Sept. 13, 1966 A. O. LONG, SR 3,271,889

FLATWORK IRONER WITH AUTOMATIC FLATWORK SPREADING MECHANISM

Original Filed Oct. 16, 1961

3 Sheets-Sheet 1

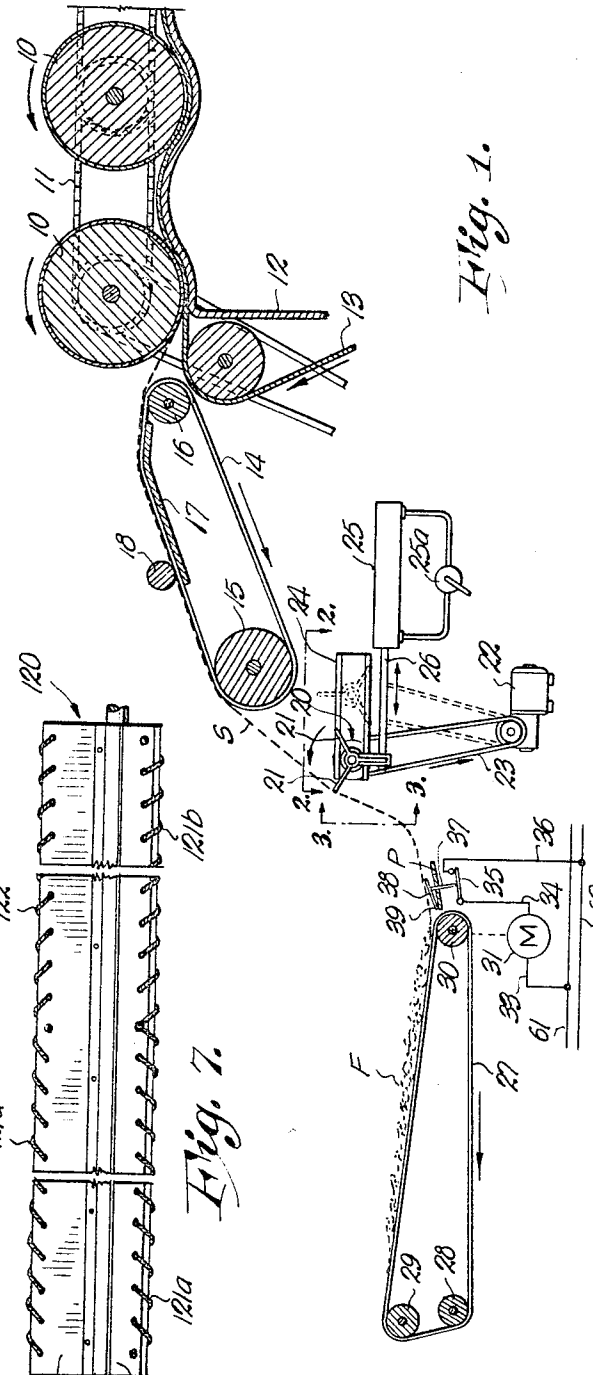


Fig. 1.

Fig. 7.

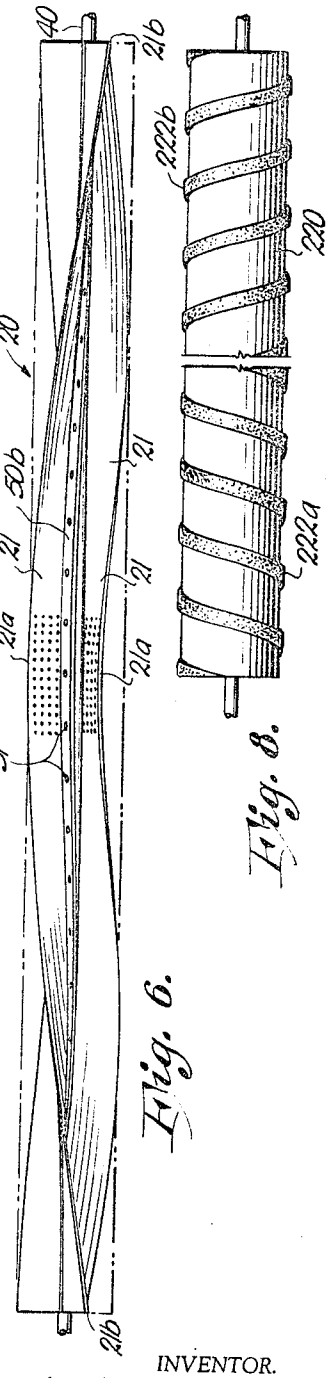


Fig. 6.

Fig. 8.

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3 Sheets-Sheet 2

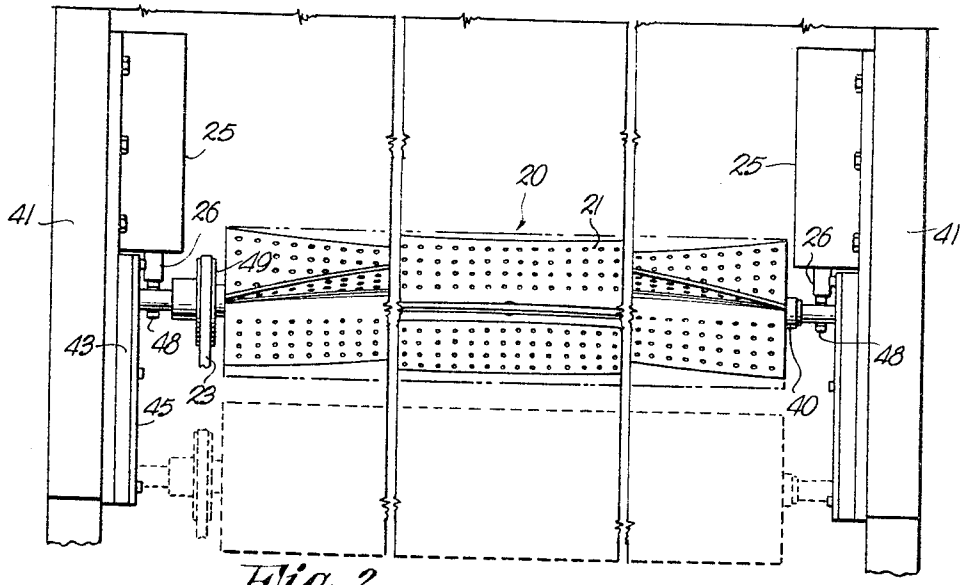


Fig. 2.

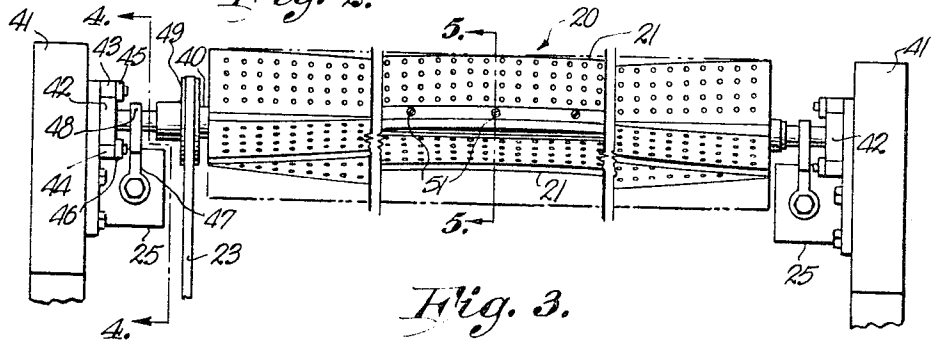


Fig. 3.

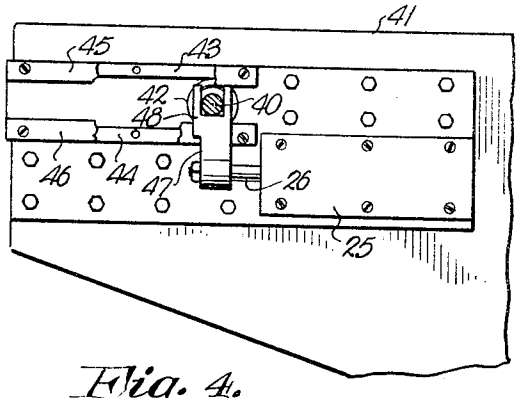


Fig. 4.

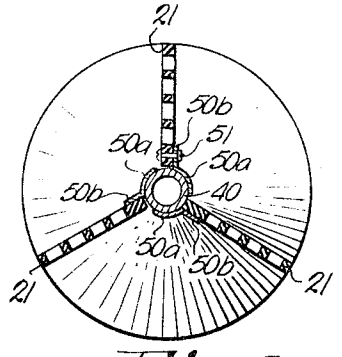


Fig. 5.

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Original Filed Oct. 16, 1961 3 Sheets-Sheet 3

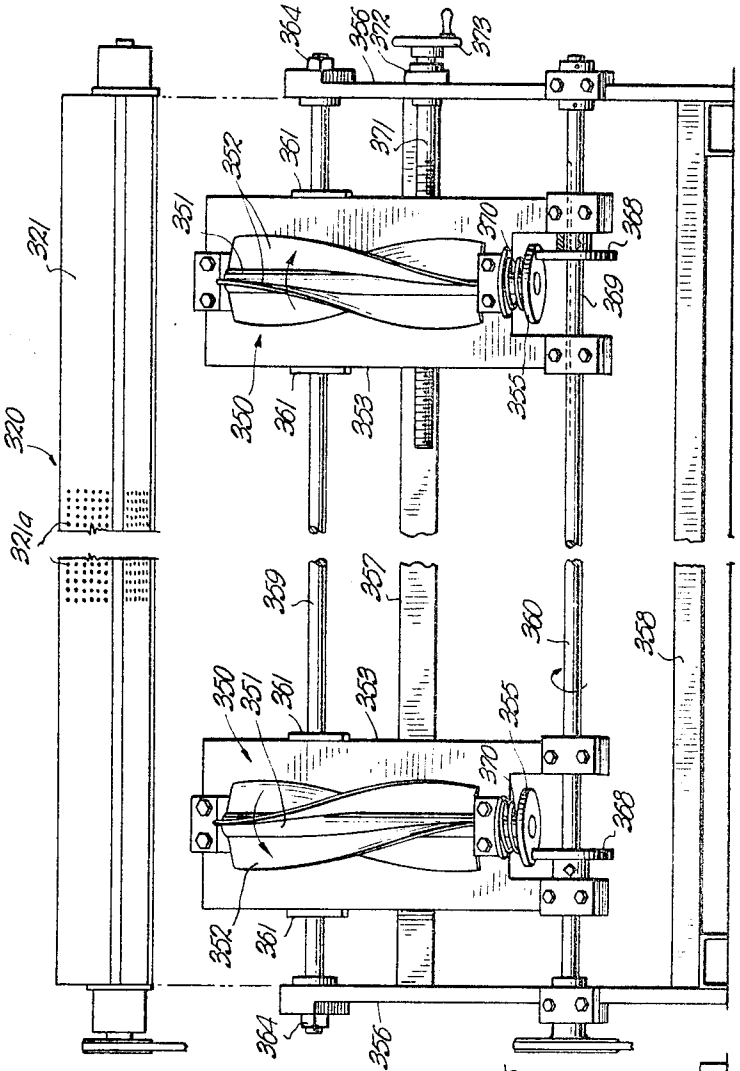


Fig. 10.

Fig. 9.

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United States Patent Office 3,271,889 Patented Sept. 13, 1966

3,271,889

FLATWORK IRONER WITH AUTOMATIC FLATWORK SPREADING MECHANISM

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Continuation of application Ser. No. 145,210, Oct. 16, 1961. This application May 13, 1965, Ser. No. 459,513
5 Claims. (Cl. 38—143)

This application is a continuation of my copending application Serial No. 145,210, filed October 16, 1961, and now abandoned.

This invention relates to flatwork ironers of the type ordinarily used in commercial laundries and refers more particularly to improvements therein for assisting in the handling and feeding of the flatwork to the ironing apparatus.

In the operation of the usual flatwork ironer, considerable time is lost manually manipulating the flatwork to spread and preliminarily smooth it as it advances toward the ironing mechanism. This is particularly true in the case of bed sheets and other pieces of large dimensions. Workers must continue at all times to pull and tug at the advancing material to assure that coarse wrinkles and folds are removed in advance of actual ironing. Thus, to achieve satisfactory feed to the ironer the close and continuing attention of the workers to the advancing flatwork is required.

It is also a significant factor in the operation of flatwork ironers that the danger to the worker from the standpoint of having the hands in position to be accidentally injured is directly proportional to the incidence of approach of the hands to the entrance to the pressing zone.

The present invention has for one of its principal objectives the elimination of manual supervision of the flatwork, once its leading end is in the ironer, by the provision of mechanism operable to automatically and mechanically smooth and tauten the damp flatwork as it is drawn toward and into the ironing mechanism. It is a feature of the invention in this respect that the rate at which flatwork can be processed is materially increased, while still easing the work required of the operators. Through actual tests I have found that with the present invention the rate of production per operator is increased in the range of approximately 30% to 80% while still lessening the manual effort required.

Another important object of the invention is to provide apparatus for flatwork ironing which, in addition to mechanical smoothing and tautening of the fabric, provides for the automatic feed of quantities of flatwork to the immediate vicinity of the input end of the ironer as needed. This reduces materially the steps which must be taken by the operators in feeding work to the ironer and aids and assists in rapid handling of the work.

Still another object of the invention is to provide apparatus of the character described which achieves the objectives hereinbefore set forth without causing undue wear on the flatwork, and yet which effectively cooperates with the ironer to assure that coarse wrinkles and folds are pulled out flat prior to the time of entrance of the flatwork into the actual ironing mechanism.

A yet further object of the invention is to provide apparatus of the character described which is simple to construct and operate, which requires little power to function efficiently and effectively, and which has unusually long operating life while requiring little maintenance.

Other and further objects of the invention together with the features of novelty appurtenant thereto will appear in the course of the following description.

In the accompanying drawings which form a part of the specification and are to be read in conjunction therewith, and in which like reference numerals indicate like parts in the various views;

FIG. 1 is a schematic view showing the input end of a conventional flatwork ironer equipped with a preferred form of the invention;

FIG. 2 is a fragmentary top plan view, greatly enlarged, of the flatwork engaging friction means, being taken generally along the line 2—2 of FIG. 1 in the direction of the arrows, the break lines indicating interrupted length;

FIG. 3 is an end-on view of the flatwork engaging friction means, being taken generally along the line 3—3 of FIG. 1 in the direction of the arrows, the break lines again indicating interrupted length;

FIG. 4 is a fragmentary sectional view taken along the line 4—4 of FIG. 3 in the direction of the arrows;

FIG. 5 is an enlarged sectional view taken along the line 5—5 of FIG. 3 in the direction of the arrows;

FIG. 6 is a full length side view of the preferred form of rotor member as utilized in FIGS. 1–3, inclusive;

FIG. 7 is a similar view of a modified form of rotor member, the break lines indicating interrupted length;

FIG. 8 is a still further modified form of rotor member, break lines again indicating length;

FIG. 9 is a side elevation of still another modification of the invention, the upper transverse rotor member being shown schematically and parts broken away for purposes of illustration;

FIG. 10 is an end-on view of the structure of FIG. 9 taken from the right-hand side of FIG. 9, the break lines indicating interrupted length.

Referring to the drawings, and initially to FIG. 1, reference numeral **10** indicates generally the ironing rolls of a conventional flatwork ironer. The rolls are driven through a chain drive **11** from a power source (not shown). Located beneath the rolls is the steam chest **12** having an undulated upper surface which registers with the ironing rolls. An endless carrier web **13** moves between the rolls **10** and upper surface of the steam chest **12** and provides a moving base for flatwork introduced into the ironing mechanism.

Located ahead of the leading ironing roll **10** and forming part of the input end of the ironer is the endless belt **14** trained around the rollers **15** and **16**. The upper flight of the belt **14** is guided by an apron **17**. The usual pressure roller **18** is disposed above the upper flight of the belt **14** and lightly rests thereon.

The parts described thus far, with perhaps minor modifications, are common in flatwork ironers of the type presently in use and further explanation of these components will be unnecessary to those skilled in the art.

In illustrating the invention in schematic form as in FIG. 1, I have shown in broken lines a piece of flatwork, such as a sheet S, which has been advanced to the point where its leading end is firmly grasped by the first ironing roll **10** with a portion disposed over the input belt **14** and the remainder trailing downwardly below the lead roller **15** of the input belt. It will be noted that located below the roller **15** and somewhat outwardly therefrom is a structure which includes a rotary member **20** adapted to be driven in the direction indicated by the arrow A. The rotary member **20** will be described in further detail at a later point herein; for the present it suffices to observe that it includes the radially extending blades **21** spaced around its periphery. A motor **22** is drivingly connected with the rotary member **20** through the medium of a belt **23**. As will subsequently be seen, the rotary member **20** is supported by a support structure **24** for guided fore and aft movement under the influence of a double acting hydraulic or pneumatic cylinder **25** having the piston rod **26**.

The rotor member **20** is so positioned that the remainder portion of the piece of flatwork S is draped thereover

in contact with the edge of blade **21**. As illustrated, the piece of flatwork being introduced into the ironer is drawn from a pile of flatwork F which is supported on the upper surface of an endless conveyor belt **27** trained around the rollers **28, 29** and **30**. An electric motor is drivingly connected with one of the rollers, for example, with roller **30**. Power for the motor is supplied from line L_1 and L_2 through a circuit including conductors **33, 34**, normally closed contact **35** and conductor **36**. While not shown in detail it will be understood that contact **35** is resiliently biased toward the closed position.

Operatively connected with the contact **35** through a connector rod **37** is a pivotal shoe **38**. The shoe **38** is pivoted at **39** to an extension platform P adjacent the right-hand end of the conveyor structure **27**.

The biasing force operating to hold the contact **35** closed is such that it will permit the shoe **38** to depress and thus open the contact when applied thereto through the delivery of flatwork from the conveyor to the apron P. So long as the contact is closed, the motor **31** will drive the conveyor, thereby causing the flatwork F to advance toward and be deposited on the extension platform P. However, as the weight of flatwork delivered to the extension platform increases, eventually the shoe **38** will be depressed, thus opening contact **35** and breaking the circuit through the motor. The contact **35** will remain open until such time as sufficient flatwork has been drawn from the platform P as to again permit the shoe **38** to rise under the influence of the biasing force. This results in closing of the contact **35** and restarting of the conveyor motor **31** to deliver more flatwork to the platform P.

It will be understood that additional flatwork will be piled as needed on conveyor **27** by workers in the plant, it normally being placed at the left-hand end of the conveyor.

Returning now to further description of the friction means, and more particularly the rotary member **20** of FIG. 1 and its support structure, it will be observed from FIGS. 2 through 6, inclusive, that the rotary member comprises an elongate shaft **40** having its long axis disposed horizontally. The shaft is supported between parallel standards **41** which are spaced apart approximately the width of the ironing mechanism and rests at their lower ends (not shown) on the floor.

The shaft supports comprise circular bearing members **42** (FIG. 4) in which the shaft ends are journaled so that the shaft is free to rotate in said bearings about its longitudinal axis. The bearing members in turn are confined in horizontal ways or tracks having the upper rail **43** and lower rail **44**. Upper and lower bar members **45** and **46**, respectively, having portions extending above the lower rail and below the upper rail at the inside edges thereof serve to loosely confine the bearing members for movement forwardly and rearwardly in the ways.

The fore and aft position of the rotary member **20** with respect to the standard **41** is controlled by a pair of the double acting pneumatic or hydraulic cylinders **25**. The cylinders are located respectively adjacent the opposite standards **41** and have the forwardly extending piston rods **26**. The forward end of each rod is connected with the rotary member by an upwardly extending bracket **47** terminating in a bifurcated upper end portion **48** which engages the shaft in a loose fit permitting rotation of the shaft therein. A control valve **25***a* is provided for effecting simultaneous actuation of the cylinders **25**.

As earlier noted, the shaft **40** comprises the main body of the rotary member **20**. This shaft has keyed to it near one end the sheave **49**. The drive belt **23** (see FIG. 1) is trained over this sheave and provides the drive connection with the motor **22**.

Secured to the shaft **40** and running generally lengthwise thereof are the blades **21**. In the embodiment of FIGS. 1–6, inclusive, there are three such blades spaced equiangularly around the shaft **40**. The blades are composed of fairly stiff, yet resilient rubber-like material, and

are provided with a pattern of perforations from one end to the other. The inner edges of the blades lie adjacent the shaft, each blade being secured to the shaft by mounting brackets, each bracket having a curved portion **50***a* welded to the shaft and the outwardly projecting shallow flange portion **50***b*. Each blade is secured to and supported by its flange **50***b*, as by the spaced bolts **51**, but the edge portion of each blade is free and can give with the resilient flexure of the blade during operation.

Referring particularly to FIG. 6, it will be noted that each blade is set in a spiral course on the shaft, the spiral being oppositely directed from approximately the center outwardly so that the blade has what may be determined a central point of reversal **21***a*. In the preferred embodiment there are three such blades and they are so arranged that each spiral portion extending outwardly from the central point of reversal terminates in an outer end **21***b* spaced around the shaft 120° from the reversal point **21***a*. In other words, the ends **21***b* of one blade lie in substantially the same axial plane as the reversal point **21***a* of the next blade.

The blades **21** are of uniform depth from one end to the other, and are at all points therealong substantially radial to the shaft axis. Stated otherwise, the outer or free edge surfaces of the blades are contained within an imaginary cylinder having its axis coincident with the axis of shaft **40** and a radius equal to the distance from said axis to the edge of the blades, as will perhaps be better understood from FIG. 5.

It will be observed that the rotor member **20** is so oriented as to provide that during rotation of the rotor member the ends **21***b* of each blade are located ahead of, or lead, the central point of reversal **21***a*.

In the operation of the invention as thus far described, the usual practice would be for two operators, one stationed at each side of the input end of the ironer, to respectively grasp a corner at one end of a sheet, for example, one positioned on the extension platform P, and raise said end to place it on the entrance conveying web **14** so as to cause the sheet to be drawn into the roller **18** and fed to the main ironing mechanism. As the end of the sheet is placed into position the remainder thereof will, due to its own weight, drape over the rotary member **20** as shown in FIG. 1. As the remainder is advanced, the blades **21** successively come into contact therewith and move counter to the direction of advance. The oppositely spiraled portions of the blade exert a substantially continuous wiping and spreading or lateral stretching force on the fabric, while at the same time they act in cooperation with the ironer to pull the portion of the piece of flatwork taut between the ironing and rotary member. The perforations in the blades prevent pressure build-up between the blades during flexure, which might otherwise lower the frictional contact between the blades and flatwork.

The aforesaid spreading and pulling action on the piece of flatwork continues so long as the flatwork remains in engagement with the rotary member and during this interval the operators are free to ready another piece for insertion. It will be apparent that the operators are given ample time to have the end of the next piece in position to immediately follow the trailing end of the preceding piece. The conveyor **27** operates in the manner previously described to maintain a ready supply of flatwork at the loading station.

The sliding frictional forces exerted by the rotor member **20** on the flatwork can be adjusted to the value desired by shifting the operating position of the rotor member **20** further away from or back toward the ironing mechanism. The closer the rotor member is to the ironer, the lesser the force, as more and more of the weight of the remainder portion is supported by the fabric itself. Conversely, if the rotor member is moved further away from the ironer, the amount of tension in the fabric can be increased.

The cylinders **25** can be utilized to shift the rotor **20** back to a substantially inoperaive position, as shown in broken lines in FIGS. 1 and 2. This may be desirable at times to facilitate the handling of items requiring less preliminary smoothing than large sheets, or to permit the sheets or other large items to be partially fed into the ironer before bringing the rotor into operating relationship therewith. In this case, the rotor member would initially be disposed in the broken line position during feeding of the leading end of a sheet into the ironer mechanism. Once the sheet is firmly grasped in the ironer and is being drawn therein, the valve **25***a* is operated to cause the rotor to advance outwardly and into operating contact with the sheet.

FIG. 7 illustrates a modified form of rotor member **120** which may be utilized. This rotor member has straight, or uncurved blades **121**, the blades again being composed of a fairly stiff, yet resilient rubber-like material. As in the preceding embodiment the blades are equiangularly spaced around the shaft. While I have found that fair results may be achieved with plain, unadorned straight blades of the type shown in FIG. 7, the performance is measurably improved by providing inclined ridges at the outer edges of the blades, the ridges being arranged in echelon arrangement and oppositely inclined from the center of the blade outwardly. In the embodiment of FIG. 7, the ridges are formed by providing a row of uniformly spaced perforations near the outer edge of the blade and threading therethrough in continuous oppositely spiraled form each end toward the center length of cord **121***a* and **121***b*. The cords are knotted at each end thereof to prevent pull-out, the adjacent inner ends thereof passing through and knotted on opposite sides of a common central aperture. The direction of the exposed portion of the cords is the same as that in the case of the preceding embodiment so that the ridges on the opposite sides of the center tend to pull in opposite directions on the fabric, or against one another, as the fabric moves relative to the blades.

FIG. 8 illustrates still another modification of the rotor member. In this case it comprises the relatively large diameter drum **220** having extending from each end oppositely spiraled strips of a resilient material having good frictional resistance to the drawing of a fabric thereover. The strips are preferably cut from a flexible urethane foam and secured to the drum in the fashion illustrated by a suitable adhesive. It will be noted that the direction of spiral conforms with the direction of spiral of the blades of FIG. 6.

In FIGS. 9 and 10 there is shown still another modification of the friction means of the invention. Here there is provided a straight blade rotor **320** of the type shown in FIG. 7 and previously described, but without the edge ridges of the FIG. 7 embodiment. The blades **321** of the rotor **320** are perforated as at **321***a*, the perforations being provided over substantially the full length thereof for the purpose previously set forth. The rotor **320** is supported and driven in the manner earlier described.

To assist the rotor **320** in spreading the flatwork to a preliminary flat condition there are provided two parallel laterally spaced auxiliary rotor members **350**. Each of these has a shaft **351** to which is secured a plurality of longitudinally extending spirally twisted blades **352**. These may conveniently be considered to conform to half sections of the rotor member of FIG. 6. As is evident, the direction of spiral on the respective auxiliary rotor members is opposite to that of the other. Like the preceding embodiment the blades of the auxiliary rotors are of fairly stiff, yet resilient, rubber-like material.

Each of the rotor members **350** is carried on a carriage **353**, the axis of the rotor member being upright but canted from the vertical as shown in FIG. 9. The rotor member is attached to the carriage by journals **354** and it will be observed that the shaft of the rotor extends below the lower journal and terminates in a disk **355**.

The carriages **353** are supported by a framework, the main elements of which comprise the upstanding pedestals or side plates **356** spaced apart approximately the width of the ironer (not shown). The pedestals are tied together by cross braces **357** and **358**.

Supported by and extending between the pedestals **356** is an upper shaft **359** and a lower shaft **360**, both of which are horizontal. Each carriage is slidably mounted on these shafts for sidewise movement, that is, toward and away from one another. The mounting connections with the upper shaft comprise the upper slide bearings **361** which slidably fit over the upper shaft. Similar slide bearings **362** connect the carriage at its lower end with the lower shaft **360**, these bearings also permitting free rotation of the lower shaft therein.

The ends of the upper shaft **359** are threaded and extend respectively through elongate transverse slots **363** in the upper ends of the pedestals. Nuts **364** are utilized to tighten the shaft **359** to the pedestal. Obviously the angle of inclination of the carriages (and thus the auxiliary rotor members) can be changed by loosening the nuts and shifting the shaft ends forwardly or rearwardly in the slots.

The lower shaft **360** is journaled on the pedestals in bearings **365** and terminates at one end in a sheave **366** which connects with a drive belt **367** leading from a power source (not shown). Referring particularly to the right-hand portion of FIG. 10, it will be seen that there is provided on shaft **360** a friction wheel **368**. The wheel **368** is keyed to the shaft to turn therewith, a longitudinal key way **369** being provided in the shaft so that the wheel **368** can be shifted lengthwise thereof while still maintaining driving connection between the shaft and friction wheel. A similar arrangement is employed at the left-hand carriage.

The rims of each of the friction wheels **368** frictionally engage the lower faces of the respective disks **355** at a point offset from the axis of the latter and thus serve to rotate the rotor members in the opposite directions shown by the arrows. To assist in maintaining good frictional contact between the friction wheels and disks, the disks are urged toward the friction wheel by helical springs **370**. It will be understood that while not shown, appropriate washers or bearings will be disposed between the springs **370** and disks **355** to permit free rotation of the latter.

To provide means for changing sidewise position of the carriages **353**, I have provided the arrangement generally illustrated at the right-hand side of FIG. 10 and in FIG. 9. While only one such means is shown, it will be understood that the same arrangement can be employed in connection with the left-hand carriage. It has not been shown simply to avoid duplication.

The adjusting means comprises a threaded shaft **371** which is journaled in the pedestal **356** by a bearing **372** and terminates outside the pedestal in a hand wheel **373**. The threaded portion of the shaft **371** extends through a similarly threaded opening in a block **373** secured to the rear of the carriage (see FIG. 9). By turning the hand wheel **373** in one direction the carriage is moved inwardly while rotation of the hand wheel in the opposite direction moves the carriage outwardly.

In the operation of the embodiment of FIGS. 9 and 10, the auxiliary rotors **350** operate to pull the side portions of the sheet away from one another, thus to stretch it between them, and remove wrinkles and folds. The curved nature of the blades assists in this operation by also imposing a tension force in the direction of advance of the sheet upwardly over the upper rotor **320**. If pocketing of air between the blades of the auxiliary rotor occurs, they can be perforated in the same fashion as earlier described to permit escape of the air and permit build-up of pressures which might tend to reduce the frictional engagement between the auxiliary rotors and the flatwork.

From the foregoing it will be seen that this invention is one well adapted to attain all of the ends and objects hereinabove set forth together with other advantages which are obvious and which are inherent to the structure.

It will be understood that certain features and subcombinations are of utility and may be employed without reference to other features and subcombinations. This is contemplated by and is within the scope of the claims.

As many possible embodiments may be made of the invention without departing from the scope thereof, it is to be understood that all matter herein set forth or shown in the accompanying drawings is to be interpreted as illustrative and not in a limiting sense.

Having thus described my invention, I claim:

1. The combination of:

a flatwork ironing apparatus having an input end and including gripping means operable to receive and grasp one end of a piece of flatwork fed thereto and to cause the remainder thereof to be drawn progressively toward and into said input end,

an elongate rotary member disposed near but in advance of said input end and oriented with its long axis transverse to the path of advance of said piece of flatwork so that the said remainder of said flatwork will be trained thereover,

a plurality of radially spaced resilient elements carried by and extending lengthwise of said rotary member and having free edge portions spaced laterally from said rotary member and adapted to engage the underside of said remainder,

ridges located on the free edge portions of said elements, said ridges disposed in oppositely directed echelon patterns proceeding outwardly on the edge from a point intermediate the ends of the element, and

means for rotating said member in a direction whereby said elements, while the ridges are in contact with said remainder of the flatwork, move against the direction of advance of the flatwork.

2. The combination of:

a flatwork ironing apparatus having an input end and including gripping means operable to receive and grasp one end of a piece of flatwork fed thereto and cause the remainder thereof to be drawn progressively toward and into said input end,

an elongate rotary member disposed near but in advance of said input end and oriented with its longitudinal axis transverse to the path of advance of said piece of flatwork so that the remainder of the flatwork will be trained thereover as it is drawn towards said input end,

friction surfaces carried by and resiliently supported from said member and extending longitudinally thereof,

said friction surfaces comprising the free edge surfaces of a plurality of radially spaced flexurally resilient blades of rubber-like material extending lengthwise along said rotary member, said friction surfaces adapted to underlie and frictionally engage the underside of said remainder, and

means for rotating said rotary member in a direction whereby said friction surfaces move in opposition to the direction of advance of said piece during contact of said friction surfaces with said remainder.

3. The combination of:

a flatwork ironing apparatus having an input end and including gripping means operable to receive and grasp one end of a piece of flatwork fed thereto and cause the remainder thereof to be drawn progressively toward and into said input end,

an elongate rotary member disposed near but in advance of said input end and oriented with its longitudinal axis transverse to the path of advance of said piece of flatwork so that the remainder of the flatwork will be trained thereover as it is drawn toward said input end,

friction surfaces carried by and resiliently supported from said member and extending longitudinally thereof, said friction surfaces comprising the free edge surfaces of a plurality of radially spaced flexurally resilient blades of rubber-like material extending lengthwise on said rotary member, said blades provided with perforations therethrough, said friction surfaces adapted to underlie and frictionally engage the underside of said remainder, and

means for rotating said rotary member in a direction whereby said friction surfaces move in opposition to the direction of advance of said piece during contact of said friction surfaces with said remainder.

4. The combination of:

a flatwork ironing apparatus having an input end and including gripping means operable to receive and grasp one end of a piece of flatwork fed thereto and cause the remainder thereof to be drawn progressively toward and into said input end,

a power driven rotary member positioned ahead of and below said input end having friction elements adapted to have frictional engagement with the underside of the advancing remainder of said flatwork, said rotary member driven in a direction to cause said elements to move oppositely from said gripping means while in contact with said remainder and to pull on said remainder in opposition to said gripping means as well as in opposed directions transverse to the path of advance of said flatwork,

guide means supporting said rotary member for displacement of said rotary member in opposite directions transverse to the longitudinal axis thereof and toward and away from engagement with said flatwork, and

power means connected with said rotary member and selectively operable to effect displacement of said member with respect to said guide means and in said opposite directions whereby to engage or disengage said rotary member with respect to said flatwork.

5. The combination of:

a conveyor mechanism operable to carry a quantity of unironed flatwork from one location to another,

a flatwork ironing apparatus having an input end near said other location and including gripping means operable to receive and grasp one end of a piece of flatwork fed thereto and cause the remainder of said piece to be drawn progressively toward and into said input end and from said conveyor mechanism,

friction means interposed between said conveyor mechanism and said input end and positioned to have said remainder draped thereover as said end is fed into said gripping means, said friction means including a power driven rotary member having friction surfaces operable to pull said remainder taut, both in the direction of advance and laterally, in a space between said gripping means and said friction means whereby to automatically smooth and hold said remainder taut during its entry into said gripping means, and

control mechanism operable to monitor the withdrawal of unironed flatwork from said other end of a conveyor mechanism and to cause said conveyor mechanism to advance further unironed flatwork upon depletion of the quantity at said other location to a preselected value.

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