

Dec. 30, 1941.

W. H. AYRES

2,267,710

SHEET FEEDING DEVICE

Filed May 4, 1940

3 Sheets-Sheet 1

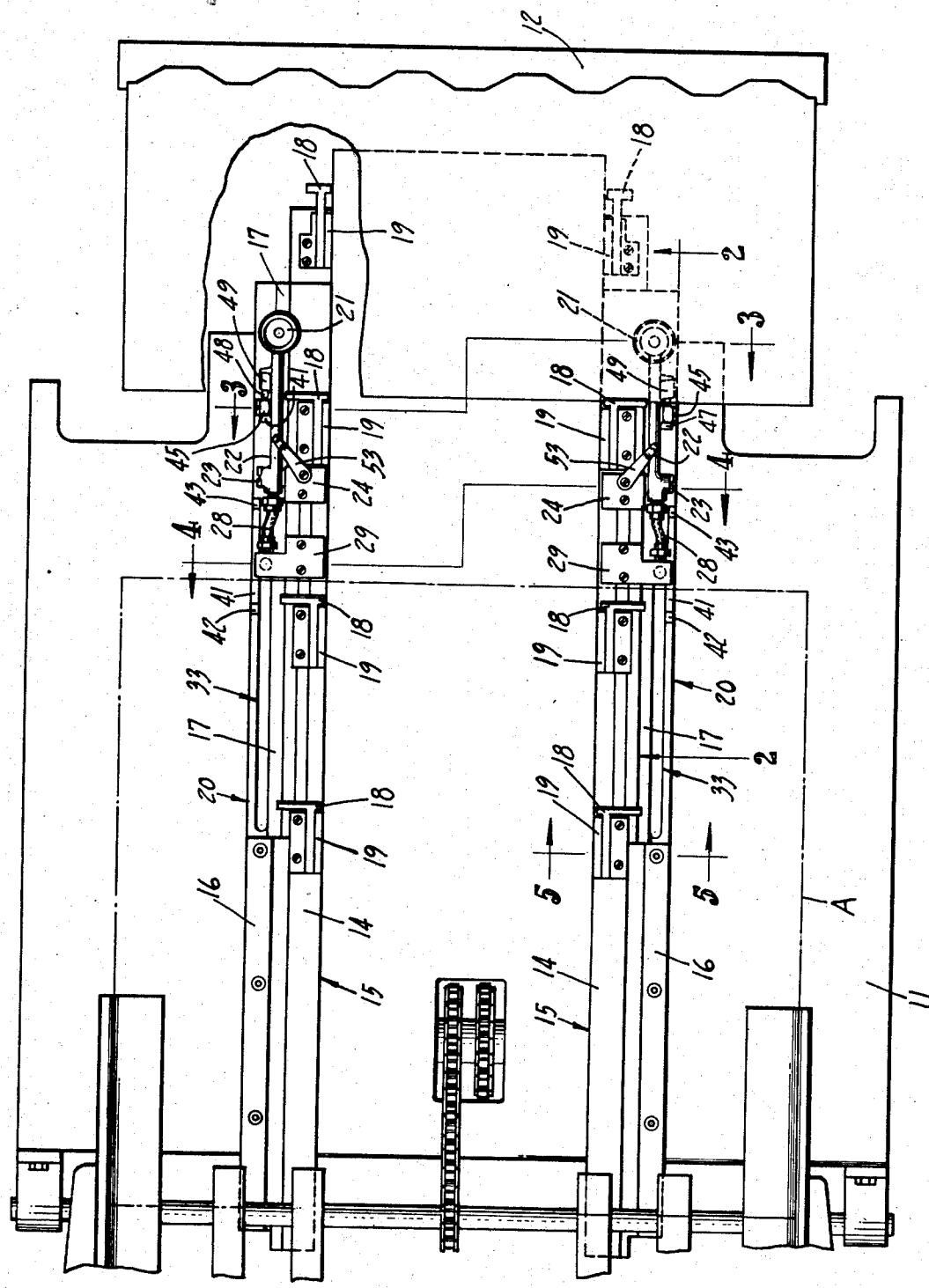


Fig 1

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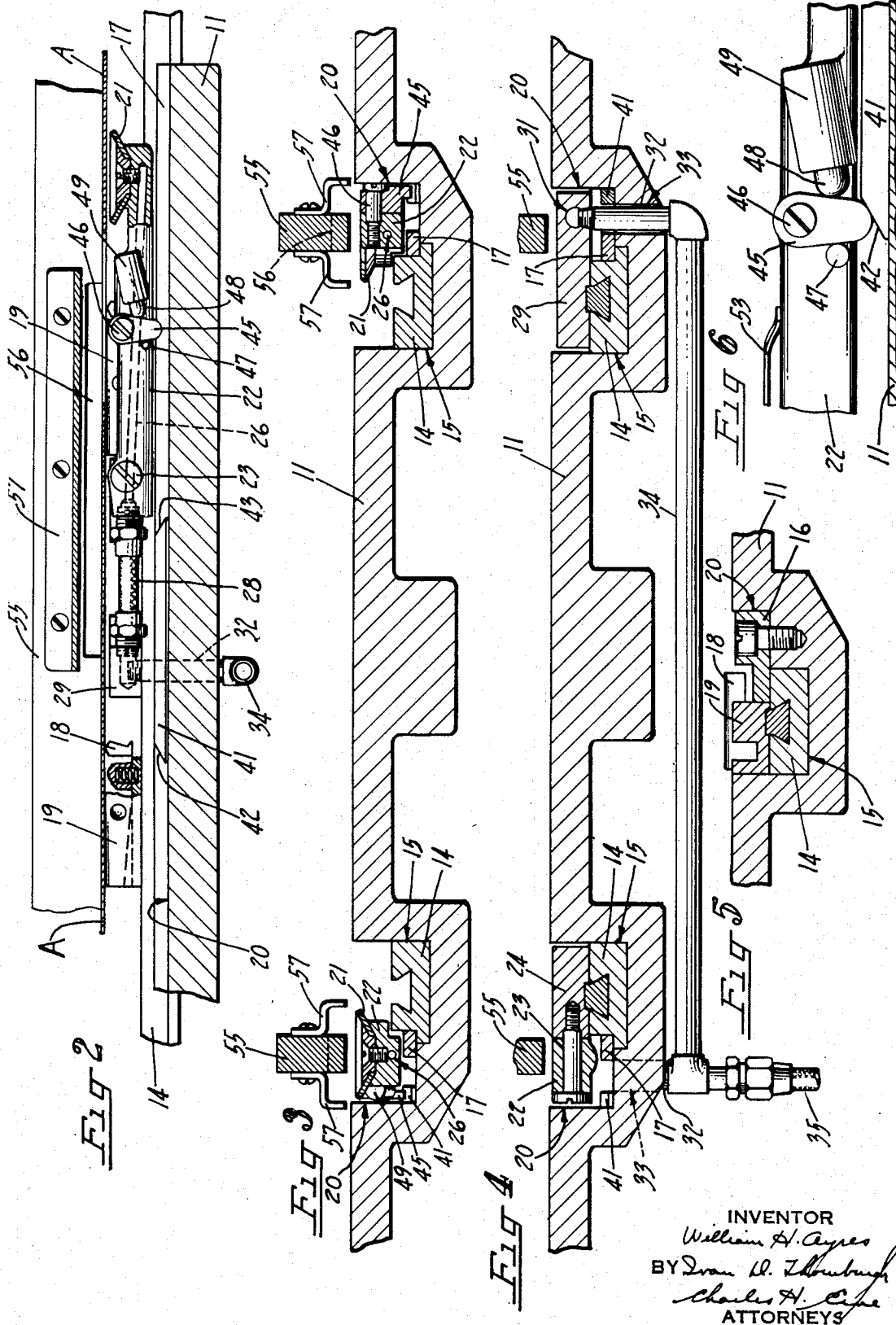
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3 Sheets-Sheet 2



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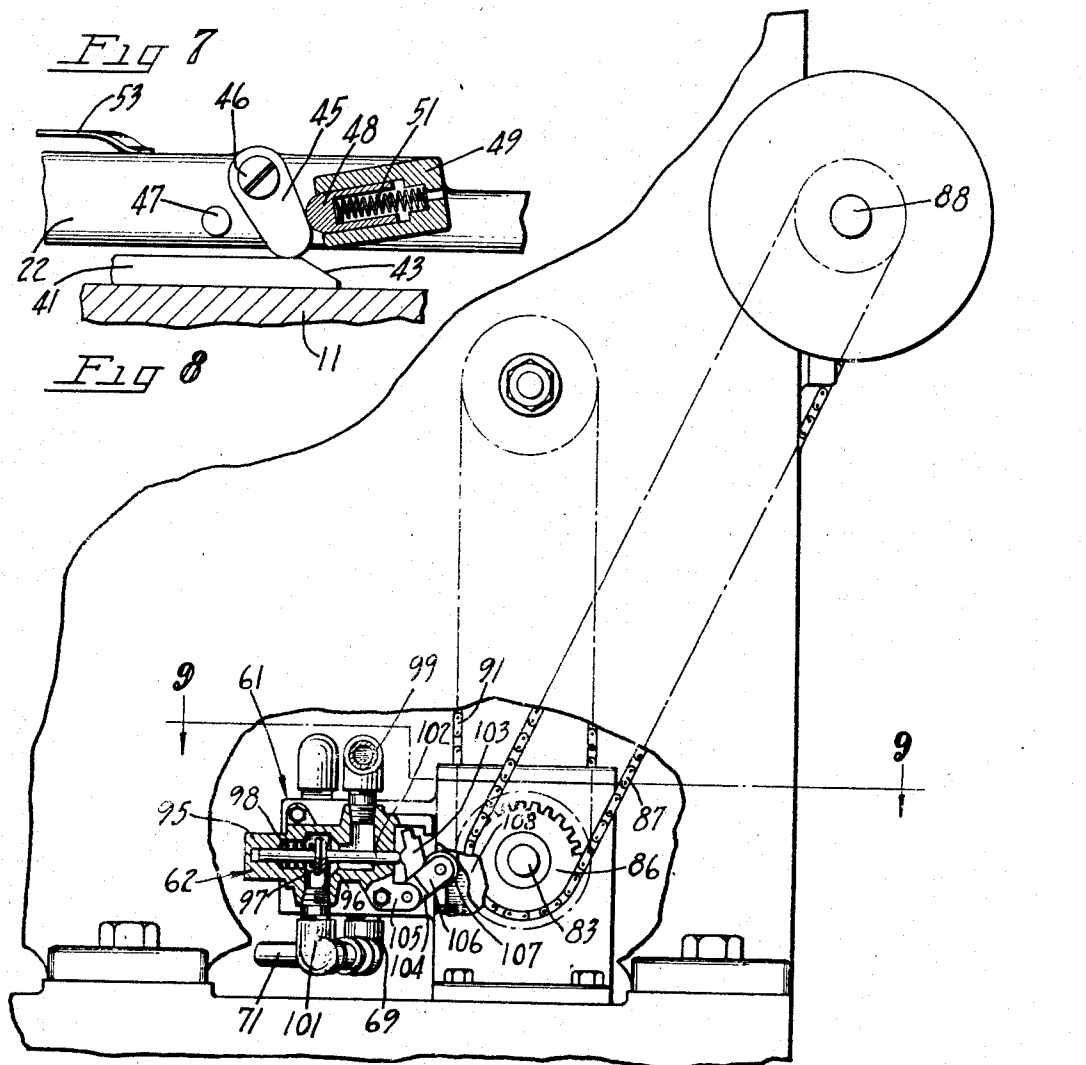
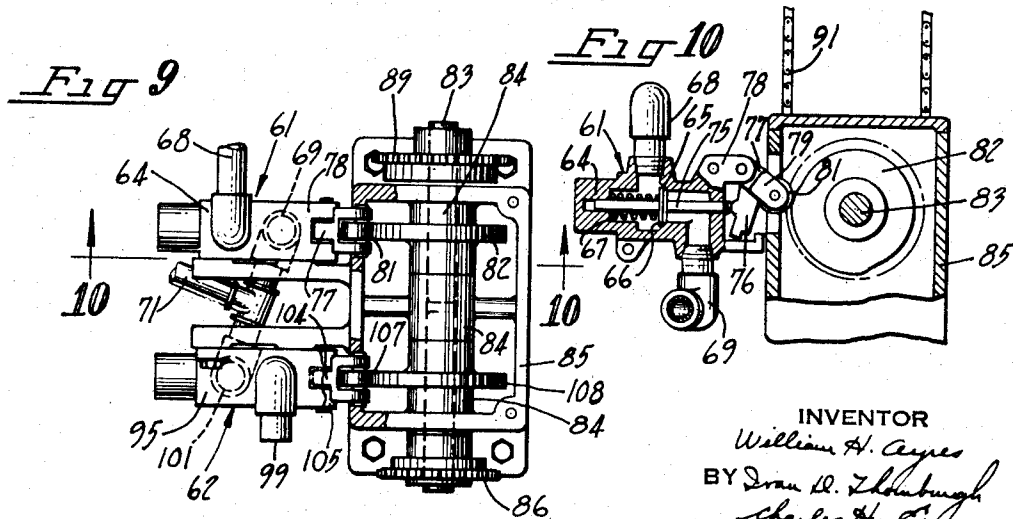
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SHEET FEEDING DEVICE

Filed May 4, 1940

3 Sheets-Sheet 3



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2,267,710

SHEET FEEDING DEVICE

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Application May 4, 1940, Serial No. 333,394

8 Claims. (Cl. 271-54)

The present invention relates to a sheet feeding device for container or can making machines or the like and has particular reference to setting in motion a sheet to be fed prior to its engagement by the regular feeding devices on the machine to prevent denting of the feeding edge of the sheet.

In the feeding of metallic sheets such as tin plate and the like through container or can making machines, the sheets are sometimes propelled by engagement along one edge as by fingers or dogs disposed in reciprocating feed bars. When these dogs strike against the stationary sheet to set it in motion for advancement, the inertia of the sheet must first be overcome and at high speeds this action often considerably dents the feeding edge of the sheet and thereby causes trouble when the sheet is undergoing subsequent operations.

The instant invention contemplates overcoming this denting of the sheets by providing vacuum cups to grip the sheet and initially set it in motion in time with the travel of the feed dogs so that when the dogs engage against the sheet edge the sheet will be in motion and therefore they will strike it gently and not dent the edge.

An object therefore of the invention is the provision in a can making machine of sheet feeding devices which initially set the sheet to be fed into motion prior to the engagement of the sheet edge by the feeding means so that the sheet will be moving when its feeding edge is engaged by the feeding means and thereby denting or otherwise damaging of the sheet edge will be prevented.

Another object is the provision of a sheet feeding device of this character wherein vacuum cups are utilized to grip a sheet to be fed and to start it into motion prior to the engagement of the sheet edge for advancement of the sheet.

Another object is the provision of such a sheet feeding device wherein the vacuum cups for initially setting the sheet in motion are carried on the same feed bar with the feed dogs which engage the sheet while it is moving and thus prevent denting of the sheet edge during the feeding operation.

Numerous other objects and advantages of the invention will be apparent as it is better understood from the following description, which, taken in connection with the accompanying drawings, discloses a preferred embodiment thereof.

Referring to the drawings:

Figure 1 is a top plan view of a machine em-

bodiment of the instant invention, with parts broken away;

Fig. 2 is an enlarged longitudinal section taken substantially along the line 2-2 in Fig. 1, with parts broken away;

Figs. 3 and 4 are enlarged transverse sections taken substantially along the respective broken lines 3-3, 4-4 in Fig. 1, with parts broken away;

Fig. 5 is an enlarged sectional detail taken substantially along the transverse line 5-5 in Fig. 1, with parts broken away;

Figs. 6 and 7 are enlarged fragmentary views of parts in Fig. 2 in different positions;

Fig. 8 is an enlarged elevation of a portion of the machine shown in Fig. 1, the view showing parts broken away and parts shown in section;

Fig. 9 is a horizontal sectional view taken substantially along the broken line 9-9 in Fig. 8; and

Fig. 10 is a vertical section taken substantially along the line 10-10 in Fig. 9.

As a preferred embodiment of the instant invention the drawings illustrate principal parts of the sheet feeding devices of a scroll shear machine of the character disclosed in United States Patent 1,920,999, issued August 8, 1933, to John H. Murch, on Shearing machine. In such a machine metallic sheets A to be operated upon are fed along a horizontal table 11 (Fig. 1) in an intermittent or step-by-step manner toward a die mechanism 12 which cuts the sheets into strips having undulating edges.

Feeding of the sheets along the table 11 (Figs 1, 2, 3, 4 and 5) is preferably effected by a pair of spaced and parallel feed bars 14 which extend longitudinally of the table. These feed bars slide in grooves 15 formed in the table and are retained against displacement by gibbs 16 and 17 which are secured to the table. The feed bars are reciprocated in unison through a forward or feeding stroke and then through a return stroke in any suitable manner operating in time with the other moving parts of the machine, such as that shown in the above mentioned patent.

Feed dogs 18 spaced at intervals along the feed bars engage the rear edge of a sheet A to advance it along the table as the feed bars move through a forward stroke. These feed dogs are carried on blocks 19 secured to the feed bars and operate in longitudinal recesses 20 formed in the table adjacent the groove 15.

In order to prevent denting of the back edge of the sheets as they are fed along the table, a vacuum cup 21 (Figs. 1, 2 and 3) is provided on

each of the feed bars in a location which will engage the bottom surface of the sheet on every stroke of the feed bars except the last. The drawing shows these cups located adjacent the third feed dog 18 from the left in Fig. 1.

Each vacuum cup 21 is secured to the outer end of an arm 22 located in the table recess 20 and mounted on a pivot pin 23 secured in a block 24 (see also Fig. 4) carried on the feed bars 14. The cup on each arm is in communication with a vacuum channel 26 formed in the arm longitudinally thereof.

Adjacent the pivot pin 23 one end of a flexible hose 28 is connected to the arm and is in communication with the channel 26. The other end of the hose is connected into a fixed block 29 which is secured to the feed bars 14. This end of the hose leads into a bore 31 formed in the block.

A short length of pipe 32 is secured in each block 29 in communication with its bore 31 and these pipes extend down through slots 33 formed in the table 11. The lower ends of the pipes are connected by a cross pipe 34 which is connected to a flexible hose 35 leading to any suitable source of vacuum.

Hence as the feed bars 14 reciprocate in their grooves 15 the vacuum cups 21, the arms 22, the blocks 24, 29 and the pipes 32, 34 all move with the feed bars.

At the beginning of each forward stroke of the feed bars 14 the vacuum cups 21 are raised into engagement with the bottom of the sheet A. For this purpose there is provided a stationary cam 41 which is secured to the floor of the recess 20. The ends of the cam are beveled at 42, 43. The cam is located in the path of travel of a movable finger 45 which is mounted on a pivot pin 46 secured in the side of the arms 22 (see also Figs. 6 and 7).

The fingers 45 are normally pressed against stop pins 47 secured in the arms 22 by spring barrels 48 located in bosses 49 formed on a side of the arms. A compression spring 51 inside each barrel keeps the barrel in engagement with its finger 45. Flat springs 53 having one end secured to the blocks 24 on the feed bars and the other end engaging against the top of the cup arms 22 hold the arms down in the table recesses 20 and thereby normally keeps the vacuum cups depressed out of engagement with the sheet A.

Figs. 1 and 2 show the cup arms 22 substantially at the end of a forward or sheet feeding stroke and about to begin a return stroke. When the bars return for a subsequent feeding stroke the movable finger 45 on each arm engages the beveled edge 43 of its associated cam 41 and is thereby rocked out of the way against the resistance of the spring barrel 48 as shown in Fig. 7. This permits the fingers to ride over their cams without raising the vacuum cups.

After passing over the cams 41 the movable fingers are forced back against their stop pins 47 by the spring barrels 48 and are ready for a forward stroke of the feed bars. The return of the feed bars permits a set of the feed dogs 18 to snap up under spring tension in back of the back edge of the sheet closely adjacent thereto but not touching the edge of the sheet.

When the feed bars 14 move forward to advance the sheet one step the movable fingers 45 on the cup arms 22 immediately engage the beveled edges 42 of the cams 41 as shown in Fig. 6 and since the fingers are backed up by their stop pins 47 they are restrained from swinging move-

ment and ride up onto the cams. This action raises the vacuum cups 21 into gripping engagement with the sheet and thereupon begins to move the sheet in harmony with the forward travel of the feed bars before the feed dogs 18 come into engagement with the rear edge of the sheet.

While the movable fingers 45 ride on the cams 41 the vacuum cups 21 cling to the sheet and thus bring it into full motion. The vacuum on the cups is broken near the end of the forward travel of the fingers 45 on the cams and as they ride down over the beveled edges 43 of the cams, the cups also move down away from the sheet. During this releasing action of the cups and while the sheet is still advancing the feed dogs 18 catch up with sheet edge and engaging the edge thereupon further propel the sheet through the remainder of the forward stroke. Since the sheet is in motion when the dogs engage it the impact of engagement is gentle and denting of the sheet edge is prevented.

Provision is made for preventing upward displacement of the sheet when it is thus engaged by the vacuum cups 21. For this purpose longitudinal hold-down bars 55 (Figs. 2 and 3) are disposed above the table 11 and these bars extend above and along the path of travel of the vacuum cups. In order to prevent engagement of the vacuum cups with the bars when no sheet is in the machine, the bars are cut away to provide clearance recesses 56 in the vicinity of the cams 41. Auxiliary hold-down bars 57 secured to the sides of the main hold-down bars 55 spread out on both sides beyond the path of travel of the cups as they pass the clearance recesses 56. These hold the sheet against displacement as it moves past these recesses.

Provision is also made for bringing the vacuum cups 21 into communication with the source of vacuum and for breaking the vacuum at the proper time. For this purpose there are provided two cam actuated valve units 61, 62 (Figs. 8 and 9). Valve unit 61 includes a hollow housing 64 (see also Fig. 10) having formed therein a valve seat 65 against which a valve disc 66 is pressed by a compression spring 67. An outlet pipe 68 leading to the source of vacuum is threaded into one side of the valve housing 64 and an inlet pipe 69 is threaded into the opposite side of the housing, the valve disc being located between the housing ends of the pipes to control the flow of air therethrough. The inlet pipe 69 is connected into a pipe 71 which in turn is connected to the flexible hose 35 leading from the vacuum cups 21.

The valve disc 66 is formed on a stem 75 which is carried in the housing 64. One end of the stem extends through the wall of and projects beyond the housing and is engaged by an arm 76 of a bell crank lever 77 mounted on a pivot pin carried in lugs 78 formed on the housing. A second arm 79 of the bell crank lever carries a cam roller 81 which operates on an edge cam 82 mounted on a continuously rotating shaft 83 journaled in bearings 84 formed in a casing 85.

The cam shaft 83 may be rotated in any suitable manner in time with the other moving parts of the machine, preferably by a sprocket 86 (Figs. 8 and 9) which is carried on one end of the shaft. A chain 87 taking over this sprocket may be operated from a shaft 88 which may be the main driving shaft of the machine. A second sprocket 89 (Fig. 9) carried on the opposite end of the

cam shaft 83 operates a chain 91 which may actuate other moving parts of the machine.

Hence as the rotating cam shaft 83 revolves the cam 82 it rocks the bell crank 77 to first move the valve disc 66 away from its seat 65 to open the valve unit 61 for a predetermined length of time and then to close it for the remainder of the revolution of the cam. While the valve is open the vacuum cups 21, by way of the hose 35, pipes 71, 68, are in communication with the source of vacuum. This is during the period the cups are in a raised position against the sheet as brought about by the stationary cams 41.

Just before the cups 21 are drawn away from the sheet, the rotating cam 82 permits the valve spring 67 to close the valve disc 66 against its seat 65 to cut off the vacuum communication between the cups and the source of vacuum. Immediately upon the closing of the valve unit 61 the valve unit 62 is opened to admit air into the line and thereby to break the vacuum on the cups so that they may be drawn away from the sheet.

The valve unit 62 includes a hollow housing 95 having formed therein a valve seat 96 against which a valve disc 97 is pressed by a compression spring 98. An air inlet pipe 99 open to the atmosphere is threaded into one side of the valve housing while an air outlet pipe 101 connecting with the pipe 71 is threaded into the opposite side of the housing. The valve disc 97 is located between the housing ends of these pipes to control the flow of air therethrough.

The valve disc 97 is formed on a stem 102 which is carried in the housing 95. One end of the stem extends through the wall of and beyond the housing and is engaged by an arm 103 of a bell crank lever 104 mounted on a pivot pin carried in lugs 105 formed on the housing. A second arm 106 of the bell crank lever carries a cam roller 107 which operates on an edge cam 108 mounted on the rotating cam shaft 83 adjacent the cam 82. Cam 108 normally keeps the valve disc 97 closed against its seat 96 to prevent air from entering the line but at the proper time in the cycle of events as explained above, the valve is momentarily opened to break the vacuum in the line as hereinbefore explained.

It is thought that the invention and many of its attendant advantages will be understood from the foregoing description, and it will be apparent that various changes may be made in the form, construction and arrangement of the parts without departing from the spirit and scope of the invention or sacrificing all of its material advantages, the form hereinbefore described being merely a preferred embodiment thereof.

I claim:

1. A feeding device for advancing sheets along a predetermined path of travel, comprising in combination, longitudinally reciprocable feeding means including a feed dog for advancing a said sheet by engagement with an edge of the sheet, and instrumentalities carried by said feeding means and bodily reciprocably therewith along the path of travel of the sheet for setting said sheet in motion prior to the engagement of the sheet edge by the said feed dog so that such feed dog gently engages the sheet edge while the sheet is in motion thereby preventing denting of the sheet side.

2. A feeding device for advancing sheets along a predetermined path of travel, comprising in combination feeding means including feed dogs for advancing a said sheet by engagement with

an edge of the sheet, and a vacuum cup movable along the path of travel of the sheet and operable against a side of the sheet, said cup setting said sheet in motion in the direction of travel of the feed dogs prior to the engagement of the sheet edge by the dogs so that the feed dogs gently engage the sheet edge while the sheet is in motion thereby preventing denting of the sheet edge.

3. A feeding device for advancing sheets along a predetermined path of travel, comprising in combination feeding means including feed dogs for advancing a said sheet by engagement with an edge of the sheet, a vacuum cup movable along the path of travel of the sheet and operable against a side of the sheet, said cup setting said sheet in motion in the direction of travel of the feed dogs prior to the engagement of the sheet edge by the dogs so that the feed dogs gently engage the sheet edge while the sheet is in motion thereby preventing denting of the sheet edge, and means for vacuumizing said cup and for breaking the vacuum in the cup in time with the feeding movements of said feeding means.

4. A feeding device for advancing sheets along a predetermined path of travel, comprising in combination feeding means including feed dogs for advancing a said sheet by engagement with an edge of the sheet, a vacuum cup movable along the path of travel of the sheet and operable against a side of the sheet, said cup setting said sheet in motion in the direction of travel of the feed dogs prior to the engagement of the sheet edge by the dogs so that the feed dogs gently engage the sheet edge while the sheet is in motion thereby preventing denting of the sheet edge, and elements for moving said vacuum cup into and out of engagement with said sheet.

5. A feeding device for advancing sheets along a predetermined path of travel, comprising in combination a reciprocating feed bar, a vacuum cup movable with said feed bar for setting said sheet in motion and for propelling it through a portion of a feeding stroke of said feed bar, elements for releasing said vacuum cup from said sheet while it is in motion, and feed dogs on said feed bar for gently engaging said sheet along an edge thereof while the sheet is in motion to prevent denting of the sheet edge and to propel the sheet through the remainder of the feeding stroke of said feed bar.

6. A feeding device for advancing sheets along a predetermined path of travel, comprising in combination a reciprocating feed bar, a vacuum cup pivotally secured to said feed bar and movable therewith for setting said sheet in motion and for propelling it through a portion of a feeding stroke of said feed bar, stationary cam elements located adjacent the path of travel of said vacuum cup for moving it into and out of engagement with said sheet, valve means connecting said vacuum cup with a source of vacuum and with a source of air for vulcanizing said cup and for breaking said vacuum at the proper time relative to the movement of said cup, and feed dogs on said feed bar for gently engaging said sheet along an edge thereof while the sheet is in motion to prevent denting of the sheet edge and to propel the sheet through the remainder of the feeding stroke and through subsequent feeding strokes of said feed bar.

7. A feeding device for advancing sheets along a predetermined path of travel, comprising in combination a reciprocating feed bar, an arm pivotally secured to said feed bar and movable therewith, a vacuum cup on said arm for engag-

ing and setting said sheet in motion and for propelling it through a portion of a feeding stroke of said feed bar, stationary cam elements located adjacent the path of travel of said vacuum cup, a movable finger connected on said arm for rigidly engaging said cam element in one direction to move the cup into and out of engagement with said sheet and for yieldably engaging said cam element in the opposite direction to keep the cup out of engagement with the sheet, valve means connecting said vacuum cup with a source of vacuum and a source of air for vacuumizing said cup and for breaking said vacuum at the proper time relative to the movement of said cup, and feed dogs on said feed bar for gently engaging said sheet along an edge thereof while the sheet is in motion to prevent denting of the sheet edge and to propel the sheet through the remainder of the feeding stroke of said feed bar.

5 8. A feeding device for advancing sheets along a predetermined path of travel, comprising in combination a pair of spaced and parallel reciprocating feed bars movable in unison for advancing a sheet along a path of travel in a predetermined position, a vacuum cup for each of said feed bars and movable therewith for setting said sheet in motion and for propelling it through a portion of each feeding stroke of said feed bars, elements for releasing said vacuum cups from said sheet while it is in motion, and feed dogs on said feed bars for successively and gently engaging said sheet along an edge thereof while the sheet is in motion to prevent denting of the sheet edge and to propel the sheet through the remainder of each feeding stroke of said feed bars.

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