Sept. 8, 1942. L. R. STALDER 2,295,060

SHEET FEEDING APPARATUS

Filed Dec. 13, 1939 3 Sheets-Sheet 1

Fig. 1.

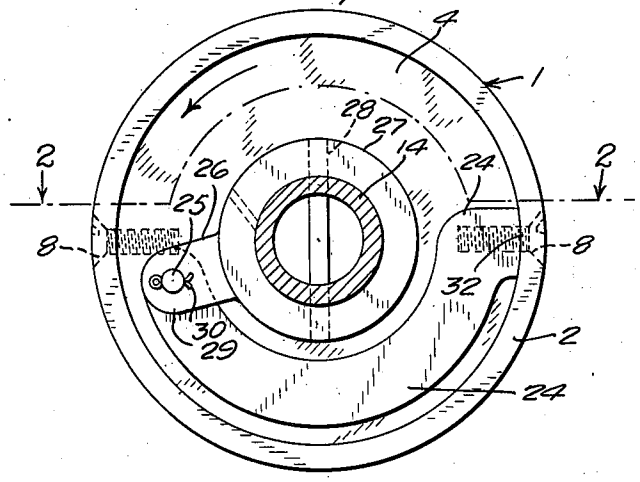
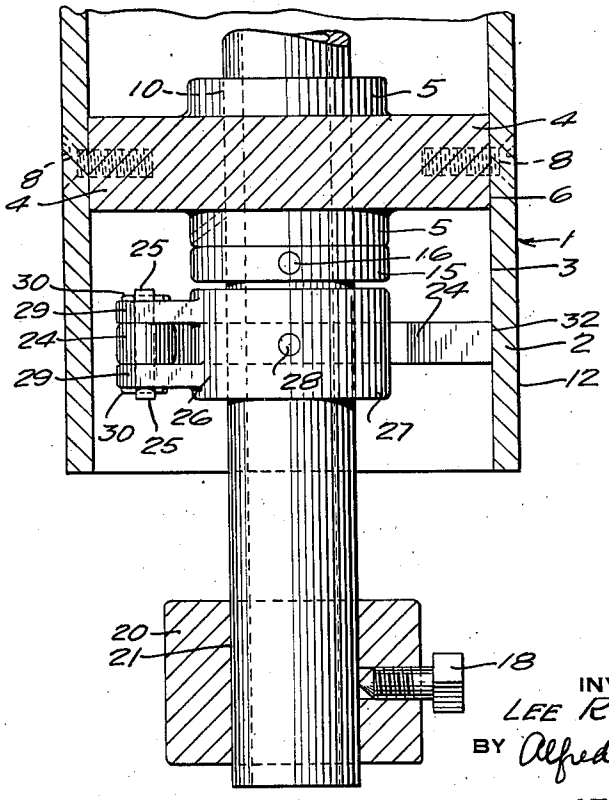


Fig. 2.



INVENTOR
LEE R. STALDER
BY Alfred F. Ernst
ATTORNEY

Sept. 8, 1942. L. R. STALDER 2,295,060

SHEET FEEDING APPARATUS

Filed Dec. 13, 1939 3 Sheets-Sheet 2

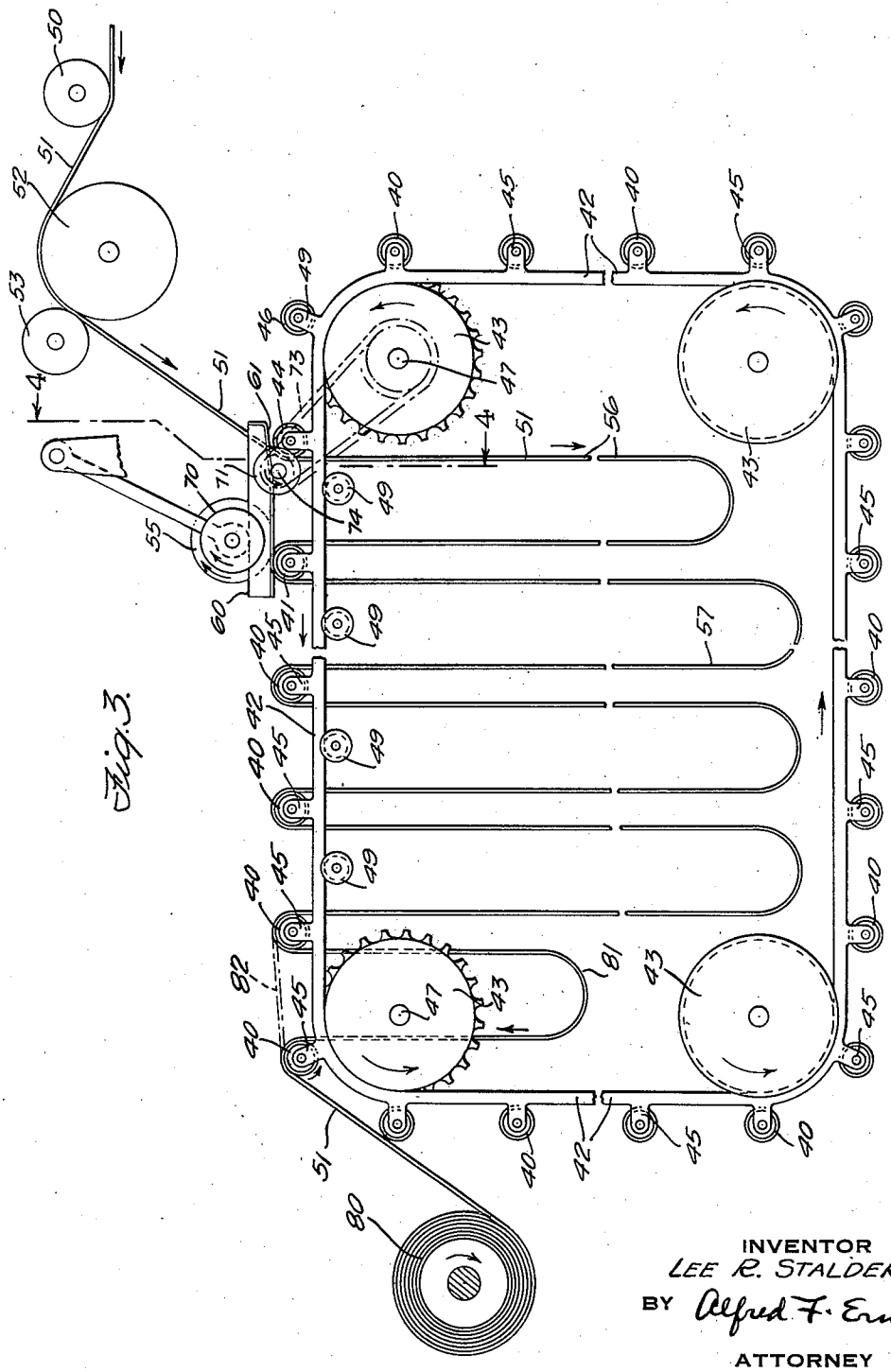


Fig. 3.

INVENTOR
LEE R. STALDER
BY Alfred F. Ernst
ATTORNEY

Sept. 8, 1942. L. R. STALDER 2,295,060

SHEET FEEDING APPARATUS

Filed Dec. 13, 1939 3 Sheets-Sheet 3

Fig. 4.

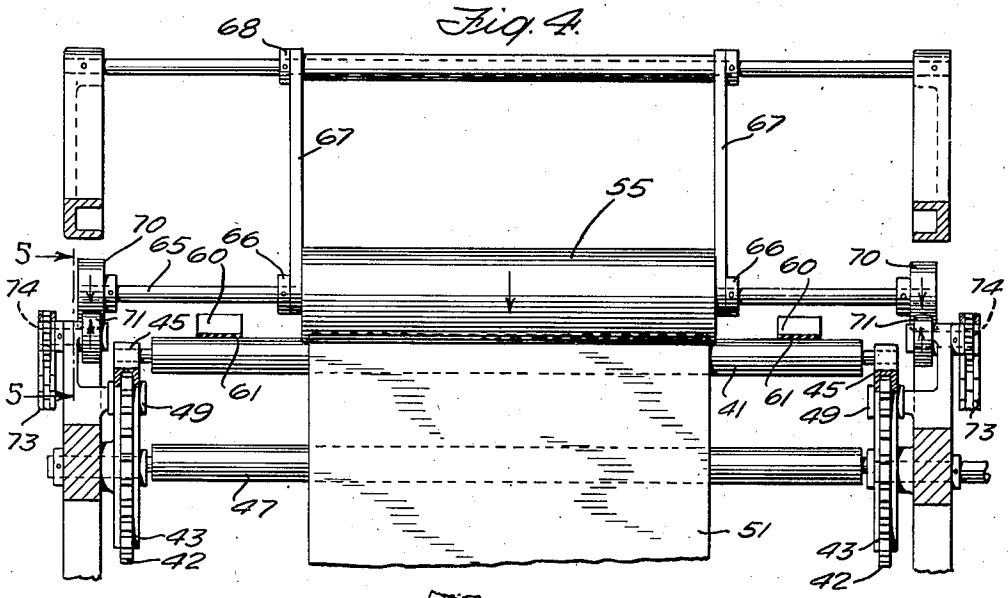
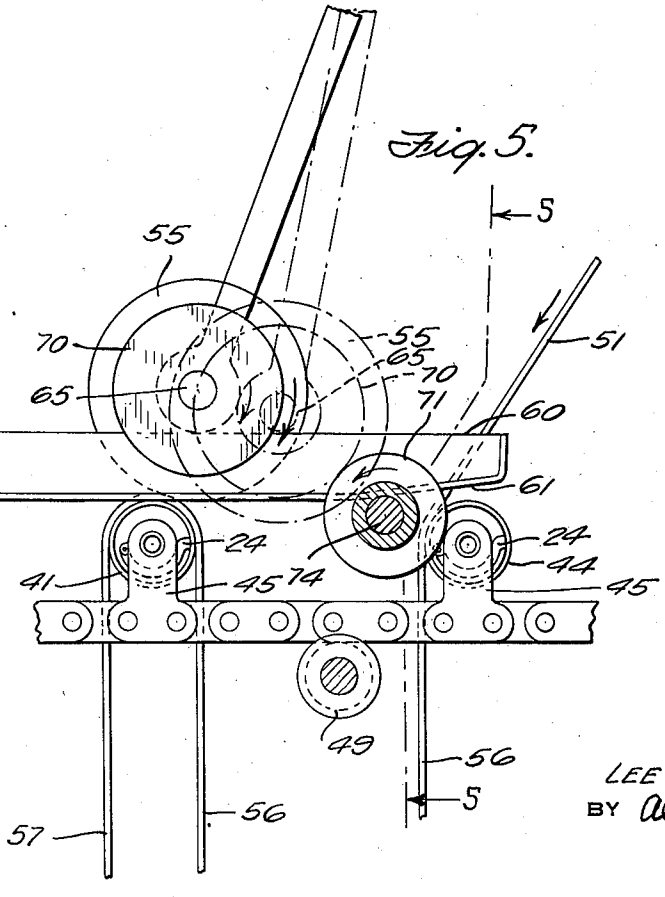


Fig. 5.



INVENTOR
LEE R. STALDER
BY Alfred F. Ernst
ATTORNEY

Patented Sept. 8, 1942 2,295,060

UNITED STATES PATENT OFFICE

2,295,060

SHEET FEEDING APPARATUS

Lee R. Stalder, Kansas City, Mo., assignor to Certain-Teed Products Corporation, New York, N. Y., a corporation of Maryland

Application December 13, 1939, Serial No. 308,969

12 Claims. (Cl. 271—2.2)

This invention relates to a mechanism for insuring uni-directional rotation and uni-directional circumferential delivery in a rotating device. The invention especially relates to such devices for control of the movement of a continuous web or sheet. The invention has particular application in apparatus for forming suspended loops of a continuous web or sheet.

In the manufacture of sheet material such as paper, felt and other fabrics in which a continuous sheet or web is delivered continuously from one operation in a machine or at one point in the manufacture to another point of processing or treatment, control of the movement of the sheet or web is necessary in many cases to prevent breakage or undue stretch or cracking by virtue of folding and for other reasons. In many of such processes of web manufacture and treatment, also, it is necessary to include a drying or other conditioning operation intermediate between other processing steps. In such apparatus it has been the practice in some cases to hang up the sheet or webs in a series of loops of the continuous sheet, the lower loops usually hanging free and the upper loops passing over suspension bars or other supports spaced apart in the direction of general movement of the sheet through the machine. In this way access of air to both sides of the sheet is obtained and the drying or other conditioning operation is expedited.

In the roofing art it has been common practice to use such "loopers" both in the preparation of dry felts and in connection with the processes of saturating the sheet with asphalt and of coating the saturated sheet with a coating of asphalt preparatory to surfacing the sheet with granular material. In such roofing machines an endless chain or conveyor has been used with bars or "flights," sometimes made removable from the chain, which are spaced apart in the direction of movement of the chain or conveyor and so arranged that they successively contact the sheet or web of roofing after a certain portion of said web has dropped in a loop from the previously contacted bar. Between each two bars or "flights" the sheets hang in loops which, by virtue of the forward movement of the "flights" as part of the conveyor, are carried forward for a sufficient distance to allow the desired drying or conditioning operation to be completed.

One difficulty with "loopers" of this type is that when one loop is or becomes shorter than an adjacent loop the weight of the sheet in the longer loop may draw the sheet over the "flight" from the shorter loop. As the weight of the shorter loop continues to decrease while the weight of the longer loop increases, continual movement of the sheet into the longer loop progresses until all of the shorter loop is shortened to a portion of the sheet which extends between the two flights which supported the shorter loop. Piling of the sheet in the lengthened loop with attendant folding which may cause cracking or other damage may occur. Such a relation of adjacent loops occurs when the sheet is delivered from the "looper," the roll-up or take-off device necessarily withdrawing the sheet from the last loop and continually shortening this loop with respect to the following loop until the sheet stretches taut between flights. A similar action, unless prevented, may occur as the sheet is delivered to the "looper" where the loop previously formed because of its greater weight may draw into itself the loop being formed or may prevent its formation between the trailing flight of said previously formed loop and a flight just coming into contact with the sheet. This lack of control of the movement of the sheet over the flights and the lack of certainty of formation and maintenance of loops of desired length cause delays as well as damage to the goods.

It is an object of the invention to overcome the difficulties above described and to provide a rotation device in which rotation thereof and delivery of a sheet which is in contact therewith in one direction only is insured.

It is a further object of the invention in the looper machine to provide means which will control the feed of a sheet to insure the formation and maintenance of a series of loops of the desired length.

It is a further object of the invention to provide means cooperating with the one way rotation device to insure the completion of loops of desired or uniform length and to insure the formation of the succeeding loops.

The one way rotation device of the invention utilizes in one embodiment a simple gravity actuated pawl or latch means or dog which will permit rotation of the device in one direction but will prevent its rotation in the opposite direction. This device may find use in various types of rotating members but particularly in those such as rollers or drums or cylinders in contact with the circumferential surface of which a sheet or web is intended to move tangentially. The sheet may act either frictionally on said roller, drum or cylinder to cause it to turn or in some cases the sheet may be moved by positive rotation of such roller, drum or cylinder through the intermediary action of said latch.

The one way rotation device of the invention has particular application in "looping" machines of the type above referred to. In such application for the bars or "flights" of the "looper" may be substituted a roller mounted to turn freely on a fixed shaft, this shaft being held with its ends supported upon the chain or

chains or other suitable members of the conveying apparatus of the looper. The one way rotation device of the invention is so combined with such a roller that the web or sheet which passes over and in contact with the circmuferential surface of the roller may hang between two of such rollers in the same manner that in the prior art constructions it hangs between the "flights." Because the roller is capable of rotating in one direction only the weight of the loops between flights cannot act to cause the sheet to be drawn backward over the rollers with the resulting piling and folding of the sheet which may cause damage thereo. The sheet, however, may be drawn forward at the discharge end of the "looper" without excessive drag over the flights from which it passes to the next step in the process, or to a roll-up device.

In connection with the one way rotation device in the application of the invention to the "looper," means are provided for preventing movement of the roller in either direction after the time of initial formation and during completion of the loop following a previously completed loop. For this purpose means are utilized cooperating with the one way rotation device applied to the roller so that the roller will be held as if fixed to the shaft during movement of the roller substantially for or somewhat in excess of the distance between loops or until the loop being formed is complete. Thereafter the device is released to be free to exercise its function of turning in the forward direction only. Moreover, during this period of formation of a loop or a substantial part thereof the sheet or web itself may be held or gripped between the roller and auxiliary means, such as a drum or "bumper" roll, to prevent sliding of the sheet over the "flight" roller due to unequal weight of the web at either side of said roller. In this way the web is prevented from moving in either direction upon that roller which is trailing in the loop previously completed during the period of formation of a new loop. After completion of the new loop this grip upon the web is released and reliance may then be placed upon the one way rotation device and the normal friction thereof to hold the loops in the length and positions as formed.

Further features of the invention will be understood from the description of the drawings to follow, in which—

Fig. 1 shows an end view of a roller provided with the one way rotation device of the invention.

Fig. 2 is a cross-section in plan on line 2—2 of Fig. 1.

Fig. 3 shows diagrammatically a "looper" equipped with the devices of the invention.

Fig. 4 shows a section on line 4—4 of Fig. 3.

Fig. 5 shows in enlarged scale a portion of the "looper" apparatus at the intake end thereof.

In Figs. 1 and 2 a roll 1 is illustrated which may be formed with a pipe or tube 2 having fitted internally thereof a disc 4 provided with hubs 5 which may be formed integral with the disc. The outer circumference 6 of the disc 4 may be turned to fit the internal diameter 3 of the pipe or tube 2. Screws 8 may be tapped into the disc 4 through holes in the pipe or tube 2 to hold the disc in place within the pipe or other suitable means of fastening may be adopted. The bore 10 of the hubs 5 of the disc 4 is substantially concentric with the circumference 6 of the disc and the outer circumference 12 of the tube or pipe 2 may be turned concentric with said bore 10. Passing through the bore 10 with a running fit is shaft 14. A collar 15 fastened with a pin 16 through shaft 14 may be placed against one face of the hub 5. A similar collar may be positioned against a hub 5 of a similar disc 4 (not shown) at the opposite end of said roll 1. These collars may be so placed as to prevent movement of the roll lengthwise of shaft 14 but leave the roll free to turn thereon.

The shaft 14 may be fastened by means of a set screw 18 tapped into a bearing or bracket 20 through the bore 21 of which the shaft 14 passes. The shaft 14 thereby is prevented from rotating in said bearing or block. The bearing 20 in the general case may be a fixed bearing but in the particular application hereafter described this bearing may be mounted upon a conveyor or chain to give said bearing a movement of translation. Thus, a roll 1 of the type described and supported in a pair of such bearings 20 mounted on parallel chains will be carried forward with a motion of translation, impelled by the chain, as in the common "looper."

In either case the roll is free to rotate upon the shaft unless prevented by other means. In order to permit rotation in one direction, for example in the direction of the arrow in Fig. 1, according to the invention a pawl or latch 24 is pivoted upon a pin 25 and supported within the tube 2 by means of a bracket 26 having a hub 27 fitting over the shaft 14 and secured thereto by the pin 28 passing through said hub 27 and shaft 14. The bracket 26 is provided with two arms 29, Fig. 2, between which the pivot end of the latch 24 is positioned without binding. The pin 25 passes through holes in the arms 29 and a hole in latch 24 in such a way that the latch 24 is free to swing upon the pin 25. The pin 25 may be held in position against movement endwise by cotter pins 30.

The latch 24 is of arcuate form so as to pass around the shaft 14 and the hub 27 and is formed with a bend or toe at the end thereof opposite the pivot pin 25 so as to provide a surface 32 for contact which will generally conform to the inner circumference of the tube 2. It will be noted that the hub 27 and the arms 26 are so positioned with respect to the horizontal and vertical through the center of shaft 14 that the pin 25 is at the opposite side of the vertical from the end 32 of the latch 24. This is the preferable arrangement because a latch of relative long radius is thereby secured. Moreover, preferably, the pin 25 is positioned somewhat below the horizontal through the center of the shaft 14. The purpose of this positioning of the pin 25 relative to the surface 32 is that as the latch 24 is moved angularly about the pin 25 the surface 32 will move in lines which will intersect the inner circumference of the tube 2. In other words, since the radius from the pin 25 to the surface 32 is greater than the radius of the inner circumference 6 of the tube 2 about shaft 14 any movement of the latch 24 in the direction downward will cause the surface 32 to bear against said inner circumference 6 of the tube 2. The opposite direction of angular movement of the latch 24 will release the surface 32 from said inner circumference of the tube 2. If the center of the pin 25 were on the horizontal or on a diameter through the center of the shaft 14 which also passes through a point upon the surface 32, no motion of the latch 24 upward or downward would be possible and no release of

the bearing of the surface 32 from bearing against the tube 2 would be possible.

Under the action which takes place if the roll 1 is rotated in the clockwise direction in the particular arrangement shown in Fig. 1 the latch surface 32 will press against the inner surface 6 of the tube 2 with pressure increasing with the force put upon the roll 1 tending to produce movement in the clockwise direction. It will be apparent, also, from examination of Fig. 1 that any such force brought upon the latch 24 would tend to make the pin 25 and the arms 26 rotate in the clockwise direction. This movement, however, is prevented by the pin 28 passing through the hub 27 and the fixed shaft 14. Thus by the jamming action of the surface 32 against the inner surface 6 of the tube 2 clockwise rotation of said tube and the roll 1 is prevented. The roll 1, however, is free to rotate in the counter-clockwise direction because the force thus applied to the roll will tend, by friction and subsequent release of the surface 32 from surface 6, to move the latch 24 upward at the free end thus to carry the surface 32 away from the inner surface 6 of the pipe 2.

It will be noted in the particular embodiment of the invention illustrated in Figs. 1 and 2 that gravity is used initially to bring the latch down with the surface 32 in contact with the inner surface 6 of the tube 2. Within the scope of the invention, however, other means may be provided, such as a spring, suitably fastened to the latch 32 and to the fixed shaft 14 or the fixed hub 5 to bias the latch 24 to swing upon the pin 25 in the direction, that is the clockwise direction, which will bring the surface 32 into contact with the inner surface of the tube 2.

It will be apparent from the above description that a sheet or web in contact with the circumferential surface 12 of the roll 1 and having friction against this surface sufficient to prevent its slipping thereon will cause said roll 1 to move in the counter-clockwise direction when said sheet is drawn in said direction. Conversely, however, any movement of the sheet tending to cause clockwise direction of the roll 1 in the arrangement shown in Figs. 1 and 2 will be prevented by the action of the latch 24 which has been described.

In Fig. 3 is shown a "looper" equipped with rolls or roller flights 40 in place of the ordinary stationary flights, which roller flights are constructed with the one way rotation device of the invention. In this figure, upon an endless chain 42 extending about sprockets 43 the rolls are mounted in brackets 45 fastened by suitable means to the chain 42. As illustrated in Fig. 4 the looper may be provided with two chains 42 extending about sprockets 43 connected by a shaft 47. One or more of the shafts 47 may be connected by suitable drive to a source of power for rotation thereof to accomplish the drive of the chain in the direction of the arrows as shown in Fig. 3. The arrangement is such that a portion of the chain extends horizontally at the upper part of the looper and a return portion extends horizontally in the reverse direction below the loops of the sheet material. To carry the weight of the looper sheet which as shown extends over and is carried by the rolls 40, supporting rollers 49 are positioned beneath the upper horizontal stretch of the chain. The rollers 49 may be mounted in suitable supports (not shown) to turn freely therein.

In Fig. 3 the sheet 51 to be hung in loops in the looper is received at the receiving end of the machine, passing under the tension or idler roller 50 and over feed or pull roll 52 between which and pressure or idler roll 43 the sheet 51 may pass. From the pull roll 52 the sheet 51 passes down into contact with a "flight" roll 44 between which and the preceding roll 41 in the direction of movement of the chain a loop 56 of the sheet 51 is being formed. With the "flight" rollers in the positions as shown in Fig. 3 the loop 56 being formed approaches completion of the loop, the sheet 51 moving with the surface of the roll 44 with which it is in contact. As will be hereafter described, the rolls 41 and 44 between which this loop is suspended are held against rotation in either direction substantially at once after completion of the loop 56. The one way rotation devices of the invention described in connection with Figs. 1 and 2 prevent rotation of the rolls 41 and 44 in the clockwise direction. With the cooperation of other means to be described, motion of the rollers in the counter-clockwise direction is prevented as the loop is moved toward the left in Fig. 3. As the loop approaches completion, the sheet moving circumferentially with the surface of the righthand roller 44, this "flight" roller 44 comes into contact with the bumper roll 55 between which and the roll 44 the sheet may be gripped to prevent further movement upon said roll 44. From the consideration of the arrangement of Fig. 3 and the explanation to be given in connection with Figs. 4 and 5 it will be clear that when the sheet 51 is thus gripped between the bumper roll 55 and the roll 44, the latter by that time having progressed to the left in Fig. 3 a sufficient distance, a new loop of the sheet 51 will start forming between said roll 44 and the pull roll 52. As the roll 44 progresses to the left, the sheet 51 being fed by the pull roll 52, a new loop of the sheet 51 will be formed between roll 44 and the following roll 46 on the chain 42.

Positioned above the rolls 40, 41, 44 and 46 as they move in the horizontal upper stretch of the chain is shown in Fig. 3 a block 60 on the lower horizontal face of which is fastened by suitable means a facing 61 of sheet friction material, such as a rubber sheet, in such position as to contact the upper circumferential surfaces of the rolls 40, 41, 44, 46 to tend to impel them to rotate in the clockwise direction. As the one way rotation device and particularly the latch 24 described above will prevent rotation of these rolls or roller flights in this direction, these rolls, such as the rolls 41 and 44 in Fig. 3, are substantially held fixed against rotation during the period of contact with the friction facing 61 of the block 60. It will be apparent, therefore, that the loop 57 which precedes the loop 56 in the direction of movement of the loops through the looper will not be effective because of its longer length to draw the portion of the sheet 51 forming the loop 56 into itself. The loop 56, therefore, may be formed and completed by the time that the bumper roll 55 contacts the roller flight 44. This roller flight 44 then acts in the manner of roller flight 41 until released from contact with the friction facing 61.

During the movement of a roller flight 40, such as the roller flight 41, from a position of first contact with the friction facing 61 to the position thereof shown in Fig. 3 this roller flight 41 not only is held against rotary motion but, as referred to above, about the time of completion of the loop 57 in the manner referred to in connection with loop 56, this roller contacts the bumper

roll 55 and is maintained in engagement therewith until it reaches the position shown in Fig. 3 at which place it is about to be released from said contact with the bumper roll 55. The sheet, therefore, is held into contact with the roll 41 substantially throughout the period of formation of the loop and until its completion.

When the roll 41 passes out of contact with the bumper roll 55 this roll 55, mounted on shaft 65 which is hung in bearings 66 on the lower end of suspension arms 67 which are pivoted on the axis 68, swings down from the position shown toward the approaching roller flight 44. Upon movement of the roll 44 into contact with the bumper roll 55, the sheet 51 being gripped therebetween, the bumper roll 55 may again be impelled by the roll 44 to swing upon the axis 68 toward the left as shown in Fig. 3 until again it is released by the roll 44 passing beyond the position of roll 41 as shown in Fig. 3. In order, however, to allow for completion of the loop, such as the loop 56, between rollers 41 and 44 by movement of the sheet 51 upon the roll 44 means are provided to prevent contact of the bumper roll 55 with the sheet 51 and roll 44 until the loop 56 substantially is fully delivered by the pull roll 52. For this purpose, at either end of the shaft 65 of the bumper roll 55 are fastened wheels or pulleys 70 arranged for friction contact with drive wheels 71 which may have on their circumferential surfaces a covering or layer of rubber to provide good frictional contact respectively with the wheels 70 as shown in Fig. 4. The wheels 71 may be driven from any power driven shaft of the apparatus such as the shaft 47 in Fig. 3 which carries the sprocket 43 for the chain drive of the looper. As diagrammatically illustrated by the dot and dash line in Fig. 3, a belt or chain 73 may be used to drive from the shaft 47 to a shaft 74 upon which the wheel 71 is mounted. The shaft 74 may be positioned by suitably locating its supporting bracket so that the bumper roll 55, as shown in dotted outline in Fig. 5, will fall back until the castiron roll 70 comes into contact with the rubber covered roll 71. Thereafter the roll 70 and, therefore, the shaft 65 and the bumper roll 55 which are all fastened to said shaft will rotate under the friction drive of the wheel 71 until the roll 44 with the sheet 51 in contact therewith brings said sheet into contact with the bumper roll 55 to grip the sheet between rolls 44 and 55. Thereafter the wheel 70 will be moved out of contact with the rubber covered wheel 71 and further rotation of the bumper roll will be prevented while maintaining the grip of the sheet 51 between said roll and the flight roller 44. The position of the shaft 74 and, therefore, of the rubber covered wheel 71 should be so chosen that contact of the bumper roll is effectively made just prior to completion of the loop 56 but allowing for a small amount of feed of the sheet 51 between the flight roller 44 and the bumper roll 55. This feeding motion between said rolls will occur during the short period until the wheel 70 is lifted out of frictional drive engagement with the rubber covered wheel 71. If desired, the bracket supporting the shaft 74 and, therefore, the wheel 71 may be made adjustable to vary this position to secure the desired action. As the flight roller 44, however, is held against motion in either direction, as described above, the adjustment should be so made that rotation of the bumper roll by virtue of the friction drive between the wheels 71 and 70 should cease promptly after contact of the bumper roll 55 with the sheet in order that the sheet shall not be damaged by the friction action of the surface of the bumper roll 55 thereagainst. It will be clear, however, that when frictional contact of the wheels 70 and 71 is removed the roll 55 may remain in contact with the sheet 51 against the surface of the "flight" roller 44 for the purpose which has been described above.

It will now be clear that control is provided for the amount of material delivered to each loop so that a uniform length of loop may be secured and that the formation of the loop between roller flights and the completion thereof to the desired length may be insured. As the roller flights 40 pass out of engagement with the friction facing 61 to the positions of the flights 40 in the upper stretch of the chain, these roller flights are released so that they may rotate in the counter-clockwise direction in Fig. 3 while remaining under control of the one way rotation device and the latch 24 thereof which prevents rotation in the counter-clockwise direction. By means of a take-up device 80 or other sheet moving or feeding means the sheet 51 as it is delivered from the last roller flight 40 at the upper stretch of the conveyor may be received and rolled up. The sheet may be pulled over said last roller flight 40 by shortening of the loop 81 until the sheet stretches in the position 82 across the two upper roller flights at this end of the looper. During the interval of withdrawal of the loop 81 and the rolling thereof on roll-up device 80 the roller flights 40 move to the left to bring the next loop into the position of the loop 81 for withdrawal from the looper. It will be apparent, therefore, that while the sheet 51 may move over the roller flights 40, turning them in the counter-clockwise direction, these roller flights may not turn in the opposite direction so that the weight of the adjacent loop of longer length cannot by virtue of its weight pull into itself the material of the loop 81. Thus there is insured the complete withdrawal of the loop 81 by the take-up device 80 without undue tension and shock to the sheet and without the piling up and folding which would occur if the shorter loop were withdrawn into a longer loop.

While the arrangements shown in the drawings are merely diagrammatic, modifications of these arrangements and of the particular details of the design may be made within the scope of the invention.

Having thus described my invention I now claim:

1. In a looper an endless conveyor, a plurality of rollers mounted on said conveyor in spaced relation along its length with their axes transverse to the length of the conveyor and in parallel relation to each other, means associated with said rollers to prevent rotation thereof in a given direction of rotation while releasing said rollers to operate in the opposite direction of rotation, and means for feeding a web to said looper into contact with the circumference of said rollers and so as to form loops between adjacent rollers.

2. In a looper an endless conveyor, a plurality of rollers mounted on said conveyor in spaced relation along its length with their axes transverse to the length of the conveyor and in parallel relation to each other, means associated with said rollers to prevent rotation thereof in a given direction of rotation while releasing said rollers to operate in the opposite direction of rotation, means for feeding a web to said looper into contact with the circumference of said rollers

and so as to form loops between adjacent rollers, and means for moving said conveyor to move said loop carrying rollers progressively away from the point at which the web is fed to the looper.

3. Apparatus for feeding a web which comprises a plurality of rollers in spaced relation with their axes parallel, means for moving said rollers substantially in the plane of their axes in a direction transverse to said axes while substantially maintaining said spaced relation, means acting on said rollers to prevent rotation thereof in either direction, whereby a loop of said web formed between said rollers and in contact with the circumference thereof is prevented from moving thereover, means acting to release said rollers for rotation thereof upon completion of said loop, and means acting thereafter to prevent rotation of said roller in the direction counter to the feeding of the web.

4. Apparatus for feeding a web which comprises a conveyor, a plurality of rollers mounted on said conveyor in spaced relation with their axes substantially parallel and transverse to the direction of movement of the conveyor, means associated with each roller to prevent rotation thereof in one direction of rotation while releasing said roller to operate in the opposite direction of rotation, means for feeding a sheet to said rollers to form loops therebetween, and means for preventing rotation of said rollers in said other direction of rotation during the interval of formation of a loop succeeding a completed loop extending between two of said rollers.

5. Apparatus for feeding a web which comprises an endless conveyor, a plurality of shafts carried by said conveyor with their axes parallel and extending generally transverse to the direction of motion of the conveyor, a roller carried by each shaft and loosely fitting thereon for rotation upon said shaft, means carried by said shaft and fixed in relation to the conveyor for preventing rotation of said rollers in one direction while releasing said rollers for rotation in the opposite direction of rotation, means for feeding a web to contact successively with said rollers and so as to form loops therebetween, and means acting with a roller between which and said loop forming means a loop being formed extends to grip the web to prevent circumferential movement thereof with respect to the axis of said last-mentioned roller.

6. Apparatus according to claim 5 in which said gripping means is arranged to move with said roller as it moves with said conveyor.

7. Apparatus for feeding a web which comprises an endless conveyor, a plurality of shafts carried by said conveyor with their axes parallel and extending generally transverse to the direction of motion of the conveyor, a roller carried by each shaft and loosely fitting thereon for rotation upon said shaft, means carried by said shaft and fixed in relation to the conveyor for preventing rotation of said roller in one direction while releasing said roller for rotation in the opposite direction of rotation, means for feeding a web to contact successively with said rollers and so as to form loops therebetween, and an auxiliary roller arranged for circumferential contact with each roller carried by said conveyor as it passes said auxiliary roller, said auxiliary roller being so arranged with respect to the rollers carried by said conveyor that said action of contacting biases said rollers to rotate in said first-mentioned direction, whereby the web may be gripped between said auxiliary roller and the roller which is passing said auxiliary roller to prevent motion of said sheet upon said roller.

8. Apparatus according to claim 7 in which means are provided for effecting movement of said auxiliary roller together with the roller with which it is in contact and for return of said auxiliary roller to the position at which initial contact of said roller with said auxiliary roller occurred upon release from said contact.

9. Apparatus according to claim 7 which includes means for pivoting said auxiliary roller at a point removed from its axis to provide for movement of said auxiliary roller with the roller with which it is in contact during the interval of said contact.

10. Apparatus for feeding a web which comprises an endless conveyor, a plurality of shafts carried by said conveyor with their axes parallel and extending generally transverse to the direction of motion of the conveyor, a roller carried by each shaft, means carried by said shafts and fixed in relation to the conveyor for preventing rotation of said rollers in one direction while releasing said rollers for rotation in the opposite direction of rotation, means for feeding a web to contact successively with said rollers and so as to form loops therebetween, and means providing a frictional surface arranged to contact said rollers and extending for the distance between two successive rollers, said frictional surface being so arranged with respect to the axis of the rollers as to bias said rollers to rotate in said first direction of rotation and thereby to act with said means carried by said shafts to prevent rotation of said rollers in either direction.

11. Apparatus for feeding a web which comprises a roller, means for moving said roller so as to maintain the axis thereof parallel to itself for each position thereof to which it is moved, means associated with said roller to prevent rotation thereof in one direction of rotation while releasing said roller for rotation in the opposite direction of rotation, means for feeding the web circumferentially to contact with said roller, an auxiliary roller arranged for circumferential contact with said first roller at a predetermined position of said first roller and with said web between said rollers, and means for positively effecting rotation of said auxiliary roller to move the circumference thereof concomitantly with the web contacted thereby.

12. Apparatus for feeding a web which comprises a roller, means for moving said roller so as to maintain the axis thereof parallel to itself for each position thereof to which it is moved, means associated with said roller to prevent rotation thereof in one direction of rotation while releasing said roller for rotation in the opposite direction of rotation, means for feeding the web circumferentially to contact with said roller, an auxiliary roller arranged for circumferential contact with said first roller at a predetermined position of said first roller and with said web between said rollers, means for positively effecting rotation of said auxiliary roller to move the circumference thereof concomitantly with the web contacted thereby, means for preventing rotation of said first roller in said opposite direction, and means for disengaging said auxiliary roller from positive rotation thereof upon the coming into action of said means for preventing rotation of said roller in said opposite direction.

LEE R. STALDER.