May 27, 1952 J. SIMPSON 2,598,451

METAL STRIP OR SHEET FEEDING MEANS

Filed March 5, 1946 2 SHEETS—SHEET 1

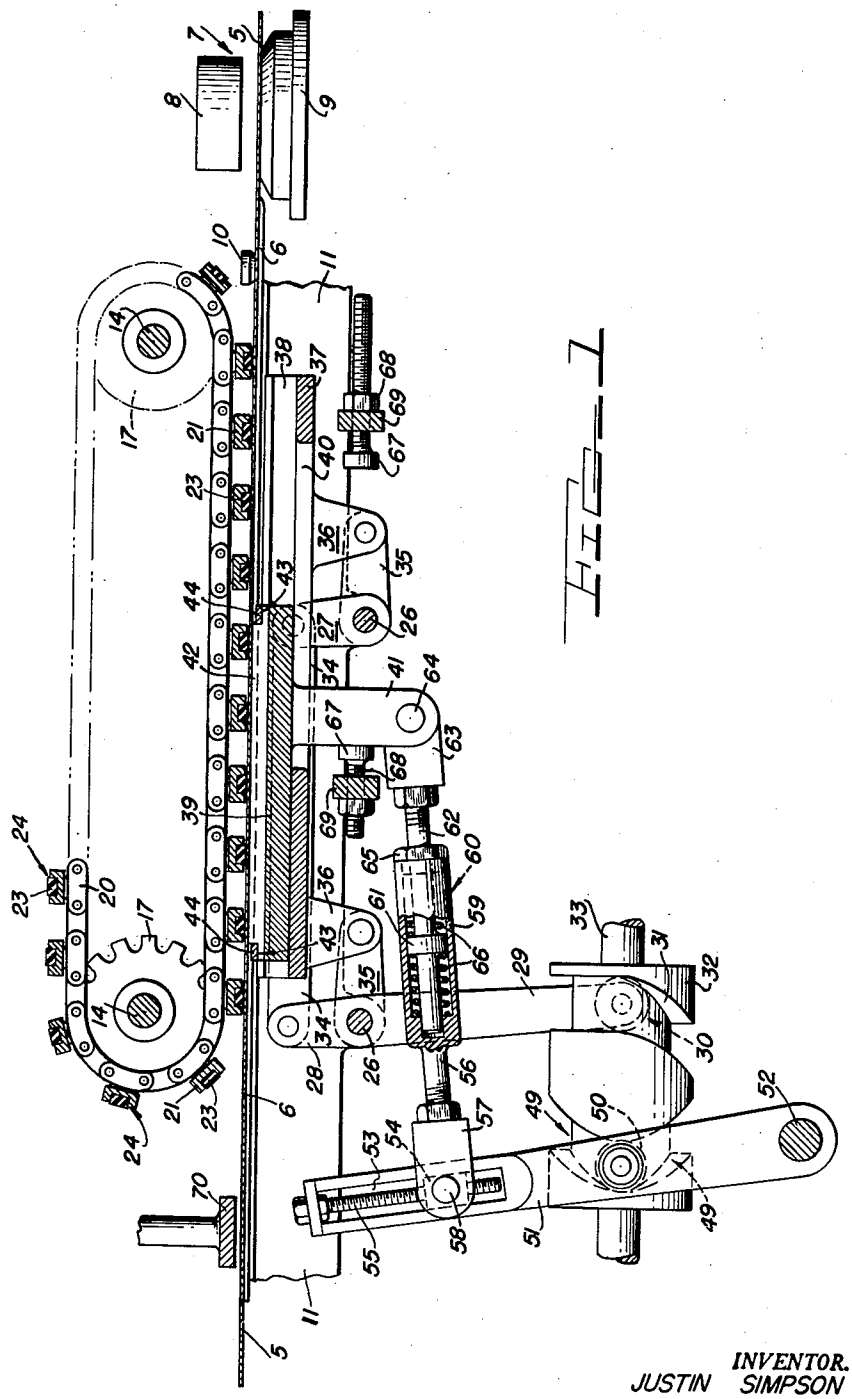


FIG. 1

INVENTOR.
JUSTIN SIMPSON

BY

Mason, Porter, Diller & Stewart.

May 27, 1952 J. SIMPSON 2,598,451

METAL STRIP OR SHEET FEEDING MEANS

Filed March 5, 1946 2 SHEETS—SHEET 2

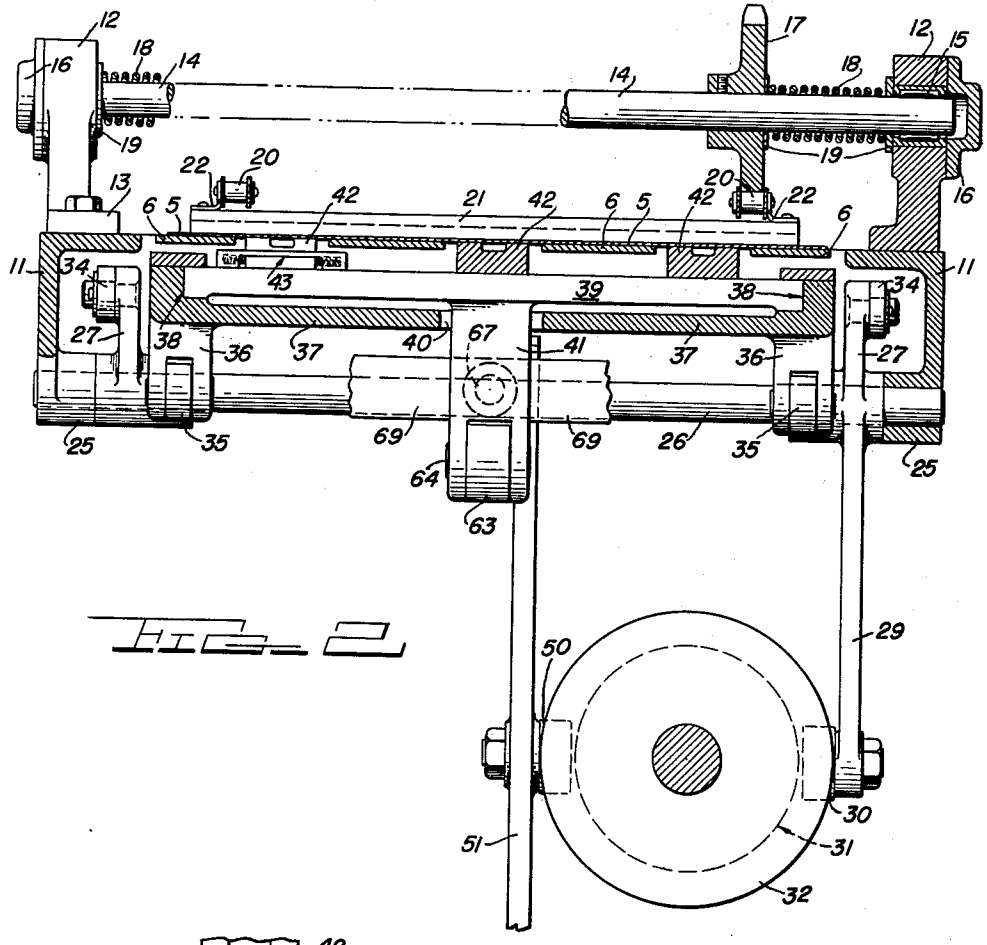


FIG. 2

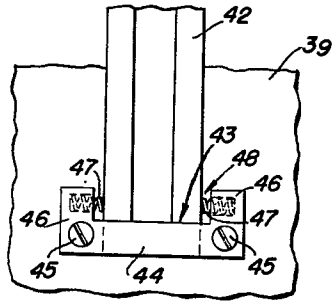


FIG. 3

INVENTOR.
JUSTIN SIMPSON

BY

Macon, Porter, Diller & Stewart.

Patented May 27, 1952

2,598,451

UNITED STATES PATENT OFFICE

2,598,451

METAL STRIP OR SHEET FEEDING MEANS

Justin Simpson, Elmhurst, Ill., assignor to Continental Can Company, Inc., New York, N. Y., a corporation of New York

Application March 5, 1946, Serial No. 652,139

13 Claims. (Cl. 271—2.5)

1

The invention relates generally to web or sheet feeding means and primarily seeks to provide novel means for intermittently feeding metal strip or sheets to a work station whereat work is to be performed thereon, as by punch and die equipments, shear cutters or the like.

It is well known that when metal strip or sheets are to be fed to a work station whereat work is to be performed, such as the punch cutting of can end blanks or the shear cutting of can body blanks or the sheets from which body blanks or end blanks are to be formed, the feeding of said strip or sheets must be positive and accurate. It is also well known that in the feeding of strip to work stations whereat punch and die equipments or scroll cutting shears constitute the strip working devices, provision must be made for permitting a limited amount of lateral weaving or creeping of the strip in advance of the work station, and also for preventing any lateral freedom for movement of the strip at said work station. The present invention seeks to provide a novel means for intermittently feeding metal strip or sheets positively and accurately, and in a manner for permitting a limited amount of weaving or lateral creeping of the strip in advance of, but not at, the work station.

An object of the invention is to provide a novel feeding apparatus of the character stated in which the feeding devices include cooperating gripper devices which grip the strip or sheets therebetween and positively move said strip or sheets therewith, certain of said gripper devices comprising magnet means.

Another object of the invention is to provide a novel feeding apparatus of the character stated in which the feeding devices include gripper members supported on idling carriers at one face of the strip or sheet in position for moving along with the strip or sheet during movement thereof, magnet members disposed at the opposite face of the strip or sheet, and means for imparting four-motion movement to the magnet means to cause them to first engage the strip or sheet and attract certain of the gripper members in strip or sheet gripping cooperation therewith, then move in the direction in which the strip or sheet is to be fed to impart a positive step feed movement thereto, then away from the strip or sheet to release the grip thereon, then back to the starting point in position for starting another feed cycle.

Another object of the invention is to provide a novel feeding apparatus of the character stated in which the gripper members are in the form of tool steel channel members disposed transversely

2

on idling chain carriers and having non-metallic, yieldable gripper surfaces projecting slightly from their channels for non-marring contact with the strip or sheet.

Another object of the invention is to provide a novel feeding apparatus of the character stated in which the four-motion feed imparting means comprises a slide guide, a slide slidable in the guide and carrying the magnet members, means for moving the guide to alternately present the magnet members to the strip or sheet for a feeding interval and then move them away, and means for sliding the slide in one direction while the magnet members are in contact with the strip or sheet and in the opposite direction when the magnet members are moved away from said strip or sheet.

Another object of the invention is to provide a novel feeding apparatus of the character stated in which the slide is limited in its strip or sheet feeding and return movements by fixed, adjustably mounted stops, and said movements are imparted by an adjustable stroke movement imparting means including a cushioned connector link permitting an amount of overtravel of the movement imparting means after contact with each stop.

Another object of the invention is to provide a novel feeding apparatus of the character stated in which there is included a gripper means effective to grip the strip or sheet and prevent movement thereof when the magnet members are out of contact with said strip or sheet.

Another object of the invention is to provide a novel feeding apparatus of the character stated in which means is provided for accurately gaging the strip edges immediately in advance of the work station, and in which means also is provided for floatably mounting the gripper members and the magnet members so as to permit a limited amount of weaving or side creeping of the strip before it reaches said gaging means.

With the above and other objects in view that will hereinafter appear, the nature of the invention will be more clearly understood by reference to the following detailed description, the appended claims, and the several views illustrated in the accompanying drawing.

In the drawings:

Figure 1 is a vertical longitudinal sectional view illustrating the invention.

Figure 2 is a vertical cross section illustrating the parts shown in Figure 1, the slide and the magnet members carried thereby being shown in end elevation.

Figure 3 is a fragmentary plan view illustrating the manner in which the ends of the magnet members are secured upon the slide.

In the example of embodiment of the invention herein disclosed, the metal strip or web 5 is directed over a plurality of longitudinally extending, laterally spaced brass rails 6 to a work station generally designated 7. In this particular disclosure, there is illustrated a cooperating punch and die equipment designated 8 and 9 respectively, but it is to be understood that the improved metal strip or sheet feeding means herein disclosed may be employed in feeding metal strip material or sheets to other metal working devices, such as straight cutting or scroll shears or the like. It is well known that in feeding metal strip according to conventional practices, there is a certain amount of weaving or lateral creeping of the strip, and in order to accurately gage the strip and prevent any misalignment in the punching or other operation at the work station 7, a pair of strip edge engaging and guiding rollers 10 are provided closely adjacent and in advance of the work station as illustrated in Figure 1.

A frame piece 11 extends along each side of the feed way provided by the rails 6, and two bearings 12 are secured as at 13 on each frame piece and extend upwardly therefrom in the manner clearly illustrated in Figure 2. In each laterally aligned pair of bearings 12, an idler cross shaft 14 is rotatably mounted in antifriction bearings 15. It will be apparent by reference to Figure 2 that the bearings 12, 15 also permit the shafts 14 to float longitudinally, and the endwise movement of the shafts may be limited by end caps 16 suitably secured to the bearings 12. Each shaft 14 has a pair of sprockets 17 secured thereon, and a compression spring 18 is coiled about each shaft end between the sprocket at the particular end thereof and the adjacent bearing 12, abutment washers 19 being mounted on the shafts for engaging the ends of said springs in the manner clearly illustrated in Figure 2. It will be obvious that the springs 18 yieldably retain the shafts 14 in centered relation and against endwise movement in the bearings 12, 15.

A chain 20 passes over each longitudinally aligned pair of sprockets 17, and tool steel channel members 21 are secured as at 22 across the chains in equidistantly spaced relation. It will be apparent by reference to Figure 1 that each channel member 21 has an insert 23 of rubber or equivalent yieldable material inserted therein, and the inserts are so proportioned that each thereof projects slightly beyond the channel in which it is mounted as at 24. The shafts 14 are so mounted and the sprockets 17 thereon and the cooperating chains 20 are so proportioned that the lower flights of the chains pass in close parallel relation over the brass rails 6 so the channels 21 are slightly spaced above the strip 5 and the channel inserts 23 will lightly engage in non-marring contact with the top surface of the metal strip 5 when said strip is not in motion.

Each frame piece 11 is provided with two depending bearings 25, and in each pair of axially aligned bearings 25 is mounted a transversely disposed rock shaft 26. One of the rock shafts has affixed thereto two upstanding crank arms 27, and the other shaft 26 has affixed thereto, two upstanding crank arms 28. One of the crank members 28 also includes a depending arm extension 29 which is equipped at its lower

end with a roller 30. The roller engages in a groove 31 formed in a rotary cam 32 secured upon a shaft 33 to which rotation is imparted in any approved manner (not shown).

Longitudinally aligned pairs of the crank arms 27 and 28 are connected at their upper ends by links 34, and each arm 27 and 28 also includes a horizontally extended crank arm 35. Each of the crank arms 35 is pivotally connected with an ear 36 depending from a slide guide member 37 having a slideway 38 therein for slidably supporting the slide member 39. The slide guide member is equipped with a longitudinal groove 40 for providing freedom of movement for the driving lug 41 which depends from the slide member 39. It will be apparent that as the lower end of the arm 29 is oscillated by engagement of the roller 30 in the rotating cam groove 31, the upper ends of the crank arms 27 and 28 will be oscillated and the free ends of the crank arms 35 will be moved upwardly and downwardly to move the slide guide member 37 toward and from the undersurface of the strip 5 supported on the brass rails 6.

A plurality of longitudinally extending, parallel spaced permanent magnets 42 are mounted on and movable with the slide 39. Each end of each magnet member 42 is stepped as at 43, and a U-shaped keeper bar 44 overlies each stepped end and is secured as at 45 to the underlying slide 39 so as to securely retain the magnet members on the slide. The bars 44 do not tightly clamp the magnet members against the slide but leave them free to partake of a limited amount of lateral movement. It will be apparent by reference to Figure 3 that each magnet member securing bar 44 has an extension 46 along each side of the respective magnet member, and each said extension is socketed to receive a compression spring 47 which extends from its receiving socket and engages the adjacent face of the magnet member. The bar extensions 46 are spaced slightly from the sides of the magnet members as at 48 thereby to permit a limited lateral floating of the magnet members.

The cam 32 (or a second cam) is provided with an actuator groove 49 in which an actuator roller 50 projects from a lever arm 51 which is swingable about a fixed pivot 52. The lever 51 is provided with a longitudinal slot 53 at its free end, and a fulcrum block 54 may be adjusted along said slot by manipulation of the adjuster screw 55. A thrust link member 56 has a head 57 adjustably mounted thereon, and said head is pivotally secured as at 58 to the fulcrum block 54. The link member 56 also includes a cylindrical enlargement 59 forming a slide chamber 60 wherein a plunger head 61 is longitudinally slidable. The plunger head 61 is formed on a thrust link member 62 also having a head adjustably mounted thereon and pivotally secured as at 64 to the lower end of the slide lug 41. An abutment end 65 is threadably mounted in the end of the cylindrical link enlargement 59, and compression springs 66 are coiled about the link member 62 between the respective ends of the plunger head 61 and the respective ends of the slide chamber 60.

It will be apparent by reference to Figure 1 that as the lever arm 51 is oscillated the thrust link structure 57, 56, 59, 62, 63 will be moved back and forth to impart reciprocation to the slide 39 along the guideway 38 in the slide guide member 37. The lug 41 depending from the slide 39 moves back and forth between two fixed stops 67 which

are adjustably mounted as at 68 in cross bars 69 secured in any approved manner to the longitudinally extended frame piece 11.

The cam grooves 31 and 41 are so timed that each time the crank arms 35 are lifted to place the magnet members 42 against the undersurface of the metal strip 5 so as to attract the overlying group of tool steel channel members 21 and firmly grip the strip 5 between said magnet members and channel insert members 23, thrust movement will be imparted to the thrust link structure to impart feed movement to the slide 39. After the feed movement determined by the spaced relation of the stops 67 has been imparted to the strip 5, the arms 35 will be lowered to move the magnet members downwardly away from the undersurface of the strip 5 so as to no longer attract the channel members 21 and thereby release the feed grip on the strip. Thereafter, the thrust link structure will be drawn back to the initial position and the parts will be ready to commence another feed cycle. During the forward or feed movement of the slide 39, the chains 20 move idly, and the magnet members 42, the channel members 21, the chains 20, the sprockets 17 and the shafts 14 are free to float laterally a limited amount sufficient to take care of any slight weaving or creeping of the strip 5.

It will be apparent that the feed stroke can be varied by changing of the position of the fulcrum block 54 and the spacing of the stops 67, and by reason of the provision of the abutment head 61 and the compression springs 66, a limited amount of overtravel of the thrust link structure may be permitted after the slide lug 41 engages a stop in each direction of travel of the slide.

Gripper means 70 is provided and this gripping means is lifted and lowered in timed relation to the operation of the previously described feeding devices by any approved means (not shown) so that said gripping means 70 will engage and securely hold the strip 5 at all times when said strip is not being moved by the magnet members 42 and the channel members 21.

While one form of the invention has been shown for purposes of illustration, it is to be clearly understood that various changes in the details of construction and arrangement of parts may be made without departing from the spirit and scope of the invention as defined in the appended claims.

I claim:

1. In apparatus of the character described, a work station, opposing metal strip gripper devices movable for intermittently feeding strip to said station, means disposed adjacent to and in advance of the work station for accurately guiding strip to said station, and means floatably mounting the gripper devices in a manner providing limited freedom for lateral movement of said gripper devices and permitting a limited amount of weaving or lateral creeping of the gripped strip in advance of said guiding means.

2. In apparatus of the character described, a work station, opposing metal strip gripper devices, means for moving said devices so that they will come together and move together intermittently for intermittently feeding strip to said station, means disposed adjacent to and in advance of the work station for accurately guiding strip to said station, and means floatably mounting the gripper devices in a manner providing limited freedom for lateral movement of said gripper devices and permitting a limited amount of weaving or lateral creeping of the gripped strip in advance of said guiding means, said gripper devices including magnet means opposed to one face of the strip and magnet means attractable gripper members mounted on idling carriers and opposed to the opposite face of the strip.

3. In apparatus of the character described, a work station, opposing metal strip gripper devices, means for moving said devices so that they will come together and move together intermittently for intermittently feeding strip to said station, means disposed adjacent to and in advance of the work station for accurately guiding strip to said station, and means floatably mounting the gripper devices in a manner providing limited freedom for lateral movement of said gripper devices and permitting a limited amount of weaving or lateral creeping of the gripped strip in advance of said guiding means, said gripper devices including magnet means opposed to one face of the strip and magnet means attractable gripper members mounted on idling carriers and opposed to the opposite face of the strip, and said moving means including devices for imparting four-motion movement to the magnet means for first moving the same against the strip, then along the direction of feed, then away from the strip, and then back to the starting position preparatory to commencement of another feed cycle.

4. In apparatus of the character described, a feedway over which metal strip or sheets are to be fed, permanent magnet means opposed to one face of the strip or sheets, a slide carrying said magnet means, a carrier having a longitudinal grooveway in which the slide is slidable, means for reciprocating the slide in the grooveway, and means for moving the carrier toward and from the feedway in time with the reciprocation of the slide for moving the magnet means into contact with a strip or sheet on the feedway, then along said feedway with the strip or sheet attracted thereto, then away from said strip or sheet to break said attraction, and then back to the starting point preparatory to commencement of another feed cycle.

5. In apparatus of the character described, a feedway over which metal strip is to be fed, magnet means opposed to one face of the strip, means for moving the magnet means into contact with a strip on the feedway, then along said feedway with the strip attracted thereto, then away from said strip to break said attraction, and then back to the starting point preparatory to commencement of another feed cycle, and means floatably mounting said magnet means so as to permit a limited amount of weaving or lateral creeping of the strip as it is being fed.

6. In apparatus of the character described, a feedway over which metal strip is to be fed, magnet means opposed to one face of the strip, means for moving the magnet means into contact with a strip on the feedway, then along said feedway with the strip attracted thereto, then away from said strip to break said attraction, and then back to the starting point preparatory to commencement of another feed cycle, magnet means attractable gripper members closely opposing the opposite face of the strip in position for being attracted by the magnet means into tight gripping contact with said strip whenever the magnet means is in contact with the strip, idling carriers for said gripper members permitting free movement thereof with the gripped strip, means floatably mounting said magnet means and means

floatably mounting said gripper members so as to permit a limited amount of weaving or lateral creeping of the strip as it is being fed.

7. In apparatus of the character described, a feed way over which metal strip or sheets are to be fed, magnet means opposed to one face of the strip or sheets, means for moving the magnet means into contact with a strip or sheet on the feedway, then along said feed way with the strip or sheet attracted thereto, then away from said strip or sheet to break said attraction, and then back to the starting point preparatory to commencement of another feed cycle, gripper members closely opposing the opposite face of the strip or sheets in position for being attracted by the magnet means into tight gripping contact with said strip or sheets whenever the magnet means is in contact with the strip or sheets, and idling carriers for said gripper members permitting free movement thereof with the gripped strip or sheets, each said gripper member comprising a tool steel body with a gripper insert of yieldable material projecting slightly beyond the strip or sheet opposing surface thereof for non-marring contact with said strip or sheets.

8. In apparatus of the character described, a feed way over which metal strip or sheets are to be fed, a slide guide, a slide reciprocable in said guide in a path paralleling said feed way, a plurality of permanent magnets extending longitudinally on said slide, means for reciprocating said slide, means for moving the guide toward and from the feed way in timed relation to the slide reciprocation to cause the magnets to engage a strip or sheet, then move along the feedway with the strip or sheet held thereagainst, then away from the strip or sheet and then back to the starting point preparatory to commencement of another feed cycle, and a pair of endless conveyors having flights paralleling the feedway opposite the slide and free to move idly in the direction of travel of the strip or sheets and having gripper members extending thereacross in position for being attracted by the magnets into tight gripping contact with said strip or sheets whenever the magnets are in contact with the strip or sheets.

9. In apparatus of the character described, a feed way over which metal strip or sheets are to be fed, a slide guide, a slide reciprocable in said guide in a path paralleling said feed way, a plurality of permanent magnets extending longitudinally on said slide, means for reciprocating said slide, means for moving the guide toward and from the feed way in timed relation to the slide reciprocation to cause the magnets to engage a strip or sheet, then move along the feedway with the strip or sheet held thereagainst, then away from the strip or sheet and then back to the starting point preparatory to commencement of another feed cycle, a pair of endless conveyors having flights paralleling the feedway opposite the slide and free to move idly in the direction of travel of the strip or sheets and having gripper members extending thereacross in position for being attracted by the magnets into tight gripping contact with said strip or sheets whenever the magnets are in contact with the strip or sheets, each said gripper member comprising a tool steel body with a gripper insert of yieldable material projecting slightly beyond the strip or sheet opposing surface thereof for non-marring contact with said strip or sheets.

10. In apparatus of the character described, a feed way over which metal strip or sheets are to be fed, a slide guide, a slide reciprocable in said guide in a path paralleling said feed way, a plurality of permanent magnets extending longitudinally on said slide, means for reciprocating said slide, means for moving the guide toward and from the feed way in timed relation to the slide reciprocation to cause the magnets to engage a strip or sheet, then move along the feedway with the strip or sheet held thereagainst, then away from the strip or sheet and then back to the starting point preparatory to commencement of another feed cycle, a pair of endless conveyors having flights paralleling the feedway opposite the slide and free to move idly in the direction of travel of the strip or sheets and having gripper members extending thereacross in position for being attracted by the magnets into tight gripping contact with said strip or sheets whenever the magnets are in contact with the strip or sheets, and adjustable stop means for limiting the reciprocatory movement of the slide, said slide reciprocating means being adjustable for varying the length of the reciprocatory movement imparted to the slide.

11. In apparatus of the character described, a feed way over which metal strip or sheets are to be fed, a slide guide, a slide reciprocable in said guide in a path paralleling said feed way, a plurality of permanent magnets extending longitudinally on said slide, means for reciprocating said slide, means for moving the guide toward and from the feed way in timed relation to the slide reciprocation to cause the magnets to engage a strip or sheet, then move along the feedway with the strip or sheet held thereagainst, then away from the strip or sheet and then back to the starting point preparatory to commencement of another feed cycle, a pair of endless conveyors having flights paralleling the feedway opposite the slide and free to move idly in the direction of travel of the strip or sheets and having gripper members extending thereacross in position for being attracted by the magnets into tight gripping contact with said strip or sheets whenever the magnets are in contact with the strip or sheets, and stop means for limiting the reciprocatory movement of the slide, said slide reciprocating means including a cushioned link connection permitting a limited overtravel of the reciprocating means as each stop is engaged.

12. In apparatus of the character described, a feed way over which metal strip is to be fed, a slide guide, a slide reciprocable in said guide in a path paralleling said feed way, a plurality of permanent magnets extending longitudinally on said slide, means for reciprocating said slide, means for moving the guide toward and from the feed way in timed relation to the slide reciprocation to cause the magnets to engage a strip, then move along the feedway with the strip held thereagainst, then away from the strip and then back to the starting point preparatory to commencement of another feed cycle, a pair of endless conveyors having flights paralleling the feedway opposite the slide and free to move idly in the direction of travel of the strip and having magnet attractable gripper members extending thereacross in position for being attracted by the magnets into tight gripping contact with said strip whenever the magnets are in contact with the strip, means floatably mounting the magnets for limited lateral movement on the slide and means floatably mounting said conveyors for limited lateral movement relative to said slide,

thereby to permit a limited amount of weaving or lateral creeping of the strip as it is being fed.

13. In an apparatus of the character described, a straight line feed way over which metal strip or sheets are to be fed, a straight line guide paralleling said feedway, magnet means opposed to one face of the strip or sheets and reciprocable in said guide, cam actuated crank and link devices for moving the guide toward and from the feedway and the magnet means back and forth in the guide for causing the magnet means to first contact with a strip or sheet on the feedway, then move along in said guide with the strip or sheet attracted thereto, then away from said strip or sheet to break said attraction, and then back in said guide to the starting point preparatory to commencement of another feed cycle, magnet means attractable gripper members closely opposing the opposite face of the strip or sheets in position for being attracted by the magnet means into tight gripping contact with said strip or sheets whenever the magnet means is in contact with the strip or sheets, and idling carriers for said gripper members mounted for unidirectional movement permitting free movement thereof with the gripped strip or sheets.

JUSTIN SIMPSON.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
162,341	Beecher	Apr. 20, 1875
544,665	Droher	Aug. 20, 1895
1,343,648	Smith	June 15, 1920
1,375,889	Baltzley	Apr. 26, 1921
1,561,063	Dunlap	Nov. 10, 1925
1,946,874	Nicholas	Feb. 13, 1934
2,096,073	Spencer	Oct. 19, 1937
2,222,168	Brooks	Nov. 19, 1940
2,236,193	Hazelton	Mar. 25, 1941
2,250,530	Hafecost	July 29, 1941
2,263,721	De Lorme	Nov. 25, 1941
2,276,472	Eberhart	Mar. 17, 1942
2,381,571	Buchan	Aug. 7, 1945