Jan. 29, 1957 T. W. KELLER ET AL 2,779,256

ANTI-FRICTION FORMER SHOES

Filed June 4, 1953 4 Sheets-Sheet 1

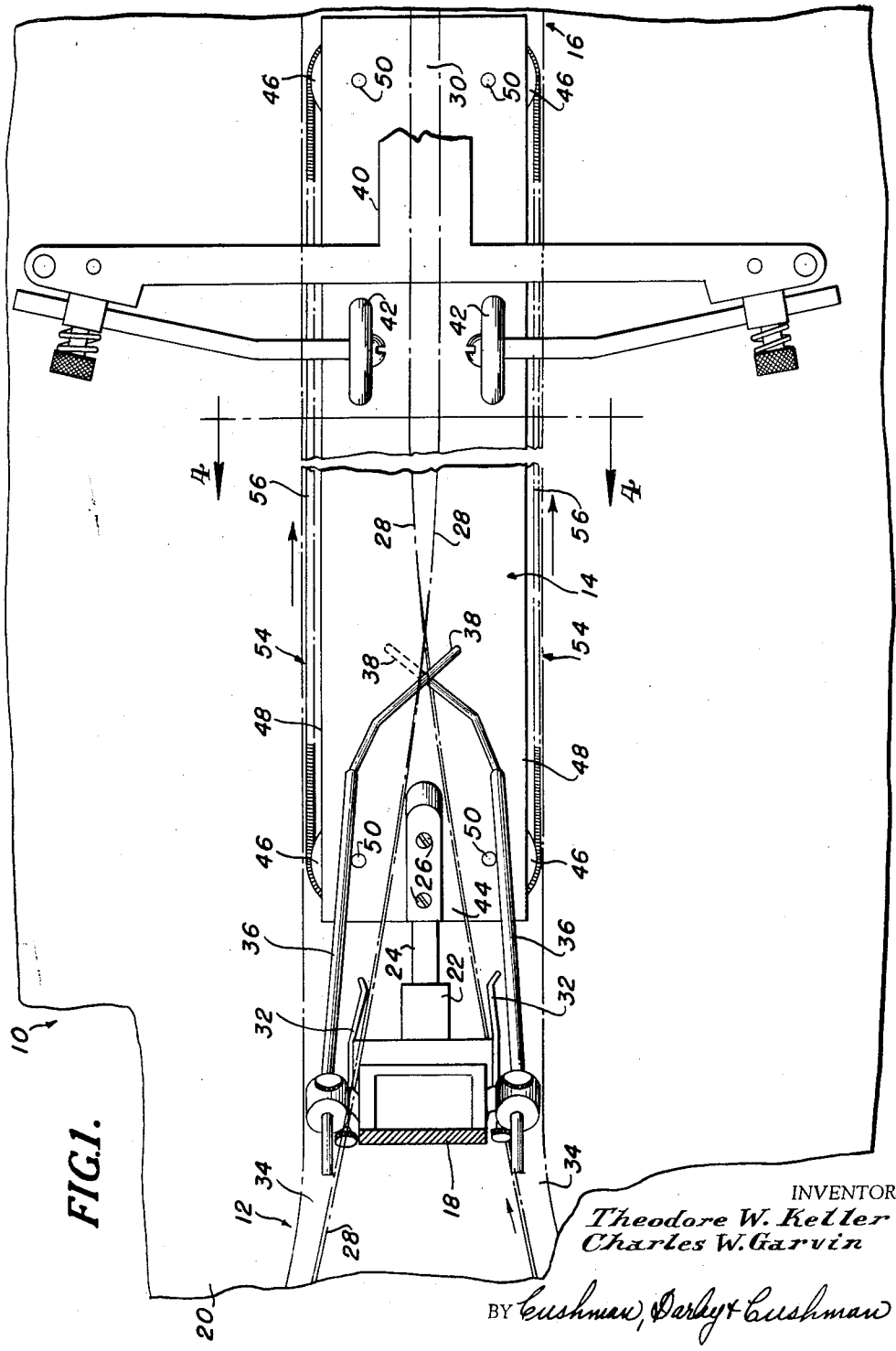


FIG. 1.

INVENTORS
Theodore W. Keller
Charles W. Garvin

BY Cushman, Darby & Cushman

ATTORNEYS

Jan. 29, 1957 T. W. KELLER ET AL 2,779,256

ANTI-FRICTION FORMER SHOES

Filed June 4, 1953 4 Sheets-Sheet 2

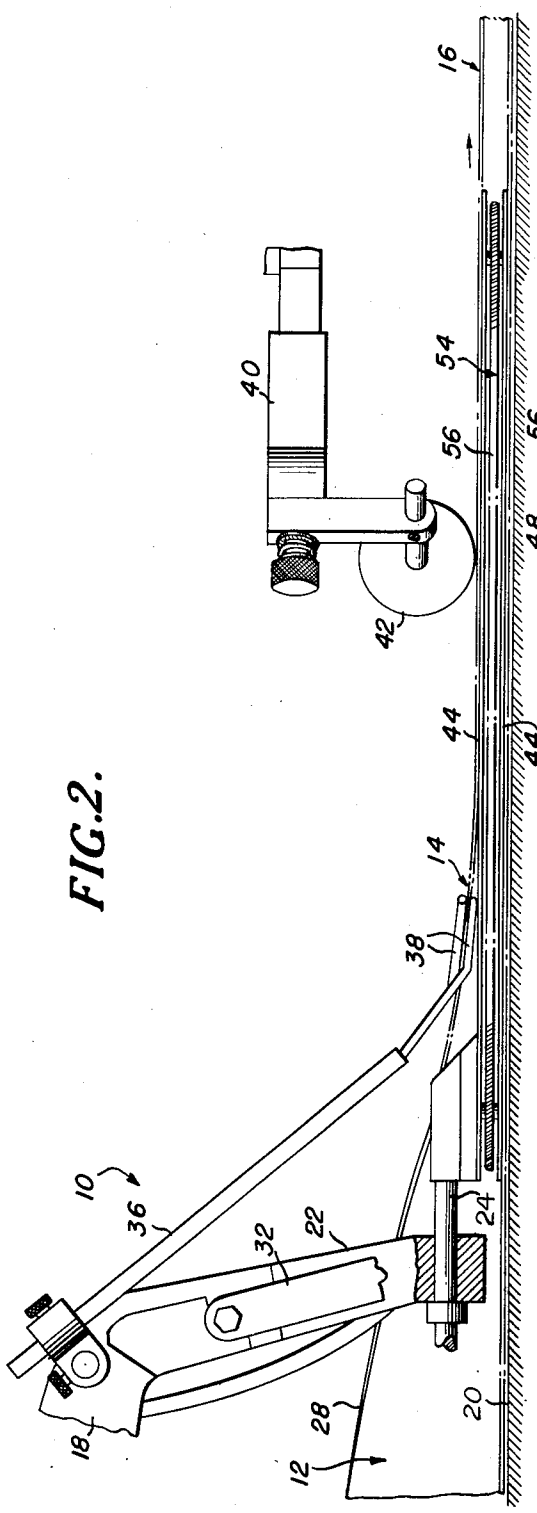


FIG. 2.

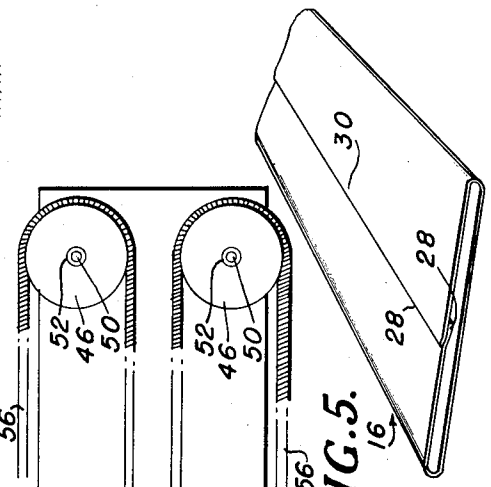


FIG. 5.

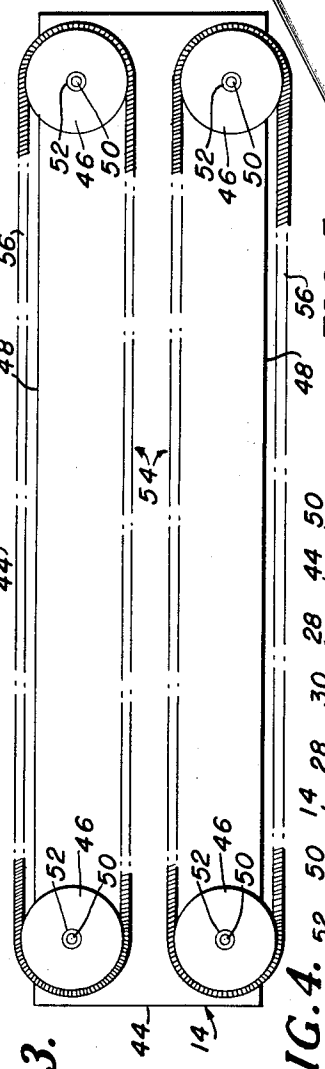


FIG. 3.

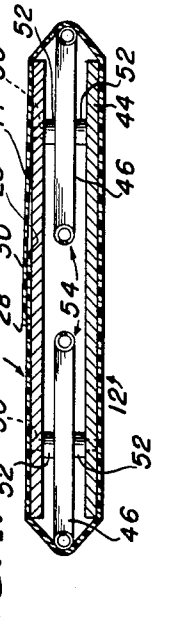


FIG. 4.

INVENTORS
Theodore W. Keller
Charles W. Garvin

BY Cushman, Darby & Cushman

ATTORNEYS

Jan. 29, 1957 T. W. KELLER ET AL 2,779,256

ANTI-FRICTION FORMER SHOES

Filed June 4, 1953 4 Sheets-Sheet 3

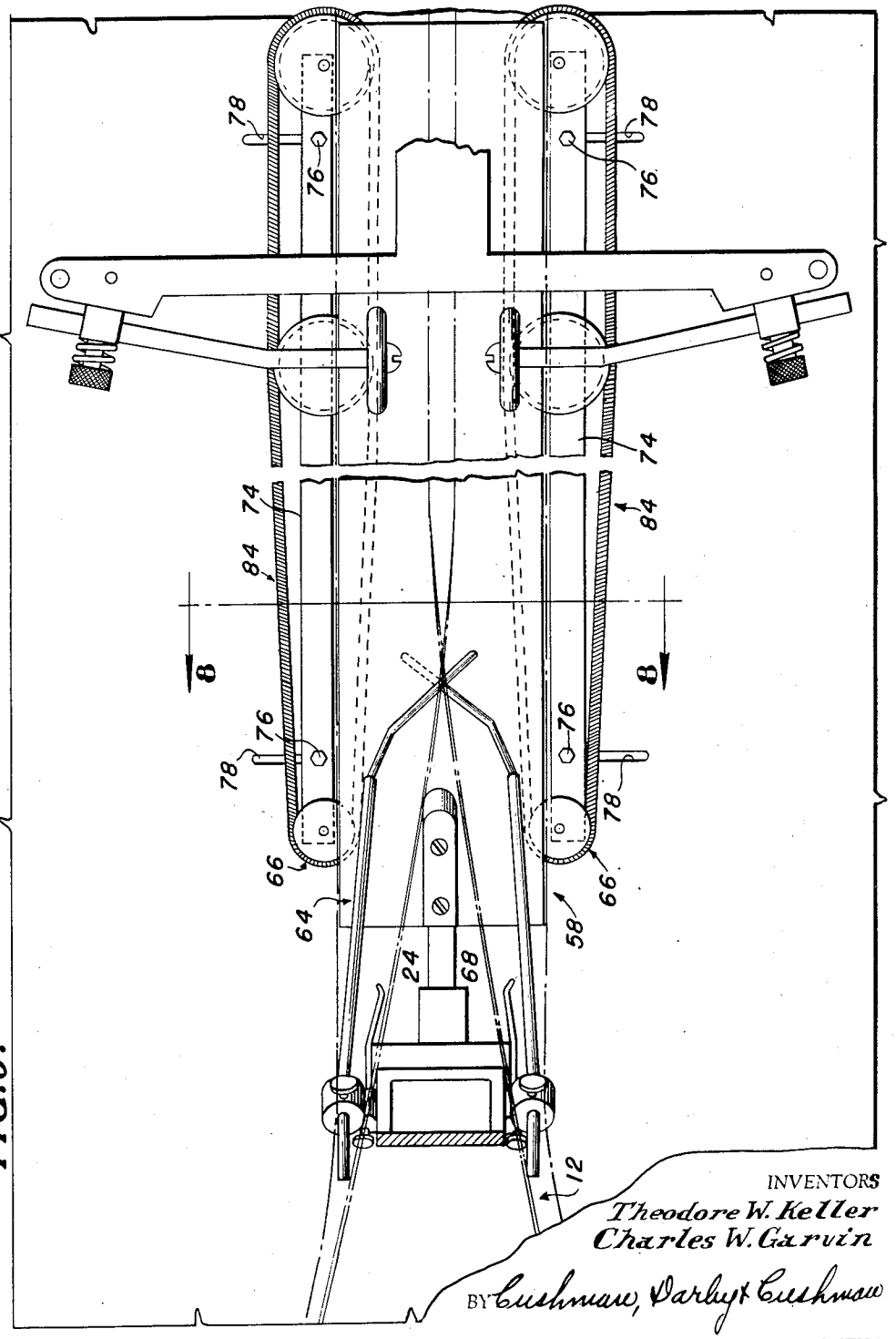


FIG. 6.

INVENTORS
Theodore W. Keller
Charles W. Garvin

BY Cushman, Darby & Cushman

ATTORNEYS

Jan. 29, 1957 T. W. KELLER ET AL 2,779,256

ANTI-FRICTION FORMER SHOES

Filed June 4, 1953 4 Sheets-Sheet 4

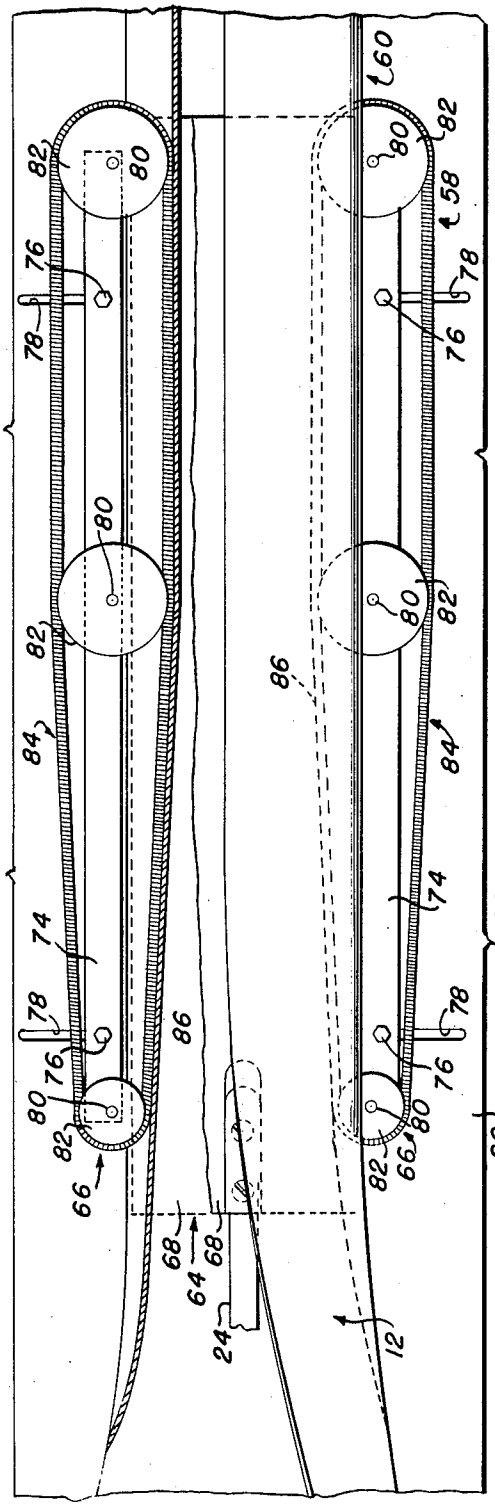


FIG.7.

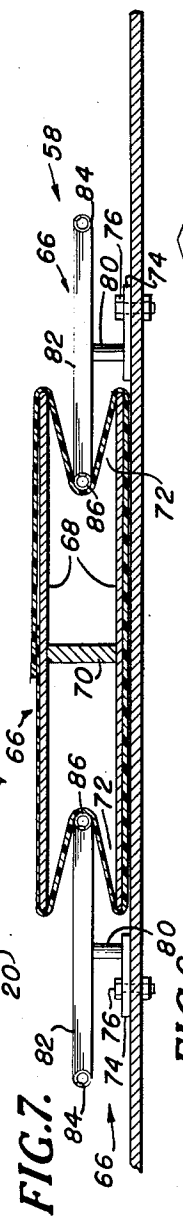


FIG.8.

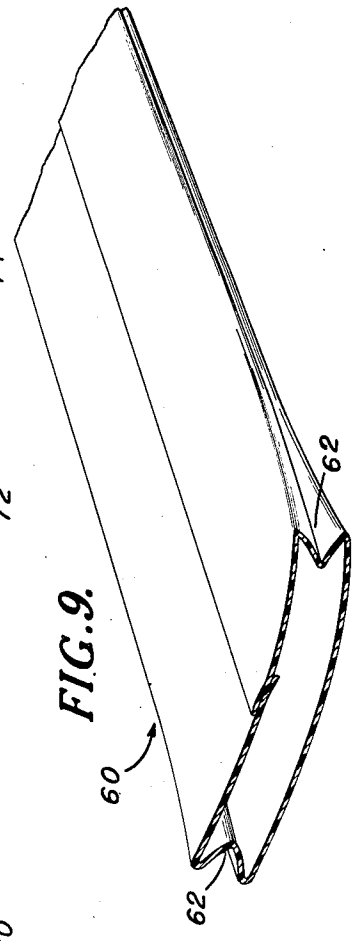


FIG.9.

INVENTORS
Theodore W. Keller
Charles W. Garvin

BY Cushman, Darby & Cushman

ATTORNEYS

United States Patent Office 2,779,256 Patented Jan. 29, 1957

2,779,256

ANTI-FRICTION FORMER SHOES

Theodore W. Keller, Council Bluffs, Iowa, and Charles W. Garvin, Omaha, Nebr.; said Garvin assignor to said Keller

Application June 4, 1953, Serial No. 359,582

4 Claims. (Cl. 93—20)

This invention relates to mandrels, or former shoes, of machines for making bags or tubing from flat sheet stock, and more particularly to forming mechanism for use with thermoplastic sheet stock.

Machines for making bags or tubing from rolls of web-like flat sheet stock or material have a mandrel or former shoe about which the travelling sheet material is folded or wrapped. The lateral edges of the sheet material are overlapped on the mandrel and, if the material is non-heat-sealable, are glued together or, if the material is heat sealable, such as polyethylene, are heat sealed together to form a permanent tube having a longitudinal seam. Difficulties are had, however, with materials such as polyethylene in forming or shaping the sheet material into a tube by conventional mandrels or former shoes. Among its other characteristics, polyethylene is quite stretchable and also has a somewhat tacky surface which develops considerable frictional drag when moved against another surface.

Tubing or bag making machines of the type under consideration usually have a pair of draw rolls for pulling the material through the machine. The forming mechanism usually is located in advance of such rolls and receives material to be tubed from a large roll of such material. Because of its stretchable characteristic, polyethylene sheet material elongates considerably in a longitudinal direction when it is pulled through the forming mechanism by the draw rolls. This longitudinal stretching of the material causes lateral contraction of the same, so that the material tends to grip the former shoe or mandrel very tightly. On flat plate-like former shoes in particular, polyethylene stock is under considerable lateral tension at the side or lateral edges of the former shoe. Because of its aforementioned high frictional drag characteristics, this lateral tension of polyethylene stock greatly increases its frictional drag with the edges of a flat mandrel or former shoe. In some instances, this frictional drag may become so excessive that the draw rolls are unable to pull the material over the former shoe. In other instances, the frictional drag results in excessive wrinkling of the stock and imperfect folding or wrapping of the same about the mandrel, so that wrinkles and imperfections appear in the overlapped longitudinal edges of the material. Consequently, the subsequent heat sealing operation results in defects in the seal constituting the longitudinal seam in the tube.

For the above reasons, polyethylene stock which is intended for the production of bags usually is made by an extruding process to produce seamless tubular stock which eliminates the necessity of tubing operation and its attendant difficulties. Seamless tubular stock is far more expensive, however, than flat stock.

Accordingly, it is an object of this invention to provide a former shoe with means for greatly reducing the frictional drag of sheet material thereagainst.

It is another object of this invention to provide a former shoe for tubing polyethylene sheet stock which will eliminate wrinkles in the shaped tube and permit the formation of a substantially perfect longitudinal seal of the overlapped edges of the stock.

It is another object of this invention to provide an improved former shoe for tubing polyethylene sheet stock with side gussets, which former shoe eliminates wrinkles in the tube by the minimization of frictional drag between the travelling stock and the shoe.

Other objects, advantages and novel features of the invention will become apparent from the following description and accompanying drawings, in which:

Figure 1 is a plan view of a former shoe embodying this invention, and illustrating the shoe in operative position in a portion of a tubing machine.

Figure 2 is an elevational view of the former shoe and machine shown in Figure 1.

Figure 3 is a plan view of the former shoe shown in Figure 1, but with the top plate of the shoe removed in order to illustrate details.

Figure 4 is an enlarged sectional view taken on line 4—4 of Figure 1.

Figure 5 is a fragmentary perspective view of a tube formed by the apparatus shown in Figure 1.

Figure 6 is a plan view of a gussetting former shoe embodying this invention and illustrating the shoe in operative position in a portion of a tubing machine.

Figure 7 is an enlarged plan view of the former shoe shown in Figure 6 with portions broken away in order to illustrate details.

Figure 8 is an enlarged sectional view taken on line 8—8 of Figure 6.

Figure 9 is a fragmentary perspective view of a gussetted tube formed on the apparatus shown in Figure 6.

Referring now to Figures 1 and 2 of the drawings, there is shown a portion of a somewhat conventional tubing machine **10** which folds travelling sheet material or stock **12** about a former shoe **14** so that the lateral edges of the material are overlapped and may be subsequently secured together to form a permanent tube **16** (Figure 5). The sheet material **12** usually is supplied from a large roll (not shown) which may be located to the left of the apparatus shown in Figure 1 and is pulled through the forming mechanism by draw rolls (not shown), which may be located to the right of the apparatus shown in Figure 1.

The forming mechanism comprises a supporting bracket **18** that is mounted in any appropriate manner on top of the machine table **20**, as by legs or feet (not shown) which straddle the travelling sheet material **12**. The bracket **18** has a depending central portion **22** to the lower end of which is secured an arm **24** that extends in the direction of movement of the sheet material. Secured, as by screws **26**, to the forward end of the arm **24** in overhanging relation with the table **20** is the former shoe **14** embodying this invention. As best shown in Figures 1 and 2, the former shoe **14** is substantially rectangular in plan view and of flat plate-like configuration.

The travelling sheet material **12**, which is of a width sufficient to be wrapped about the former shoe **14** so that the lateral edges **28** of the material may be overlapped to form a longitudinal seam, is pulled beneath the former shoe, and the edge portions of the material are progressively folded upwardly, inwardly, and downwardly so that the lateral edges of the material overlap on top of the shoe, as at **30** (Figure 1). To accomplish this folding, the shoe supporting bracket **18** is provided with depending arms **32** on opposite sides of its central depending portion **22**, between which arms the side edge portions of the sheet material **12** are held in an upstanding position, as at **34**, to initiate the folding operation. Adjustably supported at a higher elevation on the bracket **18** are two downwardly and forwardly inclined folding fingers **36** having cross lower ends or tip portions **38** beneath

which the edge portions of the travelling sheet material pass in order to urge the edge portions downwardly, in overlapping condition, on top of the former shoe **14**.

Beyond the fingers **36**, there is provided another bracket **40**, which may be appropriately supported on the table **20** in the same manner as the shoe supporting bracket **18**. Adjustably supported on the bracket **40** are a pair of wheels **42** which ride on top of the former shoe **14** over the sheet material in order to maintain the edge portions thereof in their overlapped condition until they are secured together by appropriate mechanism (not shown). In some instances, it is desirable for these wheels **42** to be angled somewhat with relation to the direction of movement of the sheet material **12**, in order to draw the same more snugly about the lateral edges of the former shoe **14**.

After passing from the former shoe **14**, the overlapped edges of the shaped tube **16**, if the latter is of thermoplastic material, are usually heat sealed in a conventional manner by known apparatus to form a permanent tube. If the sheet material is of paper, or the like, which cannot be heat sealed, the overlapped edges of the stock usually have paste or glue applied thereto to secure them together to form a permanent tube.

The apparatus thus far described is conventional and forms no part of this invention. Accordingly, a more detailed description thereof is believed unnecessary here.

As previously stated, when polyethylene or similar stretchable sheet material is formed into a tube by apparatus of the type described above, the longitudinal stretching of the material by the longitudinal tension imparted thereto by the draw rolls causes lateral contraction of the stock with the result that it is pulled extremely tightly against the side edges of a former shoe. Consequently, the frictional drag of the material with the side edges of a former shoe becomes so excessive that the aforedescribed difficulties arise and result in the formation of imperfections in the formed tube. In order to eliminate these objections to conventional former shoes, the former shoe **14** embodying this invention is provided with mechanical means for substantially completely eliminating frictional drag between the travelling sheet material **12** and the side or lateral edges of the former shoe, with the result that no difficulties whatever, such as wrinkling, etc., are had in the tubing of polyethylene and similar stretchable material on the former shoe **14**. Consequently, the completed tube **16** is free of imperfections in its longitudinal seal or seam **30**.

In order to accomplish the above object, the former shoe **14** comprises a pair of superimposed vertically-spaced substantially-rectangular plates **44**. At each of the four corners of the shoe, there is mounted between the plates **44** a peripherally-grooved pulley wheel **46** which projects slightly outwardly of the side or lateral edges **48** of the shoe (Figures 1 and 3). Conveniently, these pulleys **46** may be journalled on pins **50** fastened to the plates **44**, and the pulleys preferably are provided with hubs **52** on both sides thereof for spacing the wheels from the plates. Mounted on each pair of pulley wheels **46** at each side of the shoe **14** is an endless belt **54** having one flight **56** thereof projecting slightly beyond the corresponding lateral edge **48** of the shoe. In actual practice, it has been found that a coil spring serves admirably for the belt **54**.

It will be seen that travelling sheet material **12** is folded about the flights **56** of the belts **54** without being pulled tightly or snugly against fixed lateral edges of the plates **44**. Accordingly, the belts **54** move with the travelling sheet material **12** to thereby greatly reduce and minimize any drag between the travelling sheet material and the fixed lateral edges **48** of the former shoe. Since the sheet material **12** is not pressed tightly against the upper and lower surfaces of the former shoe **14**, very little frictional drag occurs at these surfaces. Hence, for all

intents and purposes the anti-friction endless belts **54** substantially eliminate all frictional drag of the material **12** with the fixed parts of the shoe **14**, with the result that the tubing of travelling sheet stock on the shoe **14** is accomplished with ease and with no wrinkling of the stock. Further, since the tension or force required to pull the stock **12** over the shoe **14** is thus greatly reduced, lateral contraction of the stock occasioned by longitudinal stretching of the same is also reduced, to thereby result in a further reduction of frictional drag of the material with the shoe. For these reasons, the possibility of tearing the stock by longitudinal tension thereon is substantially completely eliminated.

In instances where the material-engaging flight **56** of each belt **54** tends to sag or be pulled inwardly by lateral contraction of the stock **12**, additional pulley wheels **46** may be mounted between the plates **44** to avoid this difficulty and prevent tight frictional engagement of the stock with the side edges of the plates **44**.

Referring now to Figures 6 to 8, there is shown therein a former shoe **58** embodying this invention for tubing sheet material and providing the tube **60** with inwardly-directed side folds or gussets **62** (Figure 9). Since the folding mechanism shown in Figure 6, other than the shoe **58**, may be identical with the corresponding folding mechanism shown in Figures 1 and 2, no detailed description thereof will be repeated here. The former shoe **58** in this instance is formed in three sections, a central section **64**, and two lateral sections **66**. The central section, which is supported in overhanging relation to the table **20** by the bracket arm **24**, comprises two vertically-spaced superimposed generally-rectangular plates **68** secured together in any conventional manner, as by the longitudinal central rib **70**, best shown in Figure 8. The central section **64** thus provides a space **72** along its longitudinal edges between the upper and lower plates **68**, such space essentially constituting longitudinal edge grooves. It is within these spaces or grooves **72** that travelling sheet material is forced or pressed inwardly to form side gussets **62** when the sheet material is wrapped or folded around the central section **64** of the former shoe **58**.

Each side section **66** of the former shoe **58** is identical, so a description of one will suffice for both. A longitudinally-extending bar **74** is secured for lateral adjustment relative to the center section **64** of the shoe to vary the depth of the gussets, as by means of bolts **76** extending through transversely-elongated apertures **78** in the table **20**. Mounted on the bar **74** for rotation about vertical axes, as by means of upstanding journal pins **80**, are a plurality of longitudinally-spaced peripherally-grooved pulley wheels **82** adapted to extend into the longitudinal edge spaces **72** between the upper and lower plates **68** of the central shoe section **64**. Three such pulley wheels **82** are shown in the drawings spaced at substantially equal intervals along the length of the bar **74**. Mounted for travel on these wheels is an endless belt **84**, again preferably in the form of a coil spring.

It will be seen that the sheet material **12** is pressed inwardly into the longitudinal edge grooves **72** of the central former shoe section **64** only by contact with the inner flights **86** of the endless belts **84** and, therefore, since the belts move with the material, substantially no friction whatever is developed between the belts and the material. It will be noted that the leading pulley wheels, i. e., those at the entering end of the former shoe **12**, are of smaller diameter than the remaining pulley wheels, so that the material is progressively urged into the longitudinal edge grooves **72** of the central section **64** to more smoothly form the side gussets **62**. It will be realized, of course, that this progressive formation of the gussets may be accomplished through the use of leading pulley wheels of substantially the same diameter as the remaining wheels but having their axes of rotation spaced further laterally outwardly of the side edges of the center section of the former shoe. Further, it will be evident that additional

pulley wheels may be used, if necessary, to maintain the flights 86 of the belts against the sheet material.

It is evident that where the travelling sheet material 12 is folded about the side edges of the upper and lower plates 68 of the center section, some frictional drag possibly may occur. It has been found in actual practice, however, that the greatest frictional drag of sheet material against a conventional gusseting former shoe occurs where the gusseting plates press or force the traveling material into the longitudinal edge grooves of the center section of the shoe. Hence, elimination or reduction of frictional drag at these points, has been found to be sufficient to permit the formation of gussetted tubes without undesirable wrinkling and the other disadvantages heretofore described.

It will thus be seen that the objects of this invention have been fully and effectively accomplished. It will be realized, however, that the specific embodiments disclosed herein for the purpose of illustrating the principles of this invention are susceptible of change without departing from such principles. For example, the invention obviously is applicable to former shoes of other cross-sectional configurations, such as round, etc. Hence, this invention includes all modifications encompassed by the spirit and scope of the following claims.

We claim:

1. In a former shoe for placing a longitudinal fold in traveling, stretchable sheet material, e. g., polyethylene, and having an edge extending generally in the direction of travel of the material and over which edge the sheet material is folded, the combination of rollers spaced along the direction of travel of the material, an endless belt mounted on said rollers and having a relatively narrow portion engageable with the material, said belt having a flight defining said edge and over which flight the material is adapted to be folded at substantially an acute included angle, said flight being movable with the material to thereby reduce drag between the material and the former shoe at said edge.

2. The structure defined in claim 1 in which the belt comprises a coil spring.

3. A flat former shoe around which traveling, stretchable sheet material, e. g., polyethylene, is adapted to be folded to form tubular stock, comprising: an elongated, plate-like member; means defining a groove in a longitudinal edge of said member; an endless belt having a relatively narrow portion engageable with the material; and rollers mounting said belt and journaled on said member at longitudinally spaced locations therealong, said belt having a flight disposed somewhat outwardly of said groove and extending generally parallel thereto for engagement and movement with sheet material folded over said edge to reduce the drag between the sheet material and said shoe at said edge.

4. A flat former shoe around which traveling, stretchable sheet material, e. g., polyethylene, is adapted to be folded to form tubular stock having side gussets comprising: an elongated, plate-like member; means defining a groove in a longitudinal edge of said member; an endless belt having a relatively narrow portion engageable with the material; and rollers mounting said belt and journaled at locations spaced along the direction of travel of the material, said belt having a flight extending within said groove and generally parallel thereto for engagement and movement with sheet material folded over said edge to press the material into said groove to form a side gusset.

References Cited in the file of this patent

UNITED STATES PATENTS

1,707,712	Cowgill	Apr. 2, 1929
1,975,121	Potdevin	Oct. 2, 1934
2,125,758	Waters	Aug. 2, 1938
2,283,069	Knuetter	May 12, 1942
2,701,989	Hayward	Feb. 15, 1955