APPARATUS FOR IRONING ARTICLES OF LAUNDRY

Inventors: Wilhelms Joannes Cornelius Maria Bazelmans, Nr. 122, Provincialeweg, Jozef Alfons Maria Bazelmans, Lepelkesweg 2, both of Veldhoven, Netherlands

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Assistant Examiner or Firm—Synder, Brown and Ramik

ABSTRACT
Apparatus for ironing articles of laundry, comprising an ironing machine operating with a mangle roller, a fixed feed device, a movable feed device which consists of one or more drivable endless belts extending around guide rollers disposed in parallel relationship to the guide rollers of the fixed feed device, said movable feed device being disposed in a framework movable back and forth between two end positions and a plate movable above the shaft transversely or substantially transversely of the plane of transportation of the movable feed device, whereby the framework is connected to a pneumatically or hydraulically drivable rocker mechanism which is prestressed in such manner that in one end position a force is exerted which is directed towards the other end position.

7 Claims, 9 Drawing Figures
APPARATUS FOR IRONING ARTICLES OF LAUNDRY

This invention relates to apparatus for ironing articles of laundry, such as sheets, articles in the form of bags, cloths, or other flat articles, comprising a mangle or ironing machine operating with a mangle roller, a fixed feed device consisting of one or more drivable endless belts extending around guide rollers disposed in parallel relationship to the mangle roller, a freely rotatable pressure roller being disposed above the entry place of said fixed feed device, a movable feed device which consists of one or more drivable endless belts extending around guide rollers disposed in parallel relationship to the guide rollers of the fixed feed device, said movable feed device being disposed in a framework movable back and forth between two end positions, whereby the feed device can be brought out of a position spaced from the fixed feed device into a position near the supply point of the fixed feed device, the belts of the movable feed device being drivable at a higher speed than the speed of the belts of the fixed feed device, a vertical shaft open at the top being provided beneath the path of the movable feed device, a downwardly directed current of air being adapted to be produced in said shaft, and a plate movable above the shaft transversely or substantially transversely of the plane of transportation of the movable feed device.

In an apparatus of this kind, the article of laundry which is to be ironed is placed on the belts of the movable feed device while such movable feed device is at some distance from the fixed feed device. The belts are stationary in this position. The movable feed device is then moved into a position near the fixed feed device and, when this position has been reached, the belts are pressed against the pressure roller. The belts of the movable feed device are then driven so that the article of laundry is fed to and engaged by the pressure roller, and is brought on to the moving belt of the fixed feed device. The movable feed device is then returned to its initial position, while the belts are driven at a higher speed than before and higher than the speed of the belts of the fixed feed device.

During this movement, the movable plate is moved in the direction of the shaft situated beneath it, so that the free part of the article of laundry is pressed into the shaft. For the movement of the movable feed device, the framework is connected to a pneumatically or hydraulically drivable rocking mechanism, which is prestressed in such a manner that in one end position a force is exerted which is directed towards the other end position. The pneumatic or hydraulic force driving the rocking mechanism can be small as a result of the prestressing.

By moving the movable plate in the direction of the shaft at the moment that the movable feed device moves away from the pressure roller, the article of laundry is pressed into the shaft so that the danger of an article of laundry catching around the pressure roller is obviated.

It is very important that the article of laundry should be taut when fed to the mangle roller. To this end, the article of laundry experiences a stretching effect in the shaft as a result of the stream of air produced therein. This effect can be reinforced by making the belts of the fixed feed device from a material having a high coefficient of friction, making the speed of the belts of the fixed feed device lower than the circumferential speed of the mangle roller, and making the freely rotatable pressure roller movable between the position near the entry place and a distance therefrom. Since the speed of the mangle roller is higher than the speed of the belts of the fixed feed device, the mangle roller pulls the article of laundry away from the belts. The traction exerted on the article of laundry may be such in these conditions that it is torn apart. This is prevented, however, by lifting the pressure roller at the moment that the article of laundry is engaged by the mangle roller.

The movable plate is disposed pivotally in such a manner that it is rockable, while the pressure roller is adapted to be shifted between two end positions in parallel relationship to the entry belts. This facility can be utilised in ironing relatively short articles of laundry, in which case the movable plate is rocked over and can act as a temporary storage place for the short articles of laundry requiring to be ironed. The articles of laundry are placed from this storage station directly on to the entry belts of the fixed feed device. To this end, however, the pressure roller should be moved towards a position at some distance from the entry place to make the entry belts accessible. During the processing of short articles of laundry, the movable feed device is not shifted and its supply belts are stationary.

To iron articles of laundry in the form of bags, for example blankets and bed covers, the current to the electric motor driving the entry belts of the movable feed device at high speed is interrupted by means of a manually operated switch. Consequently, in the above-mentioned cycle, the entry belts of the movable feed device are not driven at high speed, so that the article of laundry is not introduced into the shaft. Consequently, the movable plate brushes over the bag as it passes, so that the air present therein is expelled and the creases in the fabric are removed.

The invention will be explained in detail with reference to one exemplified embodiment illustrated in the accompanying drawings wherein:

FIG. 1 is a partially broken-away perspective of an apparatus according to the invention.

FIG. 2 is a side elevation of the movable feed device.

FIGS. 3 – 7 are diagrammatic side elevations of the feed devices in various positions of the movable feed device.

FIG. 8 is a diagrammatic elevation of the feed device showing the switches required for operation of the device and

FIG. 9 is the circuit diagram of the apparatus according to the invention.

The ironer 1 comprises a mangle provided with a mangle roller 2, a fixed feed device 3, and a movable feed device 4. The mangle roller 2 rotates at a constant speed. The feed device 3 is formed by a number of belts 7 extending around a roller 5 and over a plate 6. The roller 5 is driven by a motor (not shown) in the direction of the arrow at a speed such that the speed of movement of the belts 7 is less than the circumferential speed of the mangle roller 2. A freely rotatable pressure roller 8 is disposed above the supply point of the feed device 3. The roller is rotatable around the axis 9 and is mounted to be sidable. The end of the bearing bracket 10 is pivotable about the axis 11. The bracket 10 can be moved up or down by means of a hydraulic cylinder 12.
The movable feed device 4 comprises belts 15 passing over rollers 13 and 14. Roller 14 is driven at a low speed by motor 41 or at a higher speed by motor 40 (FIG. 8). The rollers 13 and 14 are mounted rotatably in a plate 16 which is pivotally connected to the fork-shaped post 17 and to a rocker 18. The rocker 18 is connected via the hinge member 19 to a spring 21. The rocking mechanism consisting of the rocker 18 and the hinge member 19 and the spring are so coupled that a force directed towards the other of the two end positions of the rocker is always exerted on the latter. FIG. 2 shows one of the two end positions in solid lines and the other end position of the rocker mechanism in broken lines. The force exerted by the spring 21 is not sufficient to move the movable feed device 4 into the other end position. The extra force required for this purpose is delivered by the pneumatic piston and cylinder unit 22, which is pivotally connected to the rocker 18 and to a pivot point 23 of the post 17. The plate 16 has a projection 30 at the top, to which is fitted a pivot pin 24 for the arm 25 of the movable plate 32. The latter can be pivoted up and down about point 24 by means of the piston and cylinder unit 26. An air shaft or chute 36 is provided beneath the entry point of the belts 7, and a downwardly directed air current is produced therein. The pressure roller 8 is movable in parallel relationship to the entry belts 7, by means of the pneumatic piston and cylinder unit 27, between a position near the place where an article of laundry is introduced at the fixed feed device and a position at a distance from such place.

The system operates as follows. An article of laundry is placed on the stationary entry belts 15 of the movable feed device 4, the front edge of the article of laundry interrupting the light beams of parallel photo-cells 28 and 29 (FIG. 3). An electrical signal is thus produced to open an electrically actuated valve 39, and compressed air is fed to the underside of the piston in the piston and cylinder unit 22. The movable feed device is thus moved from the full to the dashed line position as shown in FIG. 2. During this movement, the shaft 38 coupled to the rocker mechanism is rotated. At a given angular position, the microswitch 37 is actuated and an electrical signal is produced, whereby the electrically actuated valve 42 is opened, so that compressed air is fed to the piston and cylinder unit 26. The movable plate 32 is thus moved up out of the path of movement of the movable feed device 4. When the belts 15 engage against the pressure roller 8, the microswitch 33 is closed, so that the motor 41 drives the entry belts at a speed equal to or substantially equal to the lowest speed of the mangle 2. Consequently, the article of laundry is discharged from the entry belts and occupies a position between the pressure roller 8 and the entry belts 7 of the fixed feed device. Closure of the microswitch 33 also results in starting of the time relay 43. The relay 43 maintains the circuit actuating the valve 39, so that the movable feed device 4 remains in the top position until the front edge of the article of laundry has come beneath the pressure roller 8. The time determined by the time relay 43 is selected in conjunction with the speed of movement of the mangle 2. When this period of time has elapsed, air is admitted to the other side of the piston and cylinder unit 22 by means of the valve 39, so that the movable feed device 4 is returned to the fall line position of FIG. 2. The shaft 38 thus rotates and when it reaches a given angular position the microswitch 37 is opened, so that the air valve 42 is closed by means of an electrical signal. Consequently, the air flows out of the piston and cylinder unit 26 and the movable plate 32 is moved down in the direction of the air shaft or chute 36. The microswitch 34, which acts as a selector switch and, during the movement of the movable feed device 4 towards the pressure roller, has allowed current to flow to the switch 44 so that the motor 41 receives current for driving the entry belts 15 at low speed, is also switched over. Current can thus flow to switch 45 and to motor 40, so that the entry belts of the movable feed device 4 are driven at high speed.

The relay switched on by the photoelectric cells 28, 29 provides the relay 46 with voltage, so that the current supply to the motor switch 45 is maintained via the selector switch 34. As soon as the rear end of the article of laundry no longer interrupts the light in the photocell 28, 29, the current supply to the relay 46 is interrupted, so that the switch 45 switches off the feed to the motor 40. The result of the switching of the relay 46 is that the air valve 35 is opened, so that a brake mechanism (not shown) stops the entry belts of the movable feed device 4. The free end of the article of laundry is fed brought into the air shaft 36 as a result of the fast drive of the entry belts of the movable feed device 4. The downwardly directed current of air produced in the air shaft 36 ensures that the article of laundry is introduced into the mangle 2 in the stretched condition and without any creases.

When the front edge of the article of laundry has reached the mangle roller 2, the pressure roller 8 is lifted, so that the article can slip over the entry belts to prevent it being torn apart. During the movement of the movable feed device 4 towards the pressure roller 8, the electrically actuated air valve 47 is opened by means of the microswitch 35, so that pressure roller 8 is moved in the direction of the entry belts 7. The pressure roller rotates as a result of contact with the entry belts. The microswitch 35 has also started the time relay 48, so that the valve 47 remains in operation during the period of time determined by said time relay. The period of time determined by the time relay 48 is selected in relation to the speed at which the mangle 2 rotates.

The photocell 31 disposed in the air shaft 36 ensures that the start order for a subsequent operation cannot be given until the free end of the article of laundry in the shaft 36 no longer screens the photocell 31. This prevents a subsequent operation from starting before the previous article of laundry has been completely processed.

To use the system for relatively short articles of laundry, the movable plate 32 is swung back completely about the pivot point 24 (see FIG. 7), to provide a storage place for the articles of laundry. The entry belts 15 of the movable feed device 4 then act as a receiving surface. From the storage station the articles of laundry are placed directly on the entry belts 7 of the fixed feed device 3. For this purpose, however, the pressure roller 8 must be shifted towards the mangle 2 in order to provide sufficient space for manual presentation of the articles. The pressure roller 8 is shifted by means of the piston and cylinder unit 27 which is actuated by a hand switch which is set to position IV on the operating panel. The air valve 49 is thus closed and the air valve 37 is opened. Consequently, compressed air is fed to
the piston and cylinder unit 27, so that the pressure roller is shifted. Since the switch is in position IV, all the other functions of the system are also switched off, except for the operation of the air valve 47, so that the pressure roller can move.

To handle articles of laundry in the form of bags, the switch is set to position II so that the feed to the switch 45 is broken. Consequently, the entry belts 15 are not driven at high speed and the article of laundry is not fed into the air shaft 36. During the transport of the article of laundry from the movable feed device 4 to the fixed feed device 3, the plate 52 sweeps over the article of laundry, so that the air present therein is driven out of the bag and any creases in the article of laundry are prevented.

For mangle fitted sheets and similar articles of laundry, the said switch is set to position III, so that the entry belts of the movable feed device are maintained in the position shown in FIG. 4 and are driven at low speed, so that the articles of laundry can be introduced manually.

Switch position I is the normal position. The various relays and switches are fed from a supply 50.

We claim:
1. Apparatus for ironing articles of laundry such as sheets, bags, cloths or other flat articles, comprising in combination:
a mangle or ironing machine having a mangle roller; fixed feed means for feeding articles in flatwise condition to said mangle roller, said fixed feed means including first guide roller means disposed in parallel relation to said mangle roller and at least one endless belt around said first guide roller means, first drive means connected to said first guide roller means for travelling said endless belt at a selected speed, and a freely rotatable roller disposed above said endless belt and defining therewith an entry mouth for said fixed feed means;
movable feed means for feeding articles to said fixed feed means, said movable feed means including second guide roller means and at least one endless belt around said second guide roller means, a framework carrying said second guide roller means and means for selectively moving said framework between two end positions, in one of which end positions said movable feed means is disposed to feed an article to said entry mouth of the fixed feed means and in the other of which end positions said movable feed means is spaced from said fixed feed means, and second drive means connected to said guide roller means for selectively travelling said endless belt of the movable guide means at a speed greater than said selected speed whereby to form a loop in an article between said fixed and movable guide means after the article is captured by said fixed feed means and is fed thereto by said movable feed means; and
a vertical air shaft having an inlet mouth positioned to receive said loop in an article and means for drawing air downwardly through said air shaft; movable plate means mounted on said movable feed means for engaging an article above said air shaft and including fluid-actuated means for moving the plate means vertically into and out of engagement with an article; said means for selectively moving said framework between its two end positions including rocker mechanism connected to said framework, fluid-actuated means connected to said rocker mechanism for operating said rocker mechanism to move said movable feed means between its end positions, and pre-stressing means connected to said rocker mechanism for exerting a force on said movable guide means directed from one end position thereof to the other end position.
2. Apparatus according to claim 1 including means for adjustably positioning said freely rotatable roller toward and away from said mangle roller thereby to shift the position of said entry mouth.
3. Apparatus according to claim 2 including means for disabling said second drive means in response to a predetermined positioning of said freely rotatable roller near to said mangle roller.
4. Apparatus according to claim 1, characterised by photoelectric means responding to an article of laundry on the movable feed device to actuate said fluid-actuated means driving the rocker mechanism and to control the current supply to said second drive means, a first switch responding to the angular position of said rocker mechanism to actuate said fluid-actuated means driving the movable plate means, a first time-determining element for determining the residence time of said movable feed means at said one end position thereof, a second switch responding to the position of said rocker mechanism to actuate said second drive means driving the endless belt of the movable feed means and to actuate said first time-determining element which determines the residence time of the movable feed means in the position near the fixed feed means, a third switch responding to the position of said rocker mechanism to actuate said second drive means, actuator means for moving said freely rotatable roller into and out of engagement with the endless belt of the fixed drive means, a second time-determining element for determining the residence time of said roller against the endless belt of the fixed drive means, a fourth switch responding to the position of said rocker mechanism to actuate said actuator means and move the roller against its associated belt and to actuate said second time-determining element which determines the residence time of the pressure roller, and photoelectric means which respond to the presence of an article of laundry in the air shaft in order to produce a start order for a subsequent operation.
5. Apparatus according to claim 4 including means for adjustably positioning said freely rotatable roller toward and away from said mangle roller thereby to shift the position of said entry mouth.
6. Apparatus according to claim 5 including means for disabling said second drive means in response to a predetermined positioning of said freely rotatable roller near to said mangle roller.
7. Apparatus for ironing articles of laundry, comprising in combination:
a mangle iron including a mangle roller;
fixed feed means defining a travelling apron for feeding an article to said mangle roller, said fixed feed device including first drive means for feeding articles to the mangle roller at a selected speed; a freely rotatable pressure roller and means mounting said pressure roller for downward movement into and upward movement out of engagement with said travelling apron whereby, when engaged with said apron, to form an article infeed nip therewith,
and first actuator means normally maintaining said pressure roller against said travelling apron;
movable feed means for delivering an article to said travelling apron, said movable feed means comprising endless conveyor belt means, second drive means for selectively driving said endless conveyor belt means at said selected speed, third drive means for selectively driving said endless conveyor belt means at a speed higher than said selected speed, support means mounting said endless conveyor belt means for movement between a first position defining a horizontal gap between said endless conveyor belt means and said travelling apron and a second position in which said endless conveyor belt means is engaged with said pressure roller to define an article delivery nip therewith, and second actuator means for moving said endless belt conveyor means as aforesaid;
air suction means having an inlet mouth disposed at said gap for drawing a trailing portion of an article thereinto;
first control means responsive to a predetermined position of an article on said endless conveyor belt means to operate said second actuator means to engage said endless conveyor belt means with said pressure roller to form said article delivery nip while said first actuator means maintains said article infeed nip;
second control means responsive to formation of said article delivery nip for energizing said second drive means to travel an article through said article delivery nip and said article infeed nip and onto said travelling apron at uniform speed;
time delay means responsive to formation of said article delivery nip for returning said endless conveyor belt means to said first position thereof;
means responsive to return movement of said endless conveyor belt means for energizing said third drive means to travel said endless conveyor belt means at its higher speed to form a loop in an article at said gap which is delivered to said inlet mouth of the air suction means; and
pre-load means associated with said second actuator means for assisting such second actuator means in moving said endless belt conveyor means from either its first or its second position thereof.

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