May 19, 1970 A. BENDE 3,512,660

FERROMAGNETIC METAL SHEET DESTACKER AND FEEDER

Filed Oct. 15, 1968

2 Sheets-Sheet 1

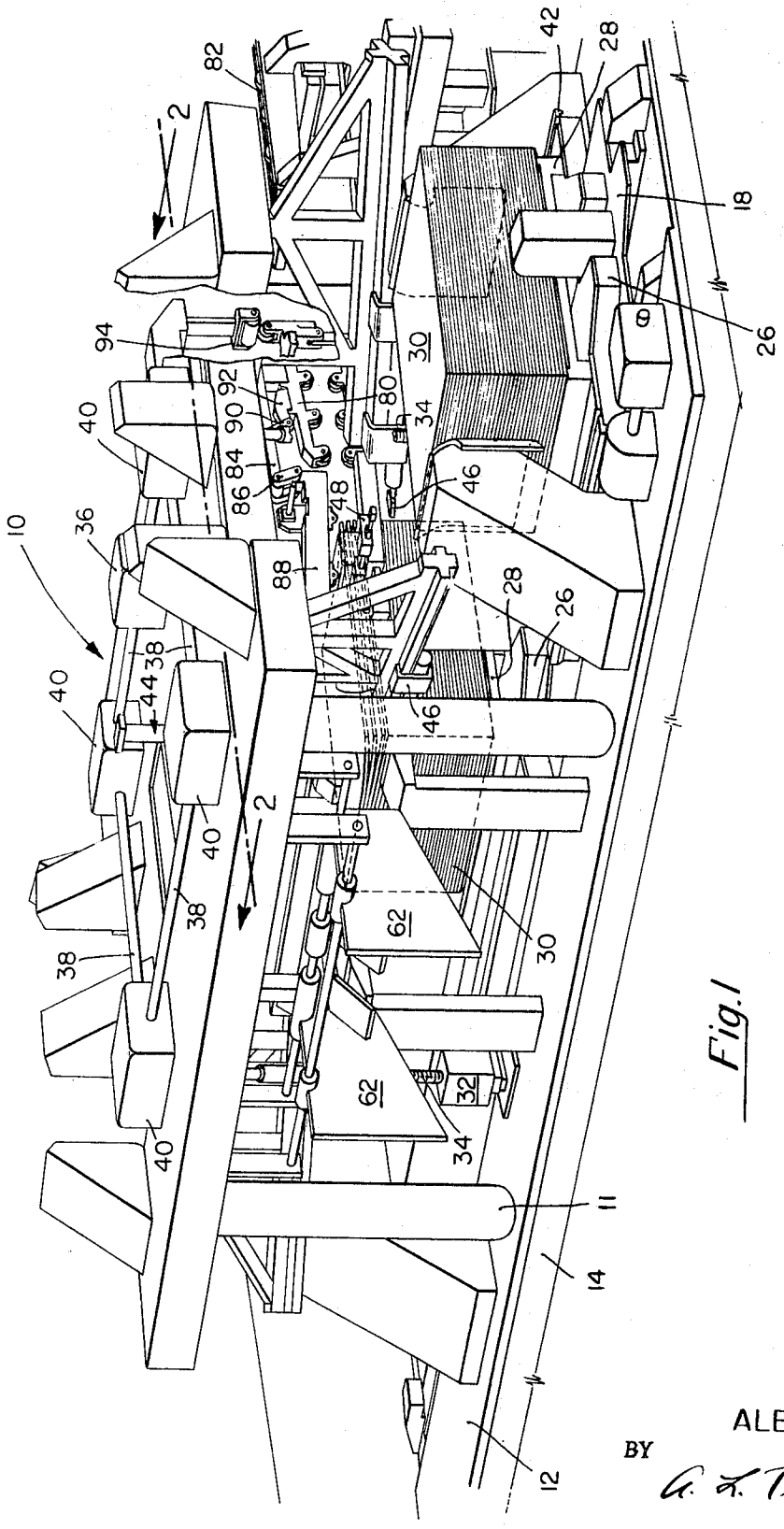


Fig. 1

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2 Sheets-Sheet 2

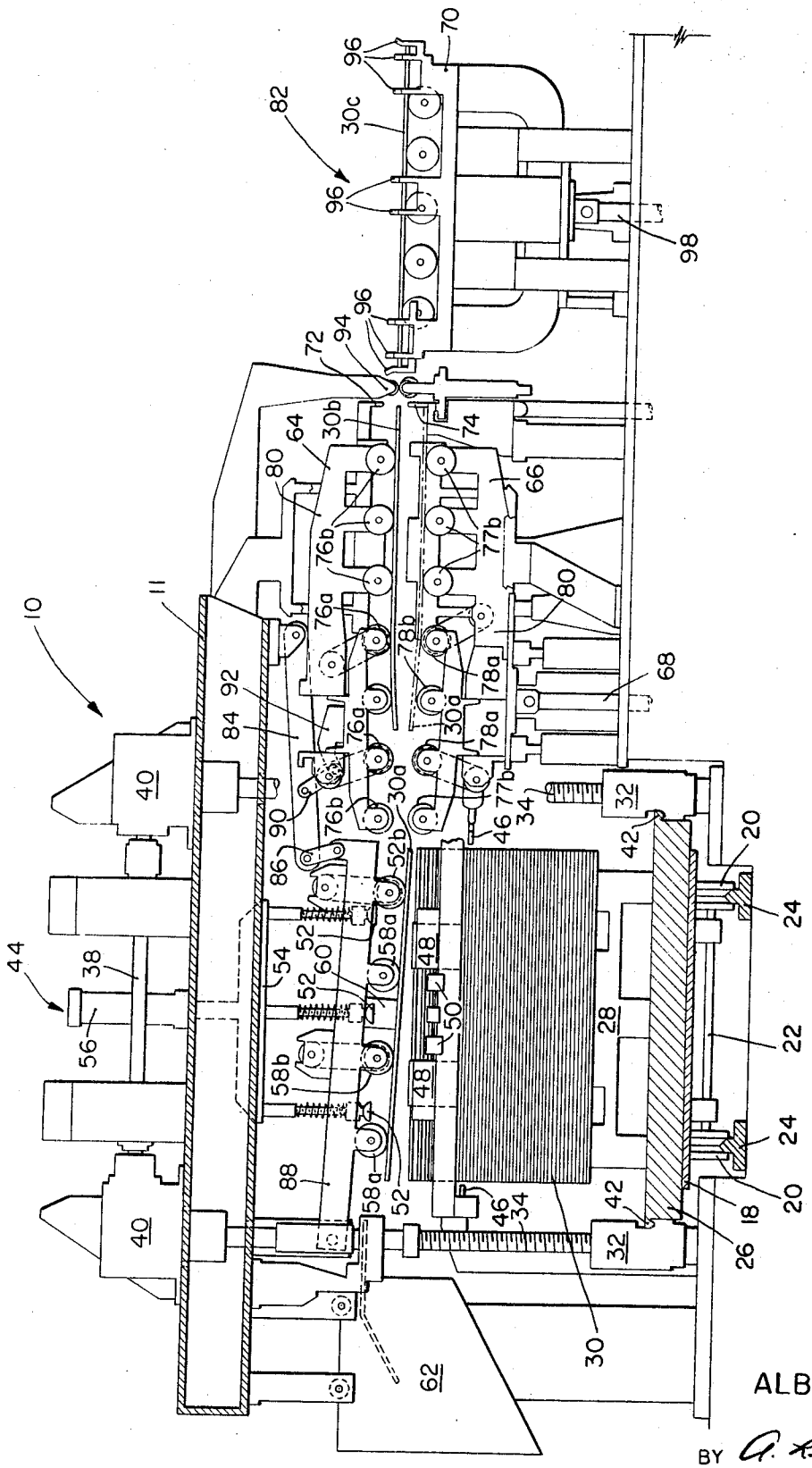


Fig. 2

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FERROMAGNETIC METAL SHEET DESTACKER AND FEEDER

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Int. Cl. B65g 59/04
U.S. Cl. 214—8.5 8 Claims

ABSTRACT OF THE DISCLOSURE

An apparatus for receiving stacked sheets of ferromagnetic metal, destacking the sheets and feeding them one at a time at timed sequences to a production line.

SUMMARY OF THE INVENTION

This invention relates to an apparatus for feeding sheets of ferromagnetic metal to a production line and more particularly to an apparatus for receiving stacks of ferrous metal sheets that are separated and fed one at a time to an automated press line.

The common practice in short-run production press lines is to provide manual labor to feed the sheets, one at a time, into the press line. For high production press lines, various mechanical feeding devices have been developed for mechanically feeding sheets to a press line or other production facility. Often in such devices, a double sheet feed occurs with resulting damage to dies or presses.

This invention includes a two station loading facility so that a shifting of a receiving carriage will remove an empty pallet from the destacking station and move a replacement stack into position for destacking. While the replacement stack is being fed to the production line, a new stack may be positioned in the empty pallet space for positioning in the destacking position when the stack being destacked has been exhausted. To assure a smooth continuous flow of sheets, a plurality of movable supports are provided to be moved into position to support enough sheets for continuous feeding while the emptied pallet is removed and the replacement pallet and stack are in position.

At the destacking station, a vacuum cup lifter removes the sheets from the stack and places them one at a time on magnetic rollers. If more than one sheet is placed on the rollers at one time, the rollers are driven in reverse and the mutiple sheet load is rejected. If only one sheet is placed thereon, the rolls are driven forward and deliver the sheet to one of two supply stations.

Each of the supply stations accommodates one sheet and alternately they feed a sheet to the production line.

In passing from the supply stations to the production line, the sheets pass through a second thickness detector that may be adjusted to stop the line when over tolerance material or doubled sheets are fed to the production line.

It is an object of this invention to provide an improved mechanical ferrous metal sheet feeder for a high speed production line that automatically rejects a double sheet feed and protects the processing equipment thereby.

Another object of this invention is to provide a vacuum cup and magnetic roller type destacker and feeder unit for handling and delivering ferrous metal sheets at a fast rate to a production line.

These and other objects of this invention will be seen by reference to the following drawing and specification, wherein:

FIG. 1 is a perspective view of the novel destacker and feeder apparatus;

FIG. 2 is a view, with sections broken away, in the direction of the arrows, substantially along line 2—2 of FIG. 1, showing a cross section of the destacker and feeder assembly.

Referring now to the drawings, the destacker-feeder assembly, indicated generally by the numeral **10**, consists of a supporting frame structure **11** and a base **12** supported on a floor or other suitable support means **14**. The destacker-feeder includes a two station loading facility **16** having a base plate **18** supported on a plurality of wheels **20** and axles **22** mounted on a pair of rails **24** for moving the loading facility **16** between the loading station and destacking station by power means (not shown). A loading platform **26** is provided for each station and rests upon the base plate **18** for receiving a pallet **28** supporting a stack of ferrous metal sheets **30**. As the base plate **18** moves a pallet of sheets **30** into the destacking station from the loading station, the loading plaform **26** engages a pair of load lifters **32** on each side of the platform for progressively raising the stack of metal sheets **30** to the feed mechanism as the sheets are removed one at a time from the top of the stack. Each of the load lifters **32** is threadably engaged to a jackscrew **34** for providing vertical movement of the load lifters by rotation thereof. As best seen in FIG. 1, the jackscrews **34** are interconnected to a power source **36** by a series of shafts **38** and gear boxes **40** so that the jackscrews are synchronized in their rotation for moving the load lifters.

As the pallet of sheets **30** is moved to the destacking station, load lifters **32** engage the hooked edges **42** of the loading platform and upon command the jackscrews **34** are rotated causing the load lifters **32** to move upwardly until a limit switch (not shown) stops the jackscrew rotation when the top of the stack of sheets is properly positioned for destacking. As the sheets **30** are removed one at a time by a vacuum lift assembly **44**, the stack is automatically raised until a predetermined number of sheets remain on the pallet. When the predetermined number of sheets remain, six supports **46** are automatically extended to support the remaining sheets and the pallet and loading platform are lowered and replaced with a new stack of sheets. As the new stack of sheets are being positioned in the destacking position, the line is fed from the remaining supported sheets. When the new stack of sheets is moved up to the destacking position, the remaining sheets from the previous pallet are deposited upon the top of the stack by removal of the six supports **46**. Thus, a continuous supply of sheets is assured at the destacker station.

The destacking apparatus includes commercially available magnetic separators **48** which fan the top sheets **30** as seen in FIGS. 1 and 2 and air jets **50** which blow air between the fanned sheets **30** to help separate the sheets and prevent a double sheet pick-up.

The vacuum lift assembly consists of a plurality of vacuum cups **52**, similar to those shown in U.S. Pat. 3,361,469, mounted on a support plate **54** with the cups **52** in substantially the same plane. The support plate **54** is connected to a piston of a double acting hydraulic cylinder **56** for reciprocal vertical movement between the extended position in engagement with the top sheet **30** and the retracted position shown in FIG. 2. In the extended position the vacuum cups **52** engage the top sheet **30** and a vacuum is created within the cups so that the top sheet is secured to the cups. The flow of fluid in the hydraulic cylinder **56** is reversed and as the support plate **54** and attached cups **52** with the secured sheet **30** are lifted vertically, the air jets **50** and magnetic separators **48** assure that only one sheet is removed from the stack. During the vertical movement from the stack, the sheet **30***a* is brought into contact with a plurality of magnetic feed rollers **58***a* and **58***b*. As the sheet contacts the mag-

netic rollers 58*a–b* the vacuum in the vacuum cups 52 is destroyed and the sheet is held to the rollers 58*a–b* by the magnetic forces thereof. In this embodiment two sets of rollers 58*a* are idler rollers and two sets of rollers 58*b* are drive rollers for moving the attached sheet 30*a*.

When the sheet 30*a* is placed on the magnetic rollers 58*a–b*, a double thickness detecting device 60 checks the thickness of the sheet or sheets placed on the rollers. The thickness detecting device can be any of a number of commercially available eddy-current type devices. If a double thickness is detected, the power source for the drive rollers 58*b* rotate the rollers to move the sheets 30*a* to the left as seen in FIG. 2 to the reject chute 62. If a single sheet 30*a* is attached to the rollers 58*a–b*, the drive rollers 58*b* are rotated to move the sheet 30*a* to the right as seen in FIG. 2 to one of two supply stations 64, 66 as determined by the vertical position of the supply stations.

The position of the supply stations 64, 66 is controlled by the movement of the first press in the line being fed by the destacker. Through a linkage system (not shown) for each complete cycle of the press, the supply stations are moved vertically by power link 68 alternately up and then down. The down position is shown in FIG. 2 with a sheet 30*a* about to be fed to supply station 66 from the destacker and the sheet 30*b* in station 64 has cleared stop 72 and is about to be fed to the idle station 70 when sheet 30*c* moves into the press line. Sheet 30*a* is shown in the phantom line in FIG. 2 resting against stop 74 in the position it will assume when fed to the idle station 66. Each of the supply stations 64, 66 include sets 76*a–b* and sets 78*a–b*, respectively, of magnetic rollers. The roller sets 76*a* and 78 are driven rollers and the sets 76*b* and 78*b* are idle rollers. The rollers 76*a–b* and 78*a–b* are supported on a single frame 80 that is moved by the power link 68 as a unit. The movement of frame 80 positions either the upper rollers 76*a–b* or lower rollers 78*a–b* in alignment with the press line for feeding the sheet 30 to the sheet receiving station 82 in the press line.

The vertical movement of frame 80 also moves the rollers 58*a–b* into position to feed the vacant supply station 64 and 66 by a series of links.

The series of links for moving the destacker rollers with the supply stations frame 80 includes a control link 84 having one end pivotally connected to the supporting frame structure 11 and the other end pivotally connected to connecting link 86. The one end of the connecting link 86 is pivotally connected to the control link 84 and the other end is pivotally connected to the end of the frame 88 supporting the feed rolls 58*a–b* adjacent the supply stations. The other end of the feed roll frame 88 is pivotally connected to the supporting frame structure 11. A second connecting link 88 has one end pivotally connected intermediate the ends of control link 84 and the other end pivotally connected to an arm 92 extending from the supply station roller frame 80. Thus, it can be seen by reference to FIG. 2, as the supply stations are moved upwardly for station 66 to feed the press line, the feed rollers 58*a–b* and frame 88 are moved upwardly into alignment with the rollers 76*a–b* of supply station 64 for delivery of a sheet 30 thereto while the sheet of supply station 66 is being fed to the press line and conversely when the supply station is moved downwardly to the position shown in FIG. 2, the sheet 30 is fed to supply station 66 as the sheet in supply station 64 is fed to the press line.

As the sheet 30*b* is fed from the supply stations 64 or 66 to the sheet receiving station 82, the sheet 30*b* contacts a second thickness checking device 94, such as a differential transformer type, that will automatically stop the press line if a double thickness is detected.

At the sheet receiving station 82, the sheet 30*c* is reorientated prior to being fed to the press line by a plurality of fingers 96 which are moved about the sheet 30*c* by an actuating lever 98 when the sheet is placed at the idle station.

I claim:

1. A ferromagnetic sheet metal destacker and feeder for receiving stacked ferromagnetic metal sheets and delivering the sheets one at a time to a production line including a stack receiving means, a stack transfer means, sheet separation means for separating the topmost sheets of a stack, vacuum sheet pick-up means for picking up the top sheet, magnetic roller receiving and transfer means for receiving a sheet from said vacuum sheet pick-up means, a first thickness detecting means for controlling rotation of said magnetic roller receiving and transfer means, a plurality of sheet supply stations for receiving and storing a metal sheet from said receiving and transfer means, linkage control means for aligning said sheet supply stations and said magnetic roller receiving and transfer means for transferring a metal sheet therebetween, a sheet receiving station adjacent said supply stations for receiving sheets one at a time from said supply stations, control means for adjusting said supply stations into alignment with said sheet receiving station for transfer of a sheet to said receiving station and for simultaneously actuating said linkage control means, and a second thickness detecting means positioned between said supply stations and said sheet receiving station for stopping the production line if more than one sheet at a time is passed to said receiving station.

2. The sheet destacker and feeder claimed in claim 1 wherein said stack transfer means includes a carriage for receiving and moving a stack of sheets horizontally, said stack transfer means having a base plate supported on a plurality of rotatably mounted wheels, power means for moving said carriage, a loading platform supported on said base plate for receiving a stack of sheets, said loading platform having attaching means on opposite sides thereof for cooperating with power operated means for vertically moving said loading platform and stack of sheets from said base plate to a position adjacent said separation means and said vacuum sheet pick-up means.

3. The sheet destacker and feeder claimed in claim 1 wherein said sheet separation means includes a magnetic sheet separator for fanning the edges of adjacent sheets on the top of the stack by inducing a similar magnetic charge into each sheet wherein each sheet repels the adjacent sheets causing the edges of the sheets to be spaced from each other, and an air jet having air under pressure issuing therefrom, said pressurized air being directed between the edges of said spaced sheets for assisting in the separation thereof.

4. The sheet destacker and feeder as claimed in claim 1 wherein said vacuum sheet pick-up means includes a plurality of resilient vacuum cups having their attaching surfaces in substantially the same plane, said vacuum cups being connected to a double acting hydraulic cylinder for movement thereby into engagement with the top sheet of the stack and for movement away therefrom for lifting the top sheet to said magnetic roller means, a means for creating and destroying vacuum in said cups upon command whereby said cups are secured to the top sheet by the creation of the vacuum in the cups and the cups are released from the sheet when the top sheet contacts the magnetic roller means and the vacuum is destroyed.

5. The sheet destacker and feeder as claimed in claim 1 wherein said magnetic roller receiving and transfer means includes a plurality of magnetic rollers in substantially the same plane, a frame for rotationally supporting said magnetic rollers, power means for driving at least one set of rollers on command, said magnetic rollers holding said sheet delivered thereto by said vacuum lift pick-up means and moving said sheet to said supply stations by rotation of said driven rollers in one direction and to a reject chute by rotation of said driven rollers in the opposite direction.

6. The sheet destacker and feeder as claimed in claim 5 wherein said first thickness detector means controls the direction of rotation of said driven roller, said driven rollers being rotated in said one direction when only one sheet at a time is delivered to said magnetic roller receiving and transfer means, and said driven rollers being rotated in the opposite direction when more than one sheet at a time is delivered to said roller receiving and transfer means.

7. The sheet destacker and feeder as claimed in claim 1 wherein said linkage control means includes a connecting link, a control link having a first pivotal connection at one end to the frame of said sheet destacker and feeder, a second pivotal connection at the other end to one end of said connecting link, a third pivotal connection intermediate said ends thereof connected to an arm of said supply stations, said connecting link having a fourth pivotal connection at the other end thereof to said frame of said magnetic roller receiving and transferring means, and a fifth pivotal connection between said magnetic rollers receiving and transferring frame and said destacker and feeder frame structure whereby movement of said supply stations for delivery of a sheet therefrom to said sheet receiving station changes the alignment of said magnetic rollers receiving and transfer means from the last

delivered sheet station to an empty station for transfer of another sheet to said supply stations.

8. The sheet destacker and feeder as claimed in claim 7 wherein said control means includes a power link operably connected to said supply stations for moving said supply station into alignment with said sheet receiving station, power means connected to said power link for providing vertical reciprocal movement thereto and such movement acting through said third pivotal connection causing said linkage control means to realign said magnetic rollers receiving and transfer means with an empty supply station.

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