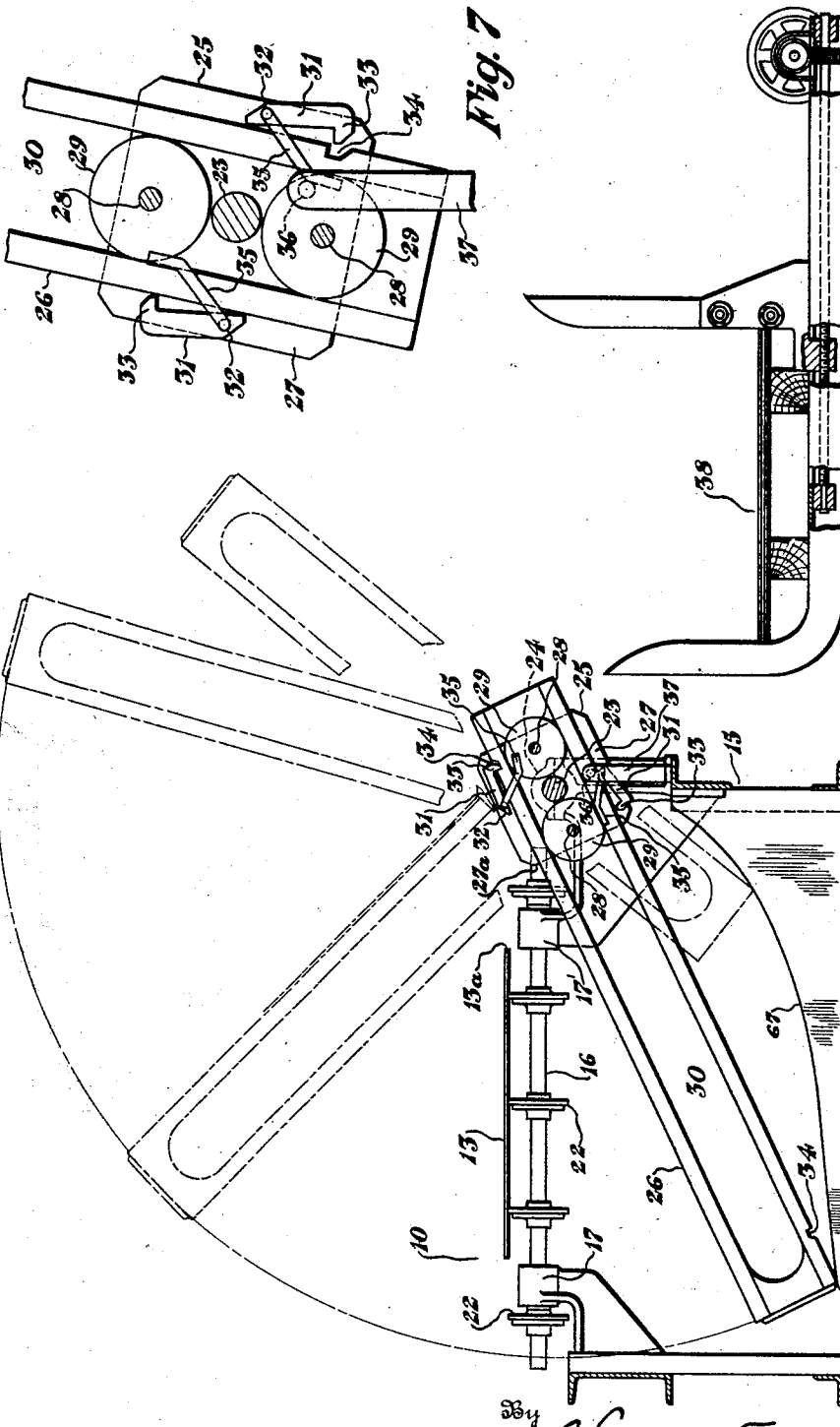
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SHEET STACKER

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4 Sheets-Sheet 4



UNITED STATES PATENT OFFICE

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SHEET STACKER

Application filed September 19, 1928. Serial No. 306,853.

My invention relates to machines particularly adapted for stacking metal sheets delivered from a rolling mill, and more particularly adapted for stacking the highly finished metal sheets delivered from highly polished cold finishing rolls, by automatically stacking one sheet directly upon the other without sliding and shifting them on each other and thus marring or scratching the surfaces of the sheets.

Machines heretofore proposed for this purpose have been characterized by a number of disadvantages, one of the more important being that during the stacking operation the sheets were unsupported except at the edges, and were thus subject to buckling.

Accordingly a principal object of the present improvements is to provide an automatic sheet stacking machine for continuous operation in the rear of a sheet finishing mill or the like, and arranged to operate for automatically stacking the sheets without marring or scratching the sheet surfaces and without buckling the sheets.

Other objects of the improvements include the provision of a sheet stacker of simplified construction and arrangement, whereby the machine may be easily manufactured, operated, and maintained.

These and ancillary objects are attained in the present invention, a preferred embodiment of which is hereinafter set forth in detail, and illustrated in the accompanying drawings forming part hereof, in which

Figure 1 is a fragmentary plan view of a preferred embodiment of the improved sheet stacker in operative combination with a sheet finishing mill, shown partially in cross-section, and a sheet delivery table;

Fig. 2, a side elevation and vertical cross-section thereof as on line 2—2, Fig. 1;

Fig. 3, an enlarged fragmentary elevational view thereof in the direction of the arrows 3—3, Fig. 1, portions of certain mechanisms of the machine being illustrated in section;

Fig. 4, a detached perspective view with portions in section of the improved actuating trip for the machine;

Fig. 5, a detached enlarged fragmentary view as on line 5—5, Fig. 1;

Fig. 6, a transverse sectional view with distant parts removed as on line 6—6, Figs. 1 and 2, illustrating the trip catch mechanism for the rotating and sliding stacking arms of the machine, the various parts of the trip catch mechanism being in the stationary position just before rotation of the arms commences; and

Fig. 7, an enlarged fragmentary view similar to Fig. 6, with distant parts removed, illustrating the various parts of the trip mechanism during rotation and just when sliding of the arms commences.

Similar numerals refer to similar parts throughout the drawings.

The improved sheet stacker indicated generally at 10 may be arranged to receive sheets delivered by a sheet finishing mill indicated generally at 11 of well known design, and which may include highly polished power rotating rolls 12 and 12' through which sheets 13 are successively fed from a feed table 14.

The top of the sheet table 14, the nip 12'' of the rolls 12 and 12' through which the sheets are rolled, and the top of the sheet stacker 10 upon which the sheets are delivered, are preferably all in the same plane and at the same level so that the sheets will not be buckled in passing from the sheet table through the finishing rolls to the sheet stacker.

The improved sheet stacker indicated generally at 10 includes a suitable frame indicated generally at 15 on the top of which a plurality of horizontally extending preferably coplanar parallel shafts 16 are each journaled in suitable bearings 17 and 17'.

The shaft 16 nearest the finishing mill 11 and a plurality of the shafts 16 at the outer end of the sheet stacker are idler shafts; while a plurality of the shafts intermediate the idler shafts at the inner end of the sheet stacker and the remaining idler shafts at the outer end of the stacker are each power driven as by means of a sprocket 18 secured at one end of each shaft, all the sprockets engaging with a drive chain 19 which is driven by a drive sprocket 20, the drive sprocket being rotated through suitable gearing by a drive motor 21 for the sheet stacker, so that the driven

shafts will rotate clockwise in the same direction as the lower finishing roll 12'.

All of the shafts have secured thereon horizontally spaced disks 22, the disks on one shaft being spaced horizontally between the disks on the next shaft, and the outer peripheries of the disks all being tangent to the plane of the feed table and nip of the rolls, and the disks serving as idling or driving disks for the sheets passing thereover, depending upon whether the disks may be on the idle or driven shafts, as aforesaid.

Accordingly, a sheet delivered by the mill upon the top of the disks will roll over the idle disks on the shaft 16 and will be conveyed by the driven disks on the intermediate shafts with sufficient force to roll over the disks on the idle shafts at the other end of the machine with considerable velocity for operating the actuating trip about to be described.

A horizontal stacking arm shaft 23 extends longitudinally of the sheet stacker, at right angles to the disk shaft 16, and at one side of the frame, preferably the side opposite the location of the chain 19; and the stacking arm shaft 23 is journaled in suitable bearings 24 secured on the frame.

The shaft 23 has secured thereon a plurality of longitudinally spaced arm mounting trip catch mechanisms 25, each trip catch mechanism being spaced between a pair of the longitudinally spaced disk shafts 16.

Each of the trip catch mechanisms mounts for rotation and sliding or radial translatable movement, a stacking arm 26 normally extending laterally from the shaft 23 between the adjacent shafts 16 and beneath the upper sheet receiving plane of the disks 22, as best illustrated in Fig. 6.

Each stacking arm mounting trip catch mechanism includes a pair of longitudinally spaced plates 27 secured for rotation on the shaft 23, and at each opposite side of the shaft 23 the plates 27 mount an arm roller shaft 28, the two arm roller shafts and the stacking arm shafts being preferably aligned with each other.

An arm roller 29 is journaled on each arm roller shaft 28 between the plates 27 of each trip mechanism 25, and each of the stacking arms 26 has formed therein a slot 30 extending longitudinally of the arm, and the shafts 28 and rollers 29 pass through the slot 30, whereby the rollers 29 provide a suitable bearing for the sliding radial translatable movement of the arm 26.

The operation of the improved sheet stacker comprehends rotation without radial translatable movement of the arms 25 from the position illustrated in full lines in Fig. 6 for from between one-quarter and one-half revolution, and during the last quarter of the half revolution a radial translatable movement of the arms; so that when the plates 27

have revolved one-half revolution, the arms 25 will have resumed the position illustrated in Fig. 6.

For automatically effecting these movements of the arms, an automatic trip catch arm 31 is mounted for oscillation about a pivot 32, at each side of the shafts 23 and 28 of each trip mechanism 25.

The outer end of each trip catch arm is provided with a trip catch tongue 33 extending towards the shafts 23 and 28 and arranged to be engaged and disengaged with a notch 34 provided in the adjacent outer side edge of the arm 26, the notch 34 of one side edge of the arm being located at the opposite end of the arm from the notch 34 for the other side edge.

A trip arm 35 is secured to and extends angularly from each of the trip catch arms 32 for being impinged at the proper time by a stationary trip arm actuating pin 36 laterally extending from a suitable bracket 37 mounted on the frame, one of the brackets 37 and actuating pins being provided for each trip arm mechanism 25.

As illustrated in Fig. 6, the catch tongue 33 of the upper trip arm 31 is engaged in its notch 34 in the upper side of the stacking arm 26, whereby rotation of the plates 27 and rollers 29 with the shaft 23 will rotate the arm 26 until it has assumed the position indicated in Fig. 7, when the trip arm 35, for the upper trip catch arm, will have been impinged against the actuating pin 36 thereby rotating the trip catch arm 31 so that the catch tongue 33 will become disengaged from its notch 34, whereby the arm 26 will by the force of gravity be given a radial translatable movement relative to the shaft 23, so that the arm 26 will resume the position indicated in full lines in Fig. 6 by the time the plates 27 and rollers 29 have completed a half revolution.

This radial translatable movement of the arms following and during a rotary movement thereof, is for the purpose of bodily lifting a sheet, which has passed over the arms on the disks 22, upwardly from the disks in a rotary movement, the lifted sheet 13 resting upon the upper edge of the several arms 26, and thus being supported against buckling.

As the sheet is being thus rotated, it will slide down on the arms towards the shaft 23, when the edge 13^a of the sheet adjacent the shaft will strike against the adjacent edges 27^a of the several plates 27, and the plate edges 27^a thus form a stop for any further sliding of the sheet.

The sheet is further rotated beyond the vertical, with considerable angular velocity, so that at a certain time the sheet will fall free of the arms and drop down upon a stack 38 of sheets thus being built up by the sheet stacker.

As aforesaid, during the last quarter of the half revolution of the plates 27 and rollers 29, the arms 26 will have been released for radial translatory movement, so that they may resume the position illustrated in full lines in Fig. 6.

For actuating the shaft 23 for operating the stacking arms as aforesaid, a sprocket 39 is secured upon the shaft 23, and provided with a driving connection by a chain 40 with a sprocket 41 secured to the cup 42 of a clutch, the cup 42 being freely rotatable on a countershaft 44 suitably supported on a bracket 45, except when engaged by the clutch cone 46 which is slidably keyed on the countershaft 44 for sliding engagement and disengagement with the clutch cup 42. A gear wheel 47 is keyed to the countershaft 44 and is provided with a driving connection by suitable gearing 48 with the motor 21.

A clutch actuating sleeve 49 is slidably mounted on the countershaft 44 and connected by a suitable toggle linkage 50 with the clutch cone 46, whereby movement of the clutch actuating sleeve 49 to the left as viewed in Fig. 3 will engage the clutch cone 46 with the clutch cup 42, and movement to the right will disengage the cone from the cup, the cone and cup being illustrated in the disengaged position in Fig. 3.

A sleeve actuating lever 51 is provided with a slot and pivotal connection at its upper end at 52 with the clutch actuating sleeve 49, and the lever 51 is pivotally mounted as at 53 in its middle portions on the bracket 45 and is provided at its lower end with a slot and pivotal connection 54 with a longitudinally extending connecting link 55.

One end of the connecting link 55 is provided with a pivotal connection 56 with the lower end of a trip arm 57 provided with a pivotal mounting 58 on the machine frame, and extending upwardly therefrom and terminating in improved hinged trip jaws 59 located at the outer end of the sheet stacker, the jaws opening at 60 towards the oncoming sheets, to receive the ends thereof for gradually reducing the speed thereof and thus preventing damage to the sheet end.

The other end of the connecting link 55 is provided with a pivotal connection 61 with the lower end of a cam follower lever 62; and the cam follower lever 62 is provided with a pivotal mounting 63 secured on the machine frame, and the lever extends upwardly from the pivotal mounting 63.

A cam follower pin 64 laterally extends from the upper end of the cam follower lever 62 into a suitably shaped cam slot 65 formed in a cylindric cam 66 which is secured on the shaft 23.

For facilitating the radial translatory movement of the arms 26, curved guides 67 may be provided beneath the shafts 16 for

serving as guides for the ends of the arms, as illustrated in Fig. 6.

The operation of the improved sheet stacker 10 is as follows:

A sheet 13, which may be fed through the finishing rolls 12 and 12', is delivered upon the top of the idler disks at the left hand end of the sheet stacker, as viewed in Figs. 1 and 2, and the sheet rolls over the idler disks and its advancing end reaches the driven disks which serve to convey the sheet away from the finishing mill, and towards the right hand or outer end of the sheet stacker, where the advancing end of the sheet enters between the hinge trip jaws 59 of the trip arm 57 with a substantial velocity.

The angled upper jaw serves to gradually reduce the speed of the oncoming sheet, which upon striking the jaws, rotates the trip arm 37 clockwise as viewed in Fig. 3, whereby the connecting link 55 is moved from left to right as viewed in Fig. 3, and the clutch cone 46 connected therewith is moved into engagement with the clutch cup 46 operatively connected therewith, so that the rotating shaft of the motor 21 will, through the above described gearing, clutch, and chain connection, rotate the stacking arm shaft 23.

At the same time the cam follower lever 62 is rotated by reason of its pivotal connection with the connecting link 55, so that the cam follower pin 64 is moved in one of the longitudinally extending shaft locking portions 65^a, two of which are comprised in the cam slot 65 at diametrically opposite positions, until the cam follower pin is in line with one of the annular portions 65^b of the cam slot 65, which permit rotation of the shaft.

The end of each annular portion 65^b of the cam slot 65 terminates in an angled portion 65^c which itself terminates at the other end of one of the shaft locking portions 65^a.

Consequently in addition to a connection being made between the clutch cone 46 and the clutch cup 42, in order to permit rotation of the stacking arm shaft 23, it is necessary that the cam follower pin 64 be moved as aforesaid into alinement with one of the annular portions 65^b in the cam slot.

Rotation of the shaft 23, serves to cause the stacking arms 25 to rotate without radial translatory movement thereof a portion of a revolution, and to follow such rotary movement with a radial translatory movement during the remaining portion of a half revolution, as has heretofore been described.

During the remaining portion of this half revolution, one angled portion 65^c of the cam slot 65 serves to move the cam follower pin 64 to the right as viewed in Fig. 3, whereby the connecting link 55 will be moved to the left, thereby disengaging the clutch cone from the clutch cup repositioning the trip arm 57 for being again actuated by the next oncoming sheet, and relocking the shaft 23.

It is accordingly obvious that the sheet stacker of the present invention requires no adjustment for accommodating sheets of different widths, and also enables a second sheet to be advanced on the disks, during the operation of the stacking arms.

In other types of sheet stackers, it is usually necessary to allow substantial intervals between the successive deliveries of successive sheets to the stackers.

The hinging of the upper jaw on the trip arm 57, permits the upper jaw to be swung upwardly out of engagement with the sheet being elevated on the stacking arms.

I claim:

1. A sheet stacker including a plurality of laterally extending sheet stacking arms, means for rotating the arms, the arms being mounted for radial translatable movement after a rotary movement thereof, means for placing a sheet in position for being lifted by the rotating arms, driving means for the arm rotating means, control means for connecting and disconnecting the driving means and the arm rotating means, and the sheet positioning means including means for impinging a sheet against the control means for connecting the driving means and rotating means.

2. A sheet stacker including a plurality of laterally extending sheet stacking arms, means for rotating the arms, the arms being mounted for radial translatable movement after a rotary movement thereof, means for placing a sheet in position for being lifted by the rotating arms, driving means for the arm rotating means, control means for connecting and disconnecting the driving means and the arm rotating means, the sheet positioning means including means for impinging a sheet against the control means for connecting the driving means and rotating means, and the rotating means including means for actuating the control means to disconnect the driving means and rotating means.

3. A sheet stacker including a plurality of arm mounting trip mechanisms, each trip mechanism mounting a laterally extending sheet stacking arm, means for rotating the trip mechanisms, and each trip mechanism including means for maintaining the arm mounted therein radially stationary during a portion of the rotary movement of the trip mechanism, and permitting a radial translatable movement of the arm with respect to the trip mechanism after a predetermined rotary movement thereof.

4. A sheet stacker including a plurality of laterally extending sheet stacking arms, means for rotating the arms, the arms being mounted for radial translatable movement during the rotation thereof, means for placing a sheet in position for being lifted by the rotating arms, driving means for the arm rotating means, control means for connecting

and disconnecting the driving means and the arm rotating means, and the sheet positioning means including means for impinging a sheet against the control means for connecting the driving means and rotating means.

5. A sheet stacker including a plurality of laterally extending sheet stacking arms, means for rotating the arms, the arms being mounted for radial translatable movement during the rotation thereof, means for placing a sheet in position for being lifted by the rotating arms, driving means for the arm rotating means, control means for connecting and disconnecting the driving means and the arm rotating means, the sheet positioning means including means for impinging a sheet against the control means for connecting the driving means and rotating means, and the rotating means including means for actuating the control means to disconnect the driving means and rotating means.

6. A sheet stacker including a plurality of laterally extending sheet stacking arms, a shaft for rotating the arms, and means operatively connecting the shaft and the arms for successively extending opposite sides of the arms from the same side of the shaft after successive half revolutions of the shaft.

7. A sheet stacker including a plurality of laterally extending sheet stacking arms, a shaft for rotating the arms, means operatively connecting the shaft and the arms for successively extending opposite sides of the arms from the same side of the shaft after successive half revolutions of the shaft, and means for placing a sheet in position for being lifted by the rotating arms.

8. A sheet stacker including a plurality of laterally extending sheet stacking arms, a shaft for rotating the arms, means operatively connecting the shaft and the arms for successively extending opposite sides of the arms from the same side of the shaft after successive half revolutions of the shaft, and means for placing a sheet in position for being lifted by the rotating arms, driving means for the shaft, control means for connecting and disconnecting the driving means and the shaft, and the sheet positioning means including means for impinging a sheet against the control means for connecting the driving means and the shaft.

9. A sheet stacker including a plurality of laterally extending sheet stacking arms, a shaft for rotating the arms, means operatively connecting the shaft and the arms for successively extending opposite sides of the arms from the same side of the shaft after successive half revolutions of the shaft, and means for placing a sheet in position for being lifted by the rotating arms, driving means for the shaft, control means for connecting and disconnecting the driving means and the shaft, and the sheet positioning means including means for impinging a sheet against the con-

trol means for connecting the driving means and the shaft, and means operated by the shaft for actuating the control means to disconnect the driving means and the shaft.

means mounting each arm for radial translatory movement on its rotating means.

17. A sheet stacker including a plurality of rotating means, a laterally extending sheet stacking arm for each rotating means, means mounting each arm for radial translatory movement on its rotating means, and means for placing a sheet in position for being lifted by the arms.

18. A sheet stacker including rotating means, a laterally extending sheet stacking arm, means mounting the arm for radial translatory movement on the rotating means, and means maintaining the arm stationary with respect to the rotating means during a predetermined fractional rotation thereof.

In testimony that I claim the above, I have hereunto subscribed my name.

GEORGE W. LENTZ.

10. An arm mounting trip mechanism for a sheet stacker or the like, including a laterally extending arm, a mounting for the arm, means for rotating the mounting, catch means engaging the arm and the mounting for maintaining the arm radially stationary during a portion of the rotary movement of the mounting, and means for disengaging the catch means and permitting a radial translatory movement of the arms with respect to the mounting after a predetermined rotary movement thereof.

11. An arm mounting trip mechanism for a sheet stacker or the like, including a shaft, a plate secured on the shaft, rollers operatively mounted on the plate, an arm mounted for translatory movement on the rollers, and catch means for engaging and disengaging the arm for preventing and permitting the translatory movement thereof.

12. An arm mounting trip mechanism for a sheet stacker or the like, including a shaft, a plate secured on the shaft, rollers operatively mounted on the plate, an arm mounted for translatory movement on the rollers, and a pair of catch means each adapted for successively engaging and disengaging the arm for preventing and permitting the translatory movement thereof.

13. An arm mounting trip mechanism for a sheet stacker or the like, including a shaft, a plate secured on the shaft, rollers operatively mounted on the plate, an arm mounted for translatory movement on the rollers, and a pair of catch means each adapted for successively engaging and disengaging the arm for preventing and permitting the translatory movement thereof, each catch means being gravity operated for engagement with the arm.

14. An arm mounting trip mechanism for a sheet stacker or the like, including a shaft, a plate secured on the shaft, rollers operatively mounted on the plate, an arm mounted for translatory movement on the rollers, a pair of catch means each adapted for successively engaging and disengaging the arm for preventing and permitting the translatory movement thereof, each catch means being gravity operated for engagement with the arm, and means for actuating each catch means for disengagement from the arm after a predetermined rotary movement of the shaft.

15. A sheet stacker including rotating means, a laterally extending sheet stacking arm, and means mounting the arm for radial translatory movement on the rotating means.

16. A sheet stacker including a plurality of rotating means, a laterally extending sheet stacking arm for each rotating means, and

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