United States Patent

Briggs et al.

[15] **3,670,551**

[45] **June 20, 1972**

[54] HOLDING SHELF APPARATUS

[72] Inventors: **Albert Theodore Briggs**, Tarentum; **Eugene Henry Swisher**, Verona, both of Pa.

[73] Assignee: **United Engineering and Foundry Company**, Pittsburgh, Pa.

[22] Filed: **June 15, 1970**

[21] Appl. No.: **46,360**

[52] **U.S. Cl.** **72/252**, 72/428

[51] **Int. Cl.** **B21d 43/16**, B21b 39/20

[58] **Field of Search** 72/250, 252, 428

[56] **References Cited**

UNITED STATES PATENTS

421,039	2/1890	Aiken	72/250
152,508	6/1874	Pennock	72/250

Primary Examiner—Charles W. Lanham

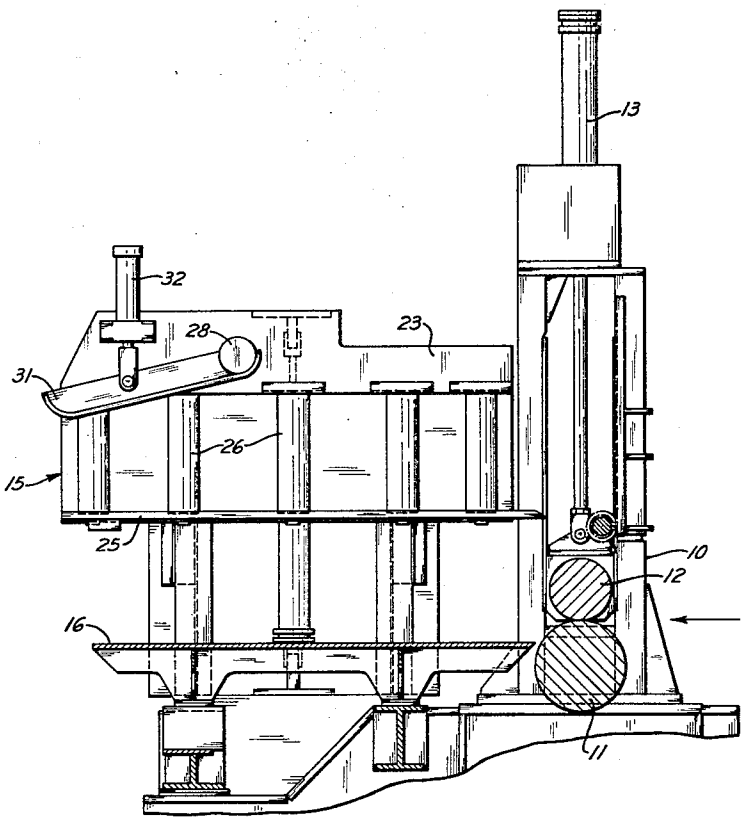
Assistant Examiner—R. M. Rogers

Attorney—Henry C. Westin

[57] **ABSTRACT**

The present invention relates to an holding shelf apparatus for strip-like material as is employed, for example, in connection with a tandem rolling mill.

8 Claims, 4 Drawing Figures



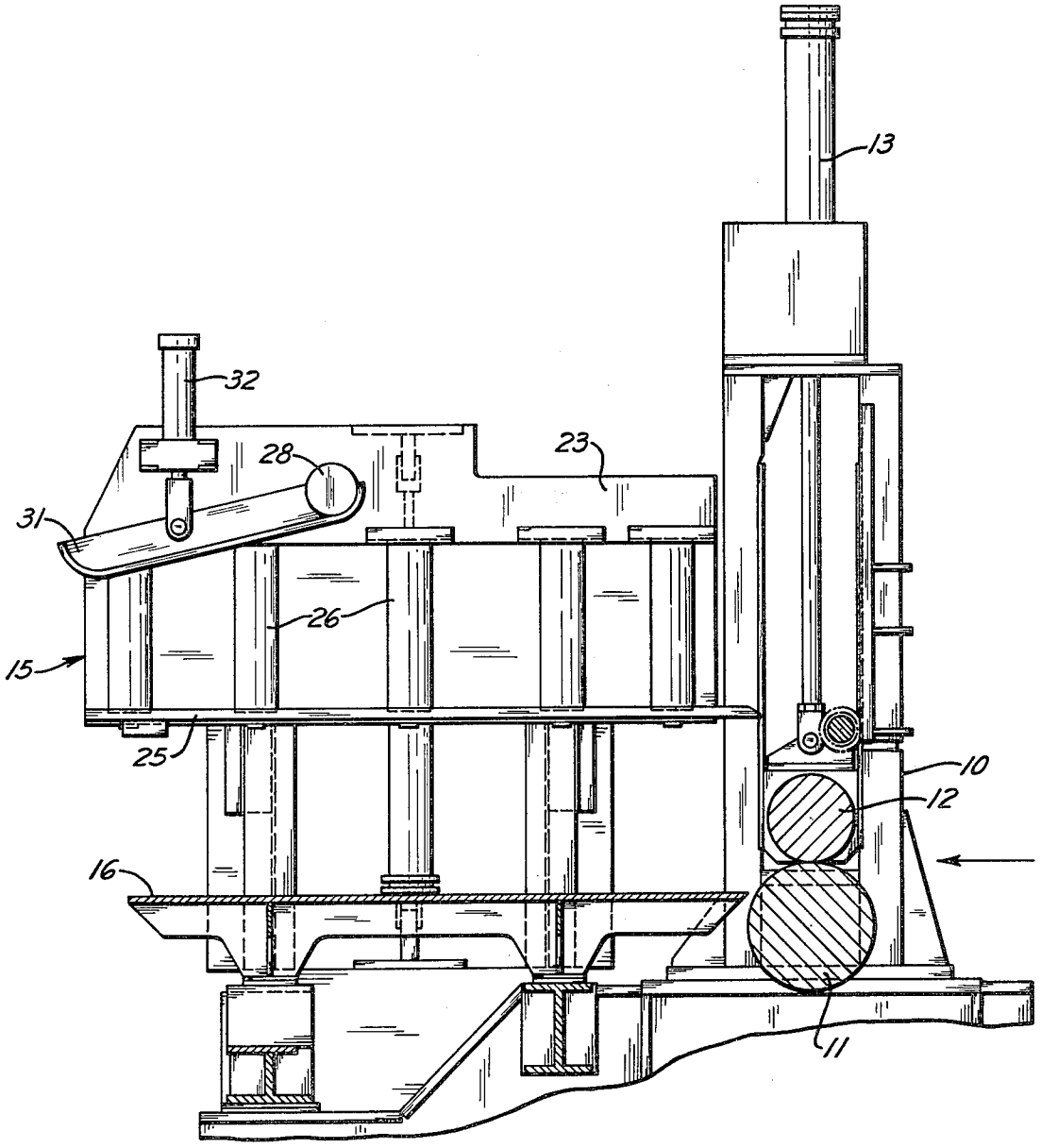


Fig. 1

INVENTORS.
ALBERT T. BRIGGS
EUGENE H. SWISHER

BY Henry C. Westin
ATTORNEY.

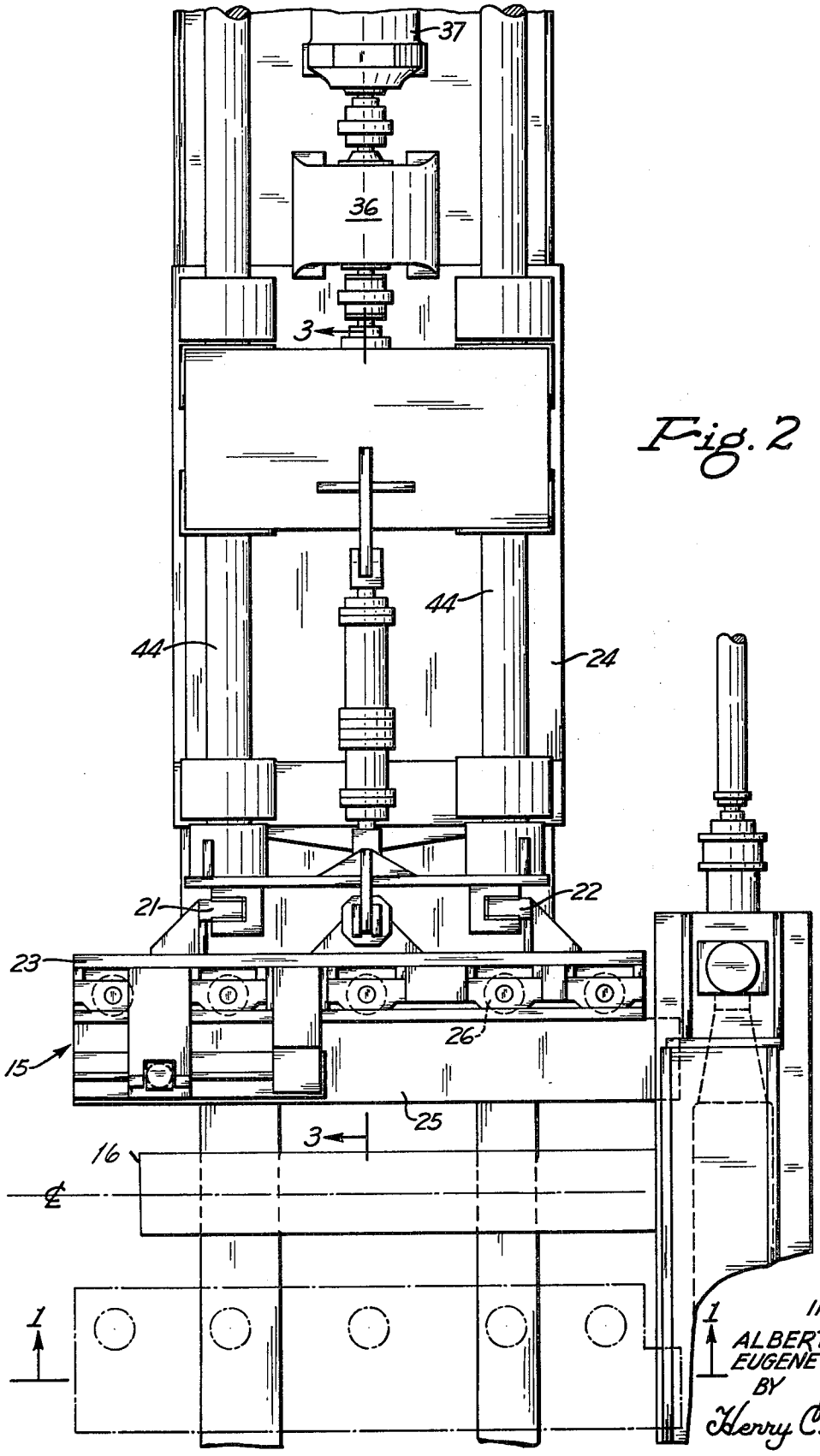


Fig. 2

INVENTORS.
ALBERT T. BRIGGS
EUGENE H. SWISHER
BY
Henry C. Westin
ATTORNEY.

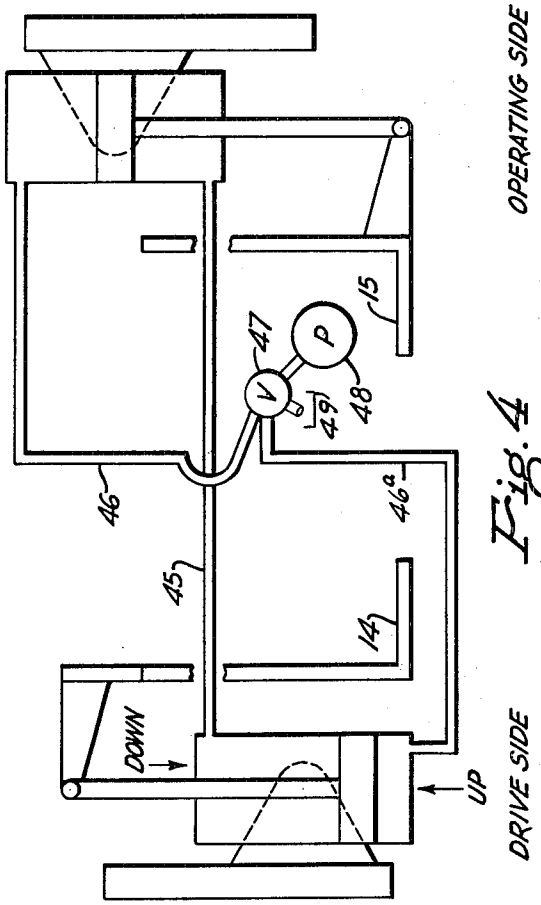


Fig. 4

Fig. 3

INVENTORS.
ALBERT T. BRIGGS
BY EUGENE H. SWISHER
Henry C. Westin
ATTORNEY.

HOLDING SHELF APPARATUS

The disclosure of this invention comprises a pair of opposed shelves for supporting the edges of a strip above the passline of a rolling mill at the entry side thereof. Each shelf includes an upright frame for vertically guiding the shelves to and from the passline. Each shelf is made up of a number of vertical rollers that engage the opposite edges of the strip and a holddown arm for holding the strip against the shelves. The shelves are lowered to the mill passline by a piston cylinder assembly and are moved transversely by a combined tandem piston cylinder assembly-screw drive; one of the cylinder assemblies being employed to bring the shelves under the strip and the other cylinder assembly is used to center the strip relative to the center line of the mill.

In the past the leading end of the strip as it was brought to the entry guides of a rolling mill was first conveyed to hold shelves which supported the strip above the passline until the trailing end of a previous coil passed into the mill, after which the holding shelves were retracted or tilted to allow the strip, by virtue of its own weight, to fall onto an apron arranged in the mill passline for conveyance to the entry guide of the mill.

In operating the mill, and particularly a tandem mill, the lost time involved in starting a new coil is very critical. The reason for providing holding shelves is to enable the leading end to be held in readiness for quick feeding to the guides once the previous strip has passed therethrough. The past designs of holding shelves, however, did not always permit the strip to be guided properly into the mill. This was because the strip was allowed to drop from a position above the mill passline and in so doing, there was nothing to prevent it from skewing and/or taking an improper attitude relative to the center line of the mill. Moreover, previous designs did not provide any positive way to center the strip prior to lowering it to the passline and, once centered, to hold it in its centered position.

It is, therefore, one of the objects of the present invention to provide an holding shelf apparatus that will assure that the strip will be centered and once centered, held in its center position when brought to the mill passline.

More particularly, the present invention provides an holding shelf having means for quickly supporting and centering the leading end of the strip and for holding the strip in its centered position while it is lowered to the passline of the mill or to other processing devices.

These objects as well as other features and advantages of the present invention will be better appreciated when the following description is read along with the accompanying drawings of which:

FIG. 1 is a sectional view of an holding shelf apparatus built in accordance with the present invention taken on lines 1—1 of FIG. 2;

FIG. 2 is a plane view of the apparatus illustrated in FIG. 1;

FIG. 3 is a sectional view taken on lines 3—3 of FIG. 2; and

FIG. 4 is a schematic view of an hydraulic system employed for the lifting piston cylinder assemblies of the shelves.

In referring to FIGS. 1 and 2 the arrows at the right indicate the direction of travel of the strip being paid off from a coil by means of an uncoiler, not shown. Also not shown is the strip entry guide which receives the leading end of the strip from the holding shelves and feeds it into the rolling mill. FIG. 1 does illustrate a pinch roll unit **10** arranged at the entry side of the holding shelves and consisting of a lower roll **11** and an upper roll **12**. The upper roll is vertically positionable by a piston cylinder assembly **13**, the function of which will be explained later.

With reference to the holding shelves **14** and **15**, it will be appreciated that each shelf consists of an identical structure and for which reason only one will be described although in FIG. **4** the second shelf is illustrated. Between each shelf **14** and **15**, centrally located just below the mill passline, which is legend in FIG. **3**, there is provided a stationary apron **16**. Referring for a moment to FIG. **3**, which best shows the support structure for the shelf **15**, there is illustrated an upright member **18** which includes a pair of guides **21** and **22** for slidably receiving a carriage **23**. The upright member **18** is ultimately supported by a base member **24**.

The carriage **23** includes an horizontal projecting apron **25** and inward of the apron are a series of vertically arranged, spaced-apart, freely rotatable rollers **26**. The rollers are arranged so that the edges of the strip supported by the apron **25** can be engaged by the rollers. Towards the entry guide side of the shelf **15** there is provided a strip holddown unit, best shown in FIG. **1**. It consists of a trunnion shaft **28** for pivotally supporting an arm **31**, the arm being movable towards and away from the apron **25** by a piston cylinder assembly **32**.

The entire carriage **23** is moved within the guides **21** and **22** by a piston cylinder assembly **33**, shown best in FIG. **3**, which shows the cylinder of the assembly connected to an upright member **34** which, in turn, is secured to the upright member **18** supportable by the base member **24**.

Referring to the base **24** and FIGS. **2** and **3**, it will be noted that the carriage **23** is adapted to be traversed towards and away from the adjacent edge of the strip. This movement is accomplished by three separate power means, the first being a screw nut drive unit **35** which is driven by a gear reducer **36** and a motor **37**. The nut of the drive unit is carried by a platform member **38** which is movable on travel of the nut by the rotating screw and which serves to support the piston end of one of two tandemly arranged piston cylinder assemblies **41** and **42**. The piston cylinder assembly **41** which is the smaller stroke cylinder is connected to the upright member **18**, the cylinder **42** being carried by the member **38**. In the illustrated form, the piston cylinder assembly **41** has a stroke of 4½ inches while the piston cylinder assembly **42** has a stroke of 10 inches.

The carriage **23** is guided during its traverse movement by parallel guide rods **44** shown in FIGS. **2** and **3**, the rods being slidably supported in bearings carried by the base **24**.

FIG. **4** illustrates the hydraulic inter-connecting system for the cylinders **33** that move the shelves vertically from a holding path which is legend in FIG. **3** to the mill passline. In order to employ standard commercial cylinders and yet provide that the pistons move at equal speeds, the piston cylinder assemblies **33** for each shelf are arranged so that their rods point in different directions and that the rod ends of the cylinders are directly inter-connected by a line **45**.

Two additional lines **46** and **46***a* are provided which through a directional valve **47** are connected to the head ends of the piston cylinder assemblies **33**. The valve is also associated with a pump **48** and a reservoir **49**. In this way the valve can be positioned to admit fluid under pressure alternately to one or the other of the head ends of the cylinders, in which case the head end of the cylinder not being supplied fluid is vented to the reservoir **49** through the valve **47**. As indicated in FIG. **4**, fluid admitted to the head end of the drive side cylinder will cause both shelves **14** and **15** to raise, in which it will be appreciated that as the piston at the drive side is raised the fluid in the rod end of this cylinder will be forced through line **45** to cause the piston of the operating side cylinder to rise at the same speed. In a similar manner fluid supplied to the head end of the operating side cylinder by the proper positioning of the valve **47** will cause both shelves to lower at the same speed, in which fluid will be again forced through the line **45**, but in the opposite direction.

A brief description of the above-described holding shelf apparatus will now be given. Assuming that a strip is being fed to the mill over the apron **16** and that the upper pinch roll **12** and the shelves **14** and **15** are in the holding path position as shown in FIG. **3**, in which case the shelves are preset, if not already in the desired position, by operating the screw drive nut units **35** to where the aprons **25** can be brought into supporting relationship with the edges of the strip on operation of the large stroke piston cylinder assemblies **42**. This will position the rollers **26** of the carriages **23** a little less than 4½ inches, the stroke of the piston cylinder assemblies **41**. It should be noted that the traverse movement of the carriages by the screws **44** and the cylinders **41** and **42** will be synchronized, particularly that of the screws to assure that each shelf is equally positioned with respect to the center line of the mill. On operation of the piston cylinder assemblies **41**, the rollers **26** will engage

the opposite edges of the strip to center it relative to the center line of the mill. Once centered, the piston cylinder assemblies **32** of the holddown device will be operated to bring the arms **31** into engagement with the strip to hold it in its center position. When the trailing end of the previous strip has passed over the apron **16**, the piston cylinder assemblies **33** are operated along with the cylinder **13** of the pinch roll unit **10** to lower in unison the shelves **14** and **15** and the upper pinch roll **12**. As soon as the upper pinch roll engages the strip, the piston cylinder assemblies **32** and both of the tandem piston cylinder assemblies **41** and **42** can be operated to release the strip and retract the aprons **25** away from the strip leaving the strip supported by the apron **16** and held in its center position by the pinch rolls **11** and **12**.

In accordance with the provisions of the patent statutes, we have explained the principle and operation of our invention and have illustrated and described what we consider to represent the best embodiment thereof.

We claim:

1. A holding shelf apparatus for supporting strip-like material incident to the strip being fed into a desired path of travel, comprising:

a strip supporting member arranged to extend in a direction parallel to said path of travel,

means for moving said member from a position above said path of travel to a position where the strip is brought to said path,

means for moving said member when in a position above said path transverse of said path to bring the member into supporting relationship with a strip and for centering

said member including means for holding the strip against said member after it has been centered and during said first movement.

2. A holding shelf apparatus according to claim **1** wherein said strip supporting member includes a pair of opposed strip supporting shelves each having a surface for supporting a different one of the edges of the strip,

separate means for each shelf for moving the shelves in unison into said two positions with respect to said path of travel, and

separate means for each shelf for transversely moving said shelves in unison.

3. A holding shelf apparatus according to claim **2** wherein said separate means for moving said shelves into said two positions, each comprise a piston cylinder assembly, and

said separate means for moving said shelves transversely each comprise a first and second piston cylinder assembly; one cylinder having a relatively long stroke for bringing the shelf into a supporting position with the strip and the other cylinder having a relatively short stroke to center the strip relative to said data position.

4. A holding shelf apparatus according to claim **2** wherein each shelf has a separate means for holding the strip and which comprises:

an arm,

means for pivotally carrying said arm, and

a piston cylinder assembly connected to said arm to bring the arm into engagement with a strip supported by a shelf.

5. A holding shelf apparatus according to claim **3**, wherein each shelf has a screw drive unit for moving said shelves transversely, and

means advanced by each of said screw drive units for carrying a different one of said first and second piston cylinder assemblies.

6. A holding shelf apparatus according to claim **1** wherein said member comprises a vertically arranged frame,

a base for supporting said frame,

guide means formed on said frame for receiving and vertically guiding a carriage,

horizontal strip supporting shelves carried by said carriage,

a number of spaced vertically arranged strip edge guiding rollers carried by said carriage,

said means for moving said member into said two positions comprising,

a piston cylinder assembly carried by said frame and connected to said carriage,

said means for transversely moving said member comprising a pair of tandemly arranged piston cylinder assemblies connected to and for moving said frame transversely relative to said base,

a platform for carrying said tandemly arranged piston cylinder assemblies, and

a screw driving unit supported by said base and connected to said platform for moving said platform transversely of said path of travel.

7. A holding shelf apparatus according to claim **3** wherein said separate piston cylinder assemblies for moving said shelves into said two positions are arranged with the piston rods extending in opposite directions and wherein the piston rod sides and the cylinder sides of the cylinder assemblies are fluidly inter-connected.

8. A holding shelf apparatus according to claim **1** wherein said strip support member comprises a pair of opposed strip supporting shelves, each having a surface for supporting a different edge of the strip, and wherein the means for moving said shelves to said path of travel includes means for placing said shelves in an aligned relationship in said position above the path of travel and further includes means for moving said shelves downwardly at substantially equal speeds from said position above the path of travel to said path of travel.

* * * * *