United States Patent [19]

Skudlarek

[11] **3,708,162**

[45] **Jan. 2, 1973**

[54] **STREAM FLOW INTERRUPTER**

[75] Inventor: **Walter R. Skudlarek**, Toledo, Ohio

[73] Assignee: **Owens-Illinois, Inc.**, Toledo, Ohio

[22] Filed: **March 12, 1971**

[21] Appl. No.: **123,557**

[52] **U.S. Cl.** **271/47**

[51] **Int. Cl.** **B65h 7/02**

[58] **Field of Search** 271/47, 56–57

[56] **References Cited**

UNITED STATES PATENTS

3,149,834 9/1964 Faeber ..... 271/56 X

Primary Examiner—Edward A. Sroka

Attorney—D. T. Innis and E. J. Holler

[57] **ABSTRACT**

A device is shown for interrupting the flow of a stream of sheets of boxboard, corrugated fiberboard, and the like, on a conveyor. A plurality of elongated structural members are each individually suspended above and along the direction of travel of a conveyor in spaced relation with respect to each other across the conveyor. First and second shafts extend across the conveyor and are spaced from each other along the direction of travel of the conveyor. A first link freely pivotally supports the upstream end of each elongated member from the first shaft a distance above the conveyor which permits the travel of sheets therebeneath. A second link freely pivotally supports the downstream end of each elongated member to enable contact with a sheet traveling on a conveyor. A pick-up arm for each link is fixedly secured on a shaft adjacent the link and has a link contacting surface extending beneath a surface of the adjacent link. A crank is connected to the shaft and is driven by a piston-cylinder assembly to rotate the crank means to raise and lower the elongated members.

20 Claims, 2 Drawing Figures

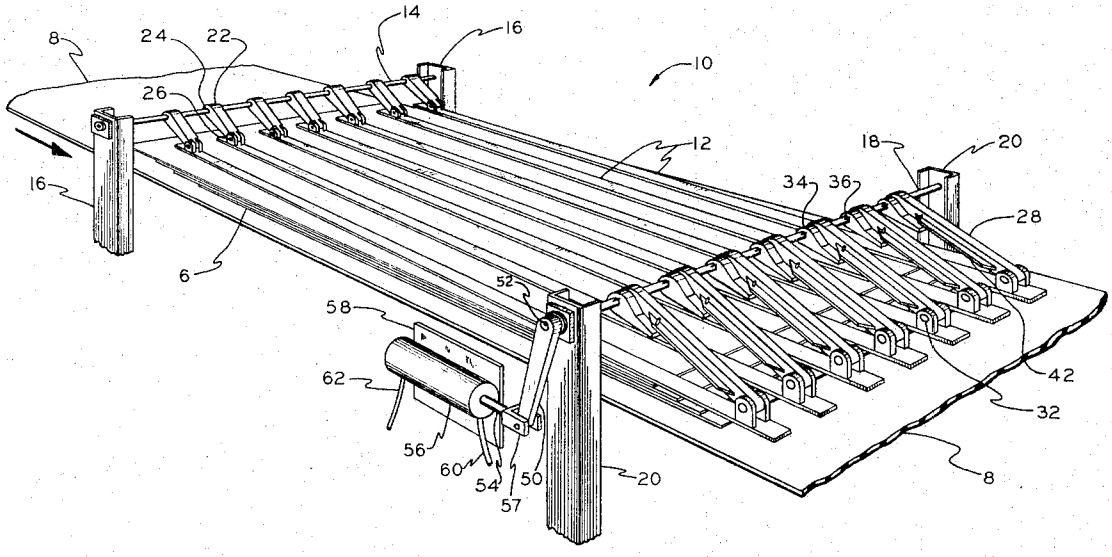
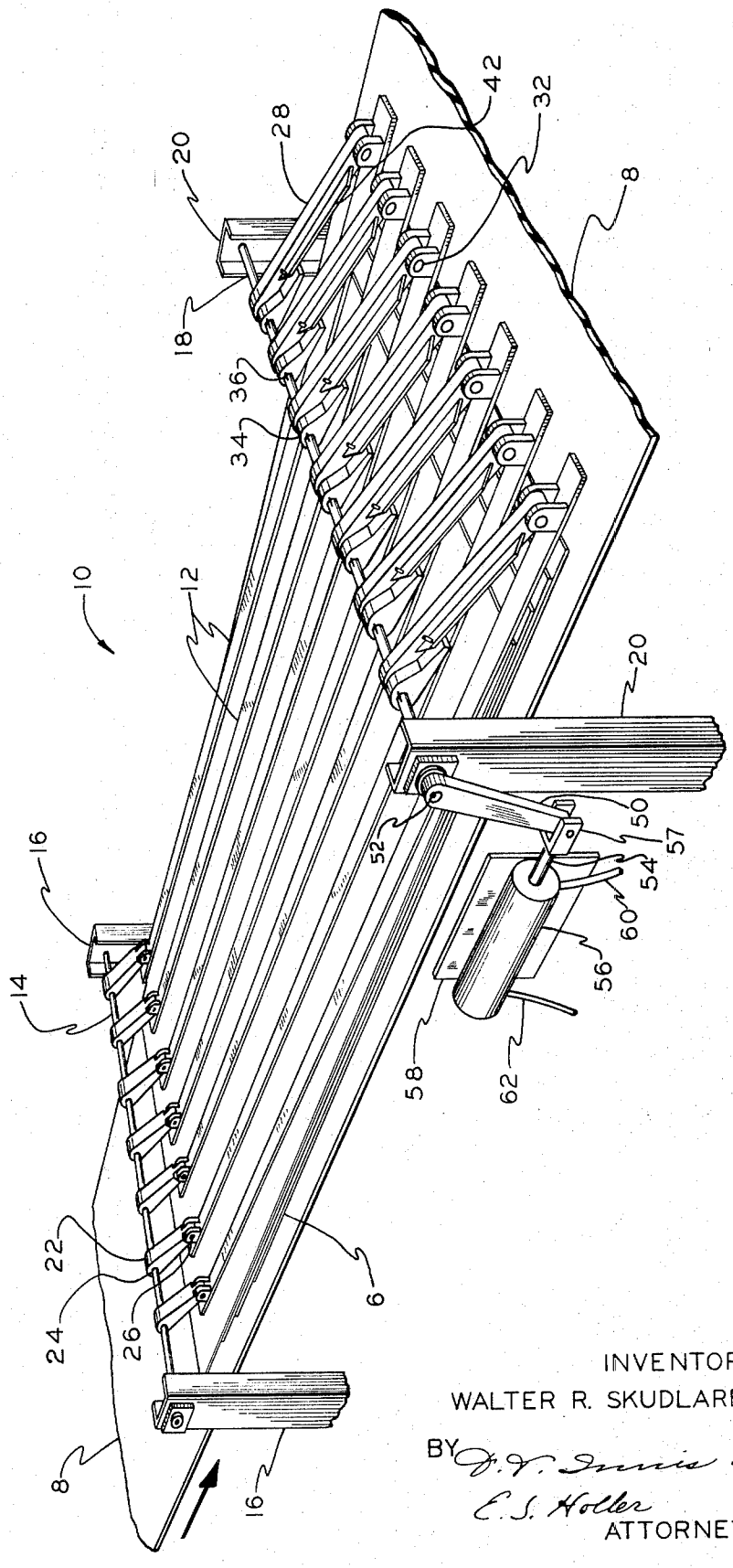


FIG. 1



INVENTOR
WALTER R. SKUDLAREK
BY D. F. Innis &
E. S. Holler
ATTORNEYS

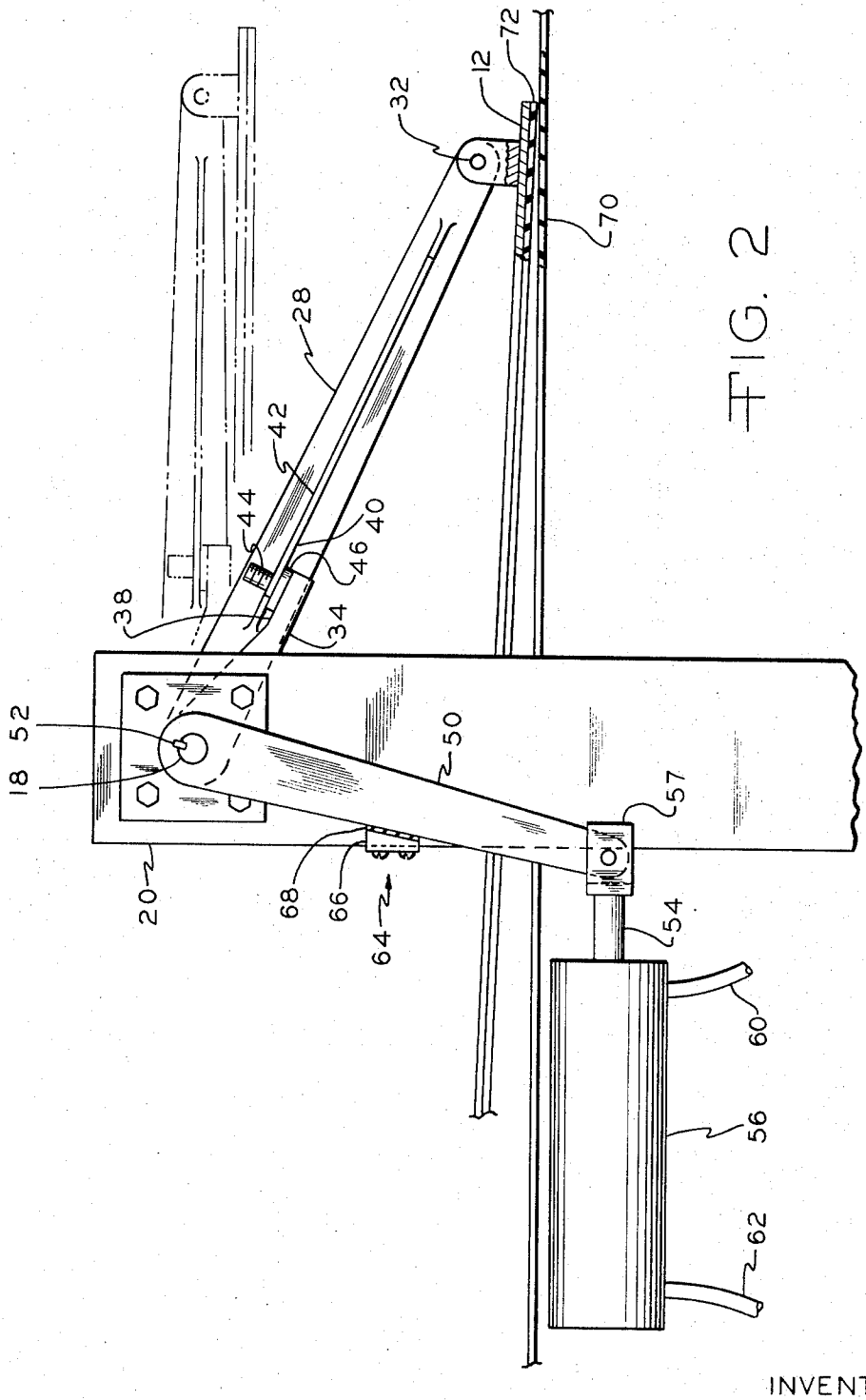


FIG. 2

INVENTOR
WALTER R. SKUDLAREK
BY D. F. Innis +
C. S. Holler
ATTORNEYS

STREAM FLOW INTERRUPTER

BACKGROUND OF THE INVENTION

In conveying sheets of the nature described from one point to another, it often becomes necessary to interrupt the movement of the stream of sheets. Such an interruption may become necessary when a jam occurs in the moving stream, when it is desired to divert the stream from one series of conveyor belts to another series of belts, or for any other function requiring a gap in the otherwise continuous stream of sheets.

In the particular operation with which this apparatus is described, sheet material is being handled from a corrugating machine. A corrugator delivers sheet material in such quantity as to present a serious handling problem at the discharge end of the machine. The delivered sheet material is usually collected and formed into stacks and, since the operation is a continuous one, there is no time available between the delivery of successive sheets in which a completed stack can be removed and a new stack started.

Off-bearing devices in commercial use generally employ either of two solutions to this handling problem. In one type of device two stack forming stations are provided along with a mechanism for diverting sheets delivered from the machine to either one of these stations. While a stack is being collected at one station, a previously formed stack is removed from the other station. This type of device is subject to the general disadvantage of being quite expensive because of the amount of structure and mechanism required for providing two stations and for handling stacks from each of these stations.

The other type of device operates on the general principle of providing some means for holding back the flow of sheets delivered from the machine for an interval sufficient to permit the removal of a formed stack. A ragged stack forming operation is sometimes encountered in devices of this type because sufficient time cannot be provided in a manner for the orderly removal of a bundle without holding back the flow of oncoming sheets to such an extent that these sheets become disarranged. As the number of sheets delivered in a given time interval increases, this condition becomes worse, with the result that this type of device usually definitely limits the rate at which a corrugator can be operated either in terms of sheets per time interval or lineal feet of material per time interval. However, stream interrupters are usually less expensive than the other more complicated devices.

Accordingly, it is an object of this invention to provide a new and improved apparatus for interrupting stream flow of sheets along a conveyor.

It is a further object of this invention to provide improved stream flow interruption apparatus which is less expensive, does not provide a ragged stack forming operation, and does not damage the sheet material being held.

SUMMARY OF THE INVENTION

In carrying out the above objects the invention features in the preferred embodiment shown a plurality of elongated structural members individually suspended above and along the direction of travel of a conveyor and in spaced relation with respect to each other across the conveyor. First link means freely pivotally supports

the upstream end of each elongated member a distance above a conveyor which permits the travel of sheets therebeneath. Second link means freely pivotally supports the downstream end of each member to enable contact with a sheet traveling on a conveyor. Pick-up means are operable to pivot one of the first and second link means of each member away from the conveyor, thereby pivoting both link means away from the conveyor, and lifting each elongated member away from the conveyor to permit the flow of single or stacked sheets therebeneath.

The apparatus advantageously further includes stop means for limiting the pivoting of one of the first and second link means of each elongated member toward the conveyor so that the downstream end of each elongated member is suspended above the conveyor a distance which is less than the thickness of a sheet traveling on a conveyor, thus enabling sheet contact but avoiding conveyor contact.

The apparatus specifically includes first and second shafts extending across the conveyor and spaced from each other along the conveyor for journally supporting the upper ends of the first and second link means, respectively. In the embodiment shown the first and second shafts are spaced the same distance above the conveyor, and the first link means are shorter than the second link means in order to hold the upstream ends of the elongated members a sheet-passing distance above the conveyor.

The pick-up means includes a pick-up arm for each of the elongated members fixedly secured to one of the shafts and having a link contact surface extending beneath the link journally supported on that shaft to enable contact with that link means between the ends thereof in response to rotation of the one shaft. Crank means are connected to the shaft on which a pickup arm is fixedly secured and piston-cylinder means are provided for turning the crank means to rotate the shaft to which the crank is connected.

Stop means are provided for limiting movement of the crank in a direction which enables the pick-up arms to lower the downstream end of the elongated members. A stop means is positioned to contact the crank means to suspend the downstream ends of the elongated members above the conveyor a distance which is less than the thickness of a sheet traveling on the conveyor, thus enabling sheet contact but avoiding conveyor contact.

Adjusting means are advantageously carried by either the pick-up arm or the link means of each of the elongated members for adjusting the contact point between the pick-up arm and the link means. The contact point adjusting means advantageously includes resilient means carried by either the pick-up arm or the link means.

In the preferred embodiment the conveyor is faced with a resilient belting material. The underside of each elongated member is also faced with a resilient belting material along the sheet contact areas thereof. The force of gravity exerted on the elongated members and the contact facing thereon is sufficient to overcome the frictional forces between the sheets and the conveyor facing to hold the sheets and enable them to shingle and/or stack without disarrangement and without damage to the sheet materials.

Other objects, advantages, and features of this invention will become apparent when the following description is taken in conjunction with the accompanying drawings, in which:

FIG. 1 is a view in perspective of sheet flow interrupting apparatus embodying the teachings of this invention; and

FIG. 2 is an enlarged side elevational view of the downstream end of the apparatus illustrated in FIG. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIG. 1 there is shown an upper run 8 of a conveyor which is moving sheets 6 from a production machine to a packaging area. The sheets 6 may be shingled in the manner shown when held by the flow interrupting apparatus indicated generally at 10 or become shingled in response to flow interruption.

The flow interrupting apparatus 10 comprises a plurality of elongated structural members 12 individually suspended above and along the direction of travel of the conveyor 8. The members 12 are spaced from each other across the conveyor. A first shaft 14 extends across the conveyor 8 between frame posts 16. A second shaft 18, downstream from the first shaft 16, extends across the conveyor 8 and is journally supported in frame posts 20.

A plurality of first links 22 are freely pivotally supported at 24 on shaft 14 and freely pivotally suspend at 26 the upstream ends of members 12. A plurality of second links 28 are freely pivotally supported on shaft 18 and freely pivotally suspend at 32 the downstream ends of members 12.

A pick-up arm 34 for each link 28 is fixedly secured at 36 to the shaft 18 by a key arrangement, welding, etc. Each pick-up arm 34 has a link contact surface 38 extending beneath a registering pick-up arm contact surface 40 of the link 28. In the embodiment shown in FIG. 2 the contact surface 40 is formed on the under side of a web 42 extending laterally from the link. A means for adjusting the contact point between the surfaces 38 and 40 is indicated at 44 and may be a stud threadedly engaged through the web 42. A rubber or other resilient material cap 46 may be used to insulate the head of the stud 44 from the surface 38.

A crank 50 has one end fixedly secured at 52 to shaft 18 and the other end pivotally secured to a driving rod 54 by a clevis assembly 57. The rod 54 is part of a piston-cylinder assembly 56 which is supported on the frame portion 58. Fluid under pressure is conducted to and exhausted from the piston-cylinder assembly 56 by conduits 60 and 62.

A stop means for the crank 50 is indicated generally at 64 and may include a plate 66 secured to and extending toward the crank from post 20. A resilient stop pad 68 is advantageously placed between the plate 66 and the crank 50.

As best seen in FIG. 2, the sheet contact area of the underside of the elongated members 12 is advantageously faced with a resilient belting material 72 which may be the same material as the facing 70 for the conveyor belt 8.

In the operation of the flow interrupting apparatus, fluid under pressure is conducted in conduit 62 while fluid is exhausted from conduit 60 from the piston-cylinder assembly 56 to push the piston rod 54 to the right in FIG. 2. This rotates crank 50, shaft 18 and pickup arm 34 in a counter-clockwise direction. The surface 38 of the pick-up arm 34 pushes against the rubber cap 46 on the link 28 to lift the downstream ends of the elongated members 12 to the position shown in the dotted lines in FIG. 2.

Since the upper ends of the links 22, 28 are pivoted about fixed points, pressure exerted on one of the links 22, 28 to pivot the links away from the conveyor 8 will also lift the elongated members 12 and the other link away from the conveyor 8 because of the parallelogram effect of the two pivoted links.

With the elongated members 12 in the lifted position shown in dotted line in FIG. 2, sheets 6 can flow uninterruptedly along the conveyor 8. When it is desired to interrupt the flow of the sheets 6, fluid under pressure is supplied to conduit 60 while fluid is exhausted from conduit 62 to move the piston rod 54 to the left in FIG. 2. Thus, crank 50, shaft 18, and pick-up arm 34 are rotated clockwise lowering the elongated members 12 into contact with the sheets on the conveyor 8.

Since each of the elongated members 12 is individually suspended, the members 12 can accommodate a variety of contours provided by the sheets 6 across the width of the conveyor 8. Thus, if the sheets 6 are warped, for example, effective holding contact may be maintained without damaging or disarranging a desired stacking or shingling of the sheets as they accumulate.

It is desirable to hold the contact area of the elongated members 12 off of the conveyor 8 so that wear will not occur on either the conveyor or the members 12. The stop means 64 enables the attainment of this function and its operation is shown in FIG. 2 where an elongated member 12 is suspended a small distance above the conveyor 8 which is less than the thickness of a sheet to be contacted.

It is also desirable to be able to selectively adjust the height of the downstream end of each of the elongated members 12 off of the conveyor 8. This is accomplished by rotating the stud 44 in the web 42 to advance or retract the rubber contact cap 46. Therefore, if the shaft 18 is not perfectly straight or if it is desired to adjust the elongated members with respect to each other to obtain a predetermined contact-contour across the conveyor 8, the adjustment is available for each link. The stop means 64 may have its limiting stop adjusted with respect to the crank 50 by placing shims between the plate 66 and the post 20.

Although the flow interrupting apparatus may function without a resilient belting material facing 72 it is advantageous to utilize the facing 72 since the elongated members 12 may then be made lighter and thus will exert less gravitational force on the sheets 6 when holding or interrupting the flow. The resiliency of the facing 72 also prevents damage that might otherwise occur to relatively fragile sheets that are being produced. Whether or not a facing 72 is utilized, the apparatus is designed so that the force of gravity exerted on the mass of the elongated members is sufficient to overcome the frictional forces between the sheets and the conveyor 8 without damaging or disarranging the sheets.

There has thus been disclosed apparatus for stopping the flow of sheets on a universal shingle conveyor in which lightweight structural members are lowered on top of the sheets moving on the conveyor and interrupt the flow by the force of gravity of the members on the sheets. The elongated structural members are individually supported at each end by links of unequal length which are supported on shafts in a manner to permit the pivoted links to seek their own level as additional shingles pile up. The arrangement disclosed herein permits the structural members to be lifted by rotation of one of the shafts to permit flow of the product. The parallelogram effect of the two pivoted links allows the elongated members to be lifted at both ends simultaneously by rotation of one shaft.

The above-described novel apparatus also illustrates the novel method of the invention. The forwardmost portion of a sheet of a series of shingled sheets traveling along the continuously moving conveyor is contacted to stop the forward progress of the initially contacted sheet. The sheets therebeneath continue their travel on the conveyor past the flow interrupting station.

The foremost portion of each sheet succeeding and shingled over the initially contacted sheet is contacted and stopped when the leading edge of each successive sheet arrives at a predetermined spacing behind the leading edge of a preceding stopped sheet by applying limited downward pressure to the leading edge of each succeeding sheet. This maintains a predetermined spacing between the leading edges of the stopped sheets and thus also maintains a rear portion of each sheet in contact with the conveyor. Therefore, the conveyor is able to maintain positive individual conveying control over each sheet to insure individual handling at the next operation station.

The stopping contact is maintained with each sheet as the contacted forwardmost portion thereof moves downwardly in response to the conveying of sheets out from under the stopped sheets.

The stopping contact with the forwardmost portion of each sheet is simultaneously released to enable the continuously moving conveyor to advance the previously stopped sheets in their predetermined spaced relationship.

The stopping contact with the forwardmost portion of each sheet includes applying a plurality of vertically downward vector forces along with a corresponding plurality of horizontally upstream vector forces, the vector sums of which are greater then the conveying forces applied to the undersides of the sheets.

Each set of vertically downward and horizontally upstream vector forces are individually yieldingly applied by the individual elongated members in the preferred embodiment. However, other structures within the scope of this invention may be utilized to practice the invention and the method. A belting or other material which is inclined upwardly back along the stream flow on the conveyor could apply the forces described since portions of the belt are relatively movable with respect to other portions and thus could individually yieldingly apply the forces described. The non-planar sheets are thus accommodated and are maintained in a squared relationship with respect to each other and the direction of travel of the conveyor.

In conclusion, it is pointed out that while the illustrated example constitutes a practical embodiment of my invention, I do not limit myself to the exact details shown since modification of these details may be made without departing from the spirit and scope of this invention.

I claim:

1. Apparatus for the interruption of flow of a stream of sheets on a conveyor comprising
   a. a plurality of elongated structural members individually suspended above and along the direction of travel of a conveyor and in spaced relation with respect to each other across the conveyor,
   b. first link means freely pivotally supporting the upstream end of each member a distance above the conveyor which permits the travel of sheets therebeneath,
   c. second link means freely pivotally supporting the downstream end of each member to enable contact with a sheet traveling on the conveyor, and
   d. pick-up means operable to pivot one of said first and second link means of each member away from the conveyor thereby pivoting both link means away from said conveyor and lifting each member away from the conveyor to permit the flow of single or stacked sheets therebeneath.

2. Apparatus as defined in claim 1 which further includes stop means for limiting the pivoting of one of said first and second link means of each member toward said conveyor so that the downstream end of each member is suspended above the conveyor a distance which is less than the thickness of a sheet traveling on the conveyor, thus enabling sheet contact but avoiding conveyor contact.

3. Apparatus as defined in claim 1 which further includes first and second shafts extending across the conveyor and spaced from each other along the conveyor for journally supporting the upper ends of said first and second link means, respectively.

4. Apparatus as defined in claim 3 in which
   a. said first and second shafts are spaced the same distance above the conveyor, and in which
   b. said first link means are shorter than said second link means.

5. Apparatus as defined in claim 3 in which said pick-up means includes a pick-up arm for each of said elongated members fixedly secured to one of said shafts and having a link contact surface extending beneath the link means journally supported on that shaft to enable contact with that link means between the ends thereof in response to rotation of said one shaft.

6. Apparatus as defined in claim 5 in which said pick-up means further includes
   a. crank means connected to a shaft on which a pick-up arm is fixedly secured, and
   b. means for turning said crank means to rotate a shaft to which said crank means is connected.

7. Apparatus as defined in claim 6 which further includes
   a. stop means for limiting movement of said crank means in a direction which enables said pick-up arms to lower the downstream end of said elongated members,

b. said stop means being positioned to contact said crank means to suspend the downstream ends of said elongated members above the conveyor a distance which is less than the thickness of a sheet traveling on the conveyor thus enabling sheet contact but avoiding conveyor contact.

8. Apparatus as defined in claim **5** which further includes means carried by one of said pick-up arm and link means of each of said elongated members for adjusting the contact point between said pick-up arm and said link means.

9. Apparatus as defined in claim **8** in which said contact point adjustment means includes resilient means carried by one of said pick-up arm and link means.

10. Apparatus as defined in claim **1** in which the contact surface on the underside of each of said elongated members is faced with a resilient material having a higher coefficient of friction than the material of said elongated member.

11. Apparatus for interrupting the flow of a stream of sheets of boxboard, corrugated fiberboard and the like on a conveyor comprising,

a. a plurality of elongated structural members each individually suspended above and along the direction of travel of a conveyor and in spaced relation with respect to each other across the conveyor,

b. first and second shafts extending across the conveyor and spaced from each other along the direction of travel of the conveyor,

c. a first link freely pivotally supporting the upstream end of each elongated member from said first shaft a distance above the conveyor which permits the travel of sheets therebeneath,

d. a second link freely pivotally supporting the downstream end of each elongated member to enable contact with a sheet traveling on the conveyor, and

e. pick-up means fixedly supported to one of said shafts operable in response to rotation of that shaft to pivot the links pivoted on that shaft away from the conveyor thereby lifting each member away from the conveyor to permit sheet flow therebeneath.

12. Apparatus as defined in claim **11** which further includes

a. stop means for limiting rotation of the shaft carrying said pick-up means in a direction which enables said pick-up means to lower the downstream ends of said elongated members,

b. said stop means being positioned to limit the lowering rotation of said shaft at a point which suspends the downstream ends of said elongated members a distance above the conveyor which enables sheet contact but avoids conveyor contact.

13. Apparatus as defined in claim **11** in which said pick-up means includes

a. a pick-up arm for each link fixedly secured on said one shaft adjacent the link and having a link contacting surface extending beneath a surface of the adjacent link, and which further includes

b. adjustment means carried by one of said pick-up arm and adjacent link for at least part of said plurality of elongated members for selectively adjusting the contact point between a pick-up arm and an adjacent link.

14. Apparatus as defined in claim **11** which further includes

a. crank means connected to said one shaft, and

b. piston-cylinder means for rotating said crank means to raise and lower said elongated members.

15. Apparatus as defined in claim **11** in which

a. said conveyor is faced with a resilient belting material, and in which

b. the underside of each elongated member is faced with a resilient belting material along the sheet contact area thereof, the force of gravity exerted on said elongated members and said contact facing thereon being sufficient to overcome the frictional forces between said sheets and said conveyor facing.

16. Apparatus for interrupting the flow of a stream of shingled sheets on a continuously moving conveyor, comprising

a. means operable to be lowered into stopping contact with at least two spaced areas of the forwardmost portion of a sheet of a series of shingled sheets passing a flow interrupting station on a continuously moving conveyor permitting the sheets beneath the initially contacted sheet to continue their travel on the conveyor,

b. said contacting means when in a sheet contacting position extending back upstream from the initially contacted sheet and generally inclined upwardly from the spaced contact areas on the initially contacted sheet to permit the forwardmost portion of succeeding sheets shingled over the initially contacted sheet to be moved by the conveyor into contact with said inclined contacting means,

c. the inclination of said contacting means maintaining a predetermined spacing between the leading edges of said stopped shingled sheets while also maintaining the underside of the rear portion of each sheet in conveyor engaging contact, and

d. means for lifting said contacting means from said inclined sheet contacting position whereby all the stopped sheets are released simultaneously enabling the conveyor to advance the shingled sheets in their predetermined spaced relationship.

17. Apparatus as defined in claim **16** in which said contacting means includes portions movable with respect to other portions to permit said contacting means to accommodate a sheet having contact areas not lying in the same plane.

18. A method of interrupting the flow of a stream of shingled sheets on a continuously moving conveyor comprising the steps of

a. contacting the forwardmost portion of a sheet of a series of shingled sheets traveling along the continuously moving conveyor with at least one elongated member and stopping the forward progress of said initially contacted sheet while the shingled sheets therebeneath continue their travel on said conveyor,

b. contacting and stopping the forward progress of the forwardmost portion of each succeeding sheet shingled over said initially contacted sheet with said elongated member when the leading edge of each sheet arrives at a predetermined spacing behind the leading edge of a preceding stopped sheet by applying limited downward pressure to the leading edge of each succeeding sheet, thereby

maintaining a predetermined spacing between the leading edges of the stopped sheets to maintain the trailing edge and the underside of the rear portion of each sheet in conveying contact with the conveyor,

c. maintaining the stopping contact of said elongated member with each stopped sheet as the contacted forwardmost portion thereof moves downwardly toward the conveyor in response to the conveying of sheets out from under said stopped sheets, and

d. simultaneously releasing the stopping contact of said elongated member with the forwardmost portion of each stopped sheet to enable the continuously moving conveyor to advance the previously stopped sheets in their predetermined spaced shingled relationship.

19. A method as defined in claim **18** in which the stopping contact with the forwardmost portion of each sheet includes applying a plurality of vertically downward vector forces along with a corresponding plurality of horizontally upstream vector forces to a plurality of said elongated members, the vector sums of which are greater than the corresponding opposing vector sums of the conveying forces applied by the continuously moving conveyor to the conveyor engaged portions of the undersides of said sheets.

20. A method as defined in claim **19** in which each set of vertically downward and horizontally upstream vector forces on each of said elongated members are individually yieldingly applied at spaced contact areas across the leading edge of each sheet to accommodate a leading edge which does not define a straight line, thereby maintaining the leading edge of each sheet squared with respect to the leading edges of the other sheets.

* * * * *