April 2, 1968 H. J. WEIR 3,376,036

LAUNDRY FEEDING MACHINE

Filed Jan. 30, 1967 6 Sheets-Sheet 1

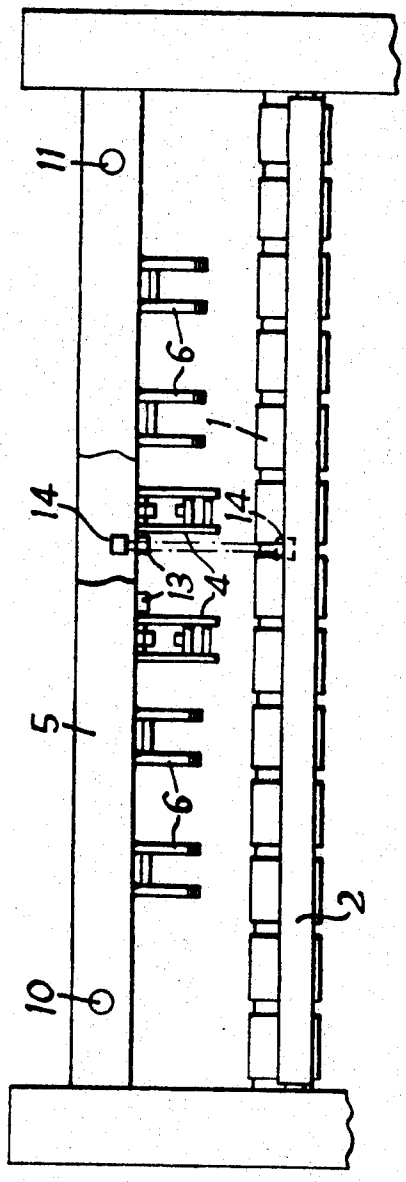


Fig. 1.

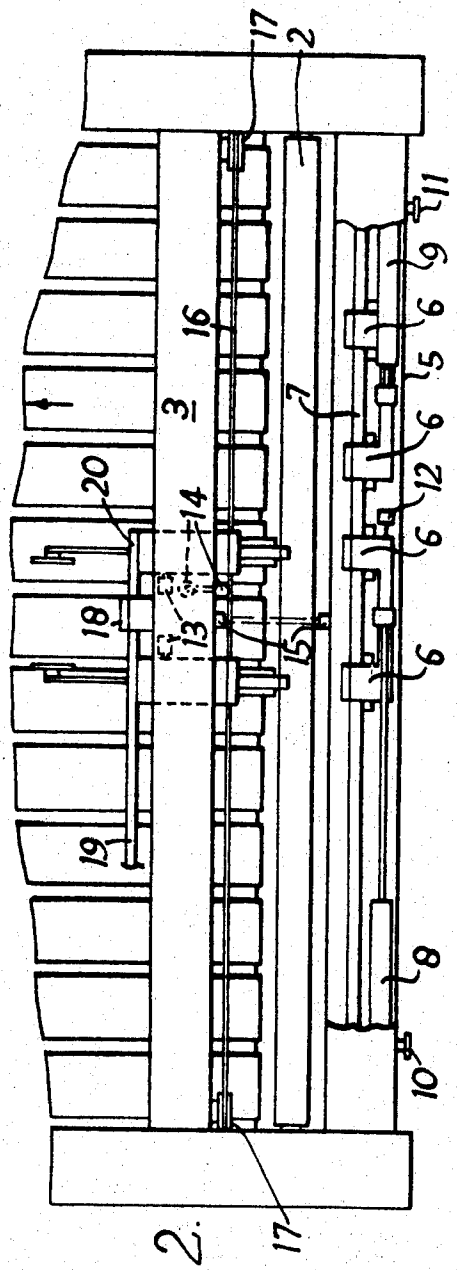


Fig. 2.

Henry John Weir, Inventor

By, Wenderoth, Lind and Ponack, attys

April 2, 1968 H. J. WEIR 3,376,036

LAUNDRY FEEDING MACHINE

Filed Jan. 30, 1967 6 Sheets-Sheet 2

Fig. 3.

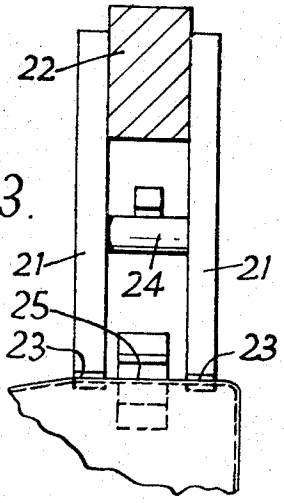


Fig. 4.

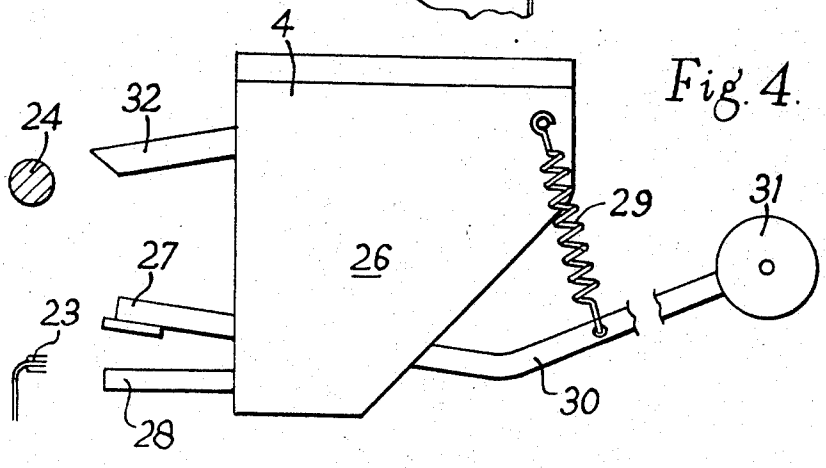


Fig. 5.

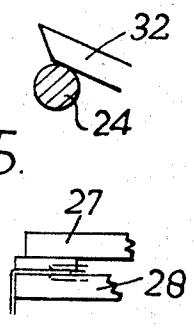
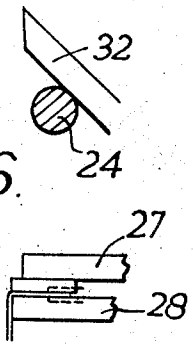


Fig. 6.



Henry John Weir
Inventor

By, Wenderoth, Lind and Ponack, Attorneys

April 2, 1968 H. J. WEIR 3,376,036

LAUNDRY FEEDING MACHINE

Filed Jan. 30, 1967 6 Sheets-Sheet 3

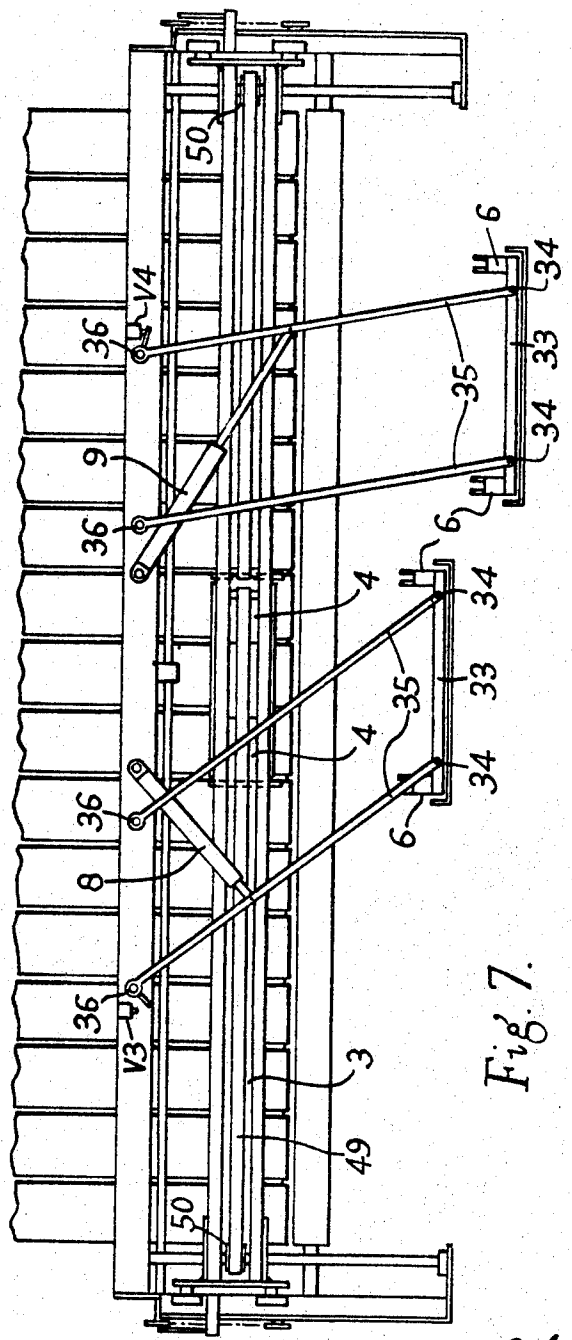


Fig. 7.

Henry John Weir
Inventor

By. Wenderoth, Lind and Ponack
attys.

April 2, 1968 H. J. WEIR 3,376,036

LAUNDRY FEEDING MACHINE

Filed Jan. 30, 1967 6 Sheets-Sheet 4

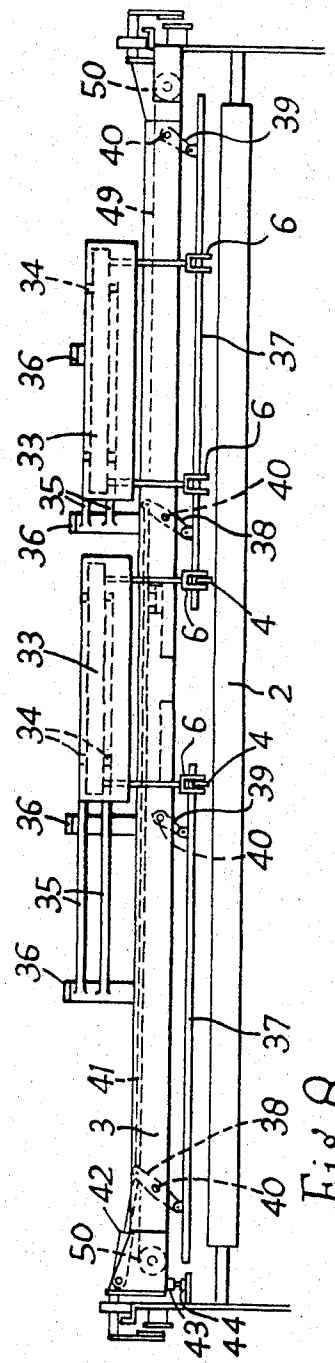


Fig. 8.

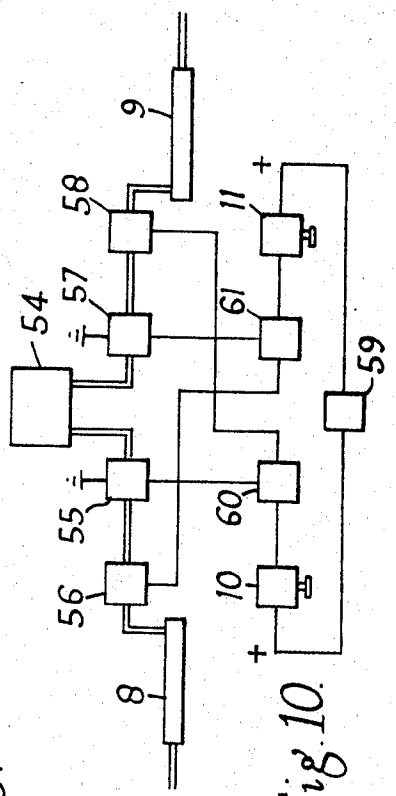


Fig. 10.

Henry John Weir
Inventor

By, Wenderoth, Lind and Ponack
attys

April 2, 1968 H. J. WEIR 3,376,036

LAUNDRY FEEDING MACHINE

Filed Jan. 30, 1967 6 Sheets-Sheet 5

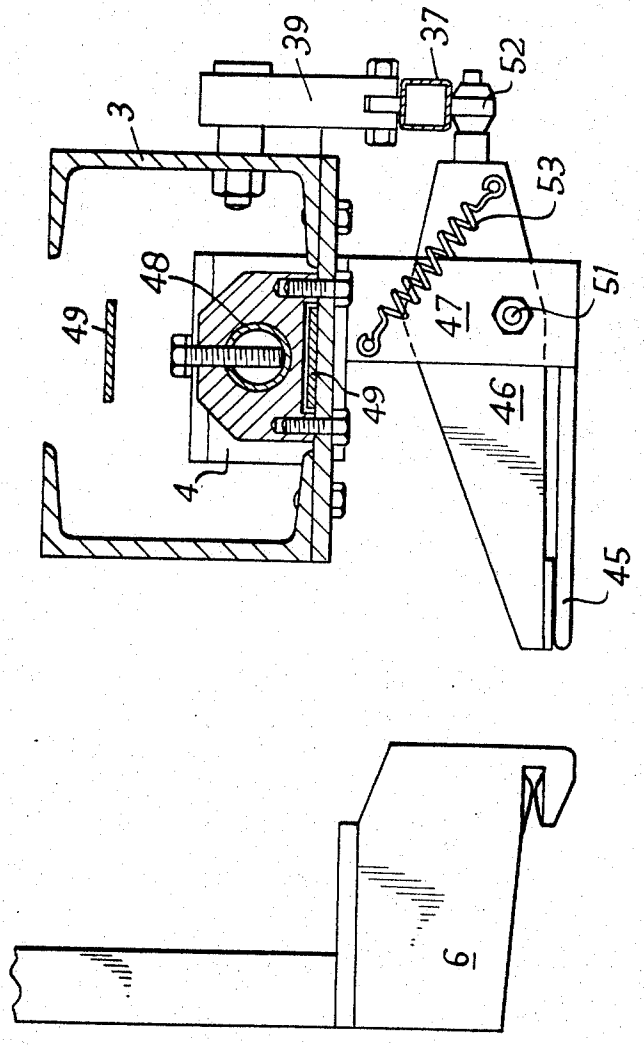


Fig. 9.

Henry John Weir
Inventor

By. Wenderoth, Lind and Ponack
Attorneys

April 2, 1968 H. J. WEIR 3,376,036

LAUNDRY FEEDING MACHINE

Filed Jan. 30, 1967 6 Sheets-Sheet 6

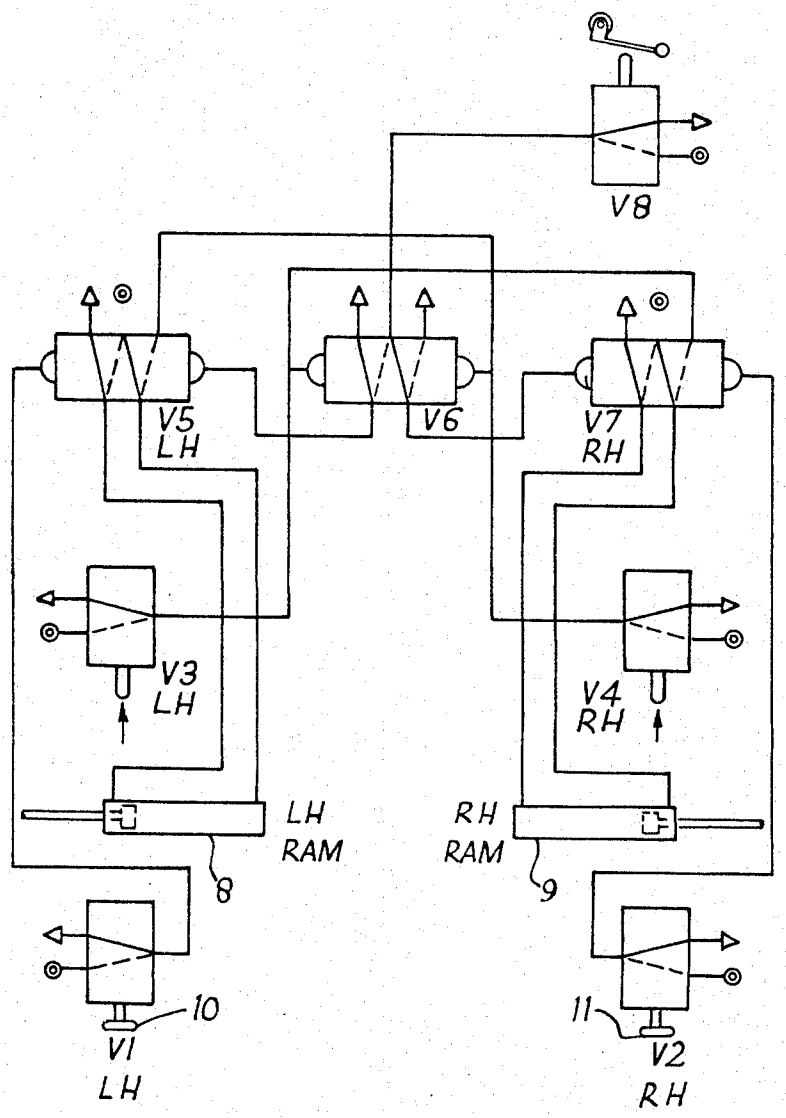


Fig. 11.

Henry John Weir,
Inventor

By, Wendroth, Lind and Ponack,
Attorneys

United States Patent Office 3,376,036
Patented Apr. 2, 1968

3,376,036

LAUNDRY FEEDING MACHINE

Henry John Weir, Sedbury, Chepstow, England

Filed Jan. 30, 1967, Ser. No. 612,386
Claims priority, application Great Britain, Jan. 31, 1966, 4,265/66
13 Claims. (Cl. 271—54)

ABSTRACT OF THE DISCLOSURE

A laundry feeding machine having two clamps adapted to receive and hold two corners of the leading edge of the article to be fed; a conveyor; means for moving the clamps transversely apart from a rest position to tension the leading edge; and feed transfer means comprising two pairs of transfer grips, each pair being adapted to receive, in respective grips, said two corners of an article to be fed and each pair being movable between a respective feed station at which a respective operator can insert the corners into the grips and a common transfer station at which the grips of the pair are each adjacent a respective clamp when the clamps are in their rest positions, means for moving the grips between the feed stations and the transfer station and means for transferring, at the transfer station, the corners of the articles from the grips to the respective clamps.

The invention relates to laundry feeding machines and has particular application in machines for feeding laundry articles (usually flat-work articles such as sheets) to ironing machines. In particular, the present invention concerns improvements in the laundry feeding machine described in my co-pending patent application No. 21,725/65.

In the above-mentioned patent application there is described a feeding machine which comprises an individual conveyor which is continuously moving and on which sheets (for example) are automatically laid with their leading edges straight. An operator places the two corners of the leading edge of the sheet between respective clamps and initiates an operation which moves the clamps apart to stretch the leading edge and then moves the clamps forward, dropping the leading edge onto the conveyor after a predetermined movement. In practice it is found that the effective speed of operation of the machine is limited by the speed at which the operator can find the two corners of the sheet and insert them into the clamps. The present invention seeks to overcome this disadvantage and provide a machine which is capable of being operated faster than the machines described in the above-mentioned application.

A laundry feeding machine in accordance with the present invention has two clamps adapted to receive and hold two corners of the leading edge of the article to be fed; a conveyor; means for moving the clamps transversely apart from a rest position to tension the leading edge; and feed transfer means comprising two pairs of transfer grips, each pair being adapted to receive, in respective grips, said two corners of an article to be fed and each pair being movable between a respective feed station at which a respective operator can insert the corners into the grips and a common transfer station at which the grips of the pair are each adjacent a respective clamp when the clamps are in their rest positions, means for moving the grips between the feed stations and the transfer station and means for transferring, at the transfer station, the corners of the articles from the grips to the respective clamps. With such an arrangement it is possible to have two operators working independently in feeding sheets to the machine and thereby speed up the effective operation of the machine.

Preferably the grips are mounted at the rear of the machine, the transfer station being on the fore-and-aft center line of the machine and the feed stations being disposed symmetrically on either side thereof. Each pair of grips may be arranged to move over a linear track across the machine between the transfer station and the respective feed station. Preferably, however, each pair of grips is arranged to move over an arcuate path between the transfer station, and the respective feed station, being mounted on a respective support pivoted to swing in a substantially horizontal plane to carry the grips between the transfer station and the respective feed station. Preferably the pivot axis or axes for each support is or are in line in front, in the fore-and-aft direction of the machine, with the respective feed station. Preferably each support comprises two parallel equal length pivoted arms pivoted at their forward ends at respective points spaced apart across the machine and a cross-piece pivoted to the rear ends of the arms and carrying the grips, the whole constituting a parallelogram movement which maintains the cross-piece tranverse to the fore-and-aft direction of the machine. This arrangement has the advantage that at the transfer station and the respective feed station. Preferadjacent the clamps while at the feed stations they are not so close to the clamp support as to be inconvenient or dangerous as far as the insertion of the article into the grips is concerned.

Conveniently the means for moving each pair of grips from the feed station to the transfer station is operable independently of the means for moving the other pair of grips and there is provided an interlock arrangement which prevents movement of a pair of grips if the other pair of grips is at the transfer station or moving towards the transfer station. The grips may be moved by a pneumatic ram for each pair.

The means for transferring the corners of the article from the grips to the clamps preferably comprises means for moving the clamps and the grips towards each other (conveniently by moving the clamp support backwards) and means for closing the clamps on the corners presented by the grips.

In one embodiment of the invention each grip comprises a pair of backward-facing spring clips spaced apart sufficiently to allow the jaws of a clamp to fit between them. The respective end of the leading edge of the article is inserted in the clips and the transfer is effected by making the clamp jaws grasp the part of the leading edge between the clips. The clamps may be of a mechanical spring-loaded kind in which a latch is provided for holding the jaws open against spring bias and means are provided to release the latch when the leading edge of the article is inserted between the jaws. Conveniently, in the present application of such a clamp, the means for releasing the latch comprises a trigger arm projecting backwardly from the clamp and an engagement member on a support frame for the clips, the arrangement being such that as the clamps are brought back towards the clips and the leading edge of the article inserted thereby between the jaws, the trigger arm is deflected by the engagement member and releases the latch.

However, in a preferred embodiment of the invention the clamps are slidably mounted on a beam extending across the machine and movable bodily back and forth over the conveyor, the holding means comprising a bar for each clamp extending along the beam and movable with respect to the beam to engage extensions of the clamp jaws and thereby control the opening of the jaws against the spring bias, means being provided for moving the bars in dependence on the forward position of the beam. The bars are movable by an air ram controlled by a switch mounted on the beam and engaging a linear cam surface

on the machine, the state of the switch being thereby governed by the position of the beam.

The invention will further be described hereinafter with reference to the accompanying drawings which illustrate the relevant parts of a feeding machine in accordance with the present invention and of which:

FIGURE 1 is a front elevation of the feeder showing the transfer mechanism;

FIGURE 2 is a plan view of the rear of the feeder, again showing the transfer mechanism;

FIGURE 3 is a front elevation showing the disposition of the clips in their frame and the associated clamp jaws of the feed arrangement illustrated in FIGURES 1 and 2;

FIGURE 4 is a side elevation illustrating the relative disposition of the clamp and clip frame before the transfer of an article from the clips to the clamps;

FIGURES 5 and 6 are schematic drawings illustrating the relative disposition of clip frame and clamp as an article is transferred to the clamp;

FIGURES 7 and 8 are respectively plan and rear elevations of a machine in accordance with a preferred embodiment of the invention;

FIGURE 9 is a side elevation of one of the clamps of the machine of FIGURES 7 and 8 at the transfer station;

FIGURE 10 is a circuit diagram illustrating the interlock of the respective grip movements of the machine; and

FIGURE 11 is a circuit diagram illustrating an alternative, pneumatic, interlock for the respective grip movements.

Referring to FIGURES 1 and 2 the feeder comprises a conveyor **1** the upper run of which moves continuously forward in the direction indicated by the arrow (FIGURE 2). A feed roller **2** in front of the conveyor is rotated in the forward direction so as to have a peripheral speed approximately twice that of the conveyor. A clamp beam **3** is mounted above the conveyor by means of bearing at either end (not shown) to move forwards and backwards relative to the bed of the machine. Two clamps **4** are mounted on the under side of beam **3** and arranged to be moved in and out along the beam. In the position shown in FIGURES 1 and 2 the clamps **4** are in their innermost, rest, positions.

Immediately in front of the clamp beam **3**, in the position shown, is mounted a support **5** which extends across the machine and constitutes a support and guide for two pairs of grips **6**. The members of each pair of grips are mounted on a carriage a fixed distance apart from each other, this distance being the same as the distance at which clamps **4** are spaced apart when in their rest positions, and are adapted to slide back and forth as a pair to and from a central transfer position shown in FIGURE 2 as being occupied by the left hand pair of grips. From the transfer position the left hand pair of grips moves to the left and the right hand pair to the right to respective feed positions, both pairs of grips being shown in their feed positions in FIGURE 1. The grips are mounted to slide on a transverse bar **7** and are urged back and forth along the bar **7** by the action of respective pneumatic rams **8** and **9**.

In the operation of the machine an operator stands at each feed position, at which the respective grips are normally at rest, and feeds into the grips respective ends of the leading edge of an article to be fed. When the corners of the article are held by the two grips of the pair, the operator pushes a button **10** or **11** which closes a circuit to admit air to the respective ram **8** or **9** and thereby move the grips carrying the article inwardly to the transfer station. When the grips reach the transfer station it is arranged that a microswitch is closed thereby. The microswitch for the left hand pair of grips is shown at **12**, that for the right hand pair of grips not being shown. Closure of this microswitch ensures that the operating circuit for the admission of air to the ram of the other pair of grips cannot be completed by the depression of the appropriate button **10** or **11**. This constitutes an interlock circuit which ensures that if one pair of grips is in the transfer station the other pair of grips cannot be moved from the feed station. Similarly, there is an interlocking arrangement which ensures that when one pair of grips is being moved towards the transfer station inward movement of the other pair of grips cannot be initiated.

The microswitches at the transfer station are also effective to initiate the next stage of the operation which is the withdrawal, in a rearward direction, of the beam **3** carrying clamps **4**. This withdrawal is effected by an air ram arrangement (not shown) which is provided to move the beam **3** back and forth. The admission of air to the air ram arrangement in order to withdraw the beam from the rest position shown is initiated by the microswitch (such as **12**) at the transfer station for the clamps but is subject to the satisfaction of a further condition. This is that the clamps **4** have returned to their innermost, rest, positions and the satisfaction of this condition is indicated by the closure of two microswitches illustrated schematically at **13** arranged to be actuated by the presence at the set positions of the two clamps **4**.

When the grips have reached the transfer station and the clamps have reached their rest position, then rearward movement of the beam **3** is initiated. As the beam is moved backwards the clamps engage with the grips in a manner to be described, grasp the corners of the article to be fed, are moved back even further to a rearward limit position by movement of the beam, and are then moved forwards by actuation by the beam of a rearward limit switch (not shown). On returning to the rest position illustrated in FIGURE 2 the beam **3** is arrested and the clamps are moved apart until the leading edge of the article is tensioned. The pneumatic operating circuit for this sideways movement of the clamps is linked at this time with the respective ram **8** or **9** so that the grips are returned thereby to their feed position. The point at which transverse movement of the clamps is stopped is determined by a lamp and photocell arrangement **15** arranged so that the beam of light is interrupted by the leading edge of the article as it is brought into a straight line by the outward movement of the clamps. In order to allow for the delay in the breaking of the outward movement of clamps the arrangement is such that the leading edge of the article breaks the light beam just before it is actually straight so that by the time the clamps actually come to a halt the leading edge of the article is, in fact, straight. The clamps are moved transversely by the action of a pneumatic ram (not shown) attached to one of the clamps and housed in the beam **3**. The clamps are connected one to the upper run and one to the lower run of an endless wire **16** which runs over pulleys **17**. Breaking of the clamps is effected by means of an electrically operated brake **18** mounted on the beam and having, passing therethrough, a brake rod **19** attached at one end **20** to one of the clamps **4**. On actuation the brake **18** grips the rod **19** and prevents further movement of the clamps. At this time the beam is moved forward to drop the leading edge of the article at a predetermined point on the conveyor if and when the trailing edge of the preceding article has passed so that the two articles will not overlap. Determination of this condition is made by another photocell arrangement **14** situated at the rear of the conveyor with the lamp beneath the level of the conveyor and projecting light between the conveyor bands towards a photocell above the level of the conveyor. The arrangement is such that a signal is given by the photocell to allow the beam to move forwards only when the trailing edge of the preceding article has cleared the line between the lamp and the photocell.

FIGURE 3 is a front regulation of the grip **5** which is furthest to the right in FIGURE 2. The grip comprises two grip supports **21** having a rectangular section bolted at their upper ends to a foundation block **22** and carrying at their lower extremities spring wire clips **23**.

A stop bar **24** having a circular section is mounted between the supports **21** intermediate their ends. The article to be fed is shown in place, the end of the leading edge being inserted at appropriate points in clips **23**, leaving a free portion **25** extending between the clips. FIGURE 3 also shows the operative parts of the respective clamp, the operation of which will be made clear with reference to FIGURE 4.

FIGURE 4 shows in side elevation a clamp **4** in relation to the stop bar **24** and clips **23** of the respective grip as shown in FIGURE 3. The clamp has a casing **26** within which is pivotally mounted the upper jaw **27** of a pair of jaws, the lower jaw **28** of which is fixed in the body **26**. A spring **29** holds the jaws normally shut except when they are latched open, to the position shown, by depression of an arm **30**. Arm **30** is depressed by engagement of a roller **31** on the end of arm **30** with a bar (not shown) on the machine when the clamps have reached the position at which it is required to drop the leading edge of the article on to the conveyor.

Disengagement of the latch which keeps the jaws open against the bias of spring **29** is effected by a trigger arm **32** pivotally mounted in casing **26**. The arrangement is such that as the clamp moves backwards towards the grip, trigger arm **32** is engaged by bar **24** and thereby deflected upwardly. At this time the free portion **25** of the leading edge of the article (FIGURE 3) is within jaws **27** and **28** and upward movement of the trigger arm releases the latch and allows the jaws to close on this free portion of the article. This condition is illustrated in FIGURE 5. The rearward movement of the clamp is not arrested at this point but proceeds slightly further to a rearward limit position illustrated in FIGURE 6 so that the edge of the article is carried out of the spring clips **23** by the jaws of the clamp and in moving forward again the clamp can carry the edge of the article past the clips **23**.

Referring now to FIGURES 7 and 8 the machine is generally similar in operation to that described above with reference to FIGURES 1 to 6 and only the essential differences will be described hereinafter. In the arrangement of FIGURES 7 and 8 the grips **6** are supported so as to be swung from the respective feed station to the transfer station in an arcuate path. Each pair of grips is mounted on a respective cross-member **33** pivotally mounted at **34** on two parallel support arms **35** of equal length and pivoted at support pillars **36** spaced apart across the machine. The support structures are moved back and forth by respective pneumatic rams **8** and **9**. In FIGURES 7 and 8 the left-hand pair of grips is shown at the transfer station and the right-hand pair at the right-hand feed station. The clamps **4** are shown at their innermost, rest, position—the position they assume before they are drawn back to the transfer position.

FIGURE 8 illustrates the mechanism for controlling the opening of the jaws of clamps **4**. Two horizontal bars **37** extend across the left hand part and right hand part of beam **3**, being mounted thereon by links **38** and **39** pivoted at points **40** on the beam. Links **38** extend upwardly beyond their pivot points **40** and are coupled to a drawing rod **41** which is moved back and forth under control of a pneumatic ram **42**. When rod **41** is in the right-hand position shown in FIGURE 8 bars **37** are in their uppermost positions. When rod **41** is pulled to the left by ram **42** the bars **37** are pulled down and, in a manner to be described, open the jaws of clamp **4**. This opening mechanism is used both for opening the jaws to accept the laundry article and for opening the jaws to drop the article. The necessary timing of the admission of air to ram **42** is controlled by a solenoid operated valve responsive to a switch **43** mounted on the beam so as to be operated by a linear cam surface **44** on the machine.

FIGURE 9 is a cross-sectional side elevation of one of the clamps **4** of the machine of FIGURES 7 and 8. Shown also is one of the grips **6** in side elevation. The clamp comprises a fixed lower jaw **45** and a movable upper jaw **46** carried on a support **47** which slides on a tube **48**. A woven tape **49** runs over pulleys **50** (FIGURE 8) at the ends of beam **3** and performs the function of wire **16** described above. One of the links **39** is shown pivotally mounted on beam **3** and carrying bar **37** which is a hollow rectangular-sectioned tube. The upper jaw **46**, which is pivoted at **51**, carries a roller **52** which engages with bar **37** and runs along it when the clamps are moved transversely. A spring **53** urges the jaws shut and it will be seen that depression of bar **37** in the manner described above opens the jaws against the spring bias.

FIGURE 10 illustrates schematically the interlock arrangement used for preventing actuation of one grip support if the other support is at, or moving towards, the transfer station. A source of compressed air **54** is coupled through a solenoid operated valve **55** and a pressure sensitive switch **56** to ram **8** and through a solenoid operated valve **57** and a pressure sensitive switch **58** to ram **9**. Button **10**, which is depressed by an operator to move the left-handgrips, is connected in series with a power supply **59**, valve **55** and a relay-operated switch **60**. Button **11** is connected in series with power supply **59**, valve **57** and a relay-operated switch **61**. Switch **56** operates to open switch **61** on opening of valve **55** and switch **58** operates to open switch **60** on opening of valve **57**.

FIGURE 11 shows a pneumatic interlock system for the grip supports. Buttons **10** and **11** control pneumatic valves V1 and V2 respectively. Valves V3 and V4 are mounted on the machine (see FIGURE 7) so as to be closed (the condition shown in FIGURE 11) by the respective grip support when at the feed station. When the respective grip support moves away from the feed station towards the transfer station valve V3 or V4 is opened.

Depression of button **10** changes a five-port valve V5 to the opposite condition to that shown which, provided valve V2 and thus corresponding five-port V7 has not previously been operated for the right-hand grips, activates ram **8** and moves the left-hand grips. Valve V3 is thereby opened and changes a five-port reset valve V6 to the opposite condition to that shown. Valve V3 also applies air under pressure to one of the exhaust ports of valve V7 and this ensures that if button **11** is subsequently depressed and valve V7 changed over, it will not activate ram **9**.

When the laundry article has been transferred from the left-hand grips to the clamps, the clamp beam opens a normally closed valve V8 which momentarily applies air to the inlet port of valve V6 and thence to the control port of valve V5 to revert valve V5 to the position shown. This activates ram **8** to return the grips to the feed station, whereupon valve V3 is closed. The cycle is then completed. It will be understood that the system is entirely symmetrical and what has been described for the left-hand grips applies similarly for operation of the right-hand grips. If, while valve V3 was open, button **11** was depressed and valve V7 changed over the action of valve V7 would be inhibited until valve V3 was closed, whereupon the right-hand ram **9** would be allowed to be activated by exhausting through valve V3. Thus there is provided a degree of instruction storage which ensures that the operator need depress her operating button only once for each feeding operation.

I claim:

1. A laundry feeding machine having two clamps adapted to receive and hold two corners of the leading edge of the article to be fed; a conveyor; means for moving the clamps transversly apart from a rest position to tension the leading edge; and feed transfer means comprising two pairs of transfer grips, each pair being adapted to receive, in respective grips, said two corners of an article to be fed and each pair being movable between a respective feed station at which a respective operator can insert the corners into the grips and a com-

mon transfer station at which the grips of the pair are each adjacent a respective clamp when the clamps are in their rest positions, means for moving the grips between the feed stations and the transfer station and means for transferring, at the transfer station, the corners of the articles from the grips to the respective clamps.

2. A laundry feeding machine as claimed in claim 1 wherein the grips are mounted at the rear of the machine, the transfer station being on the fore-and-aft center line of the machine and the feed stations being disposed symmetrically on either side thereof.

3. A laundry feeding machine as claimed in claim 2 wherein each pair of grips is arranged to move over a linear track across the machine between the transfer station and the respective feed station.

4. A laundry feeding machine as claimed in claim 2 wherein each pair of grips is arranged to move over an arcuate path between the transfer station and the respective feed station.

5. A laundry feeding machine as claimed in claim 4 wherein each pair of grips is mounted on a respective support pivoted to swing in a substantially horizontal plane to carry the grips between the transfer station and the respective feed station.

6. A laundry feeding machine as claimed in claim 5 wherein the pivot axes for the respective supports are in line in front, in the fore-and-aft direction of the machine, with the respective feed station.

7. A laundry feeding machine as claimed in claim 5 wherein each support comprises two parallel equal length pivoted arms pivoted at their forward ends at respective points spaced apart across the machine and a cross-piece pivoted to the rear ends of the arms and carrying the grips, the whole constituting a parallelogram movement which maintains the cross-piece transverse to the fore-and-aft direction of the machine.

8. A laundry feeding machine as claimed in claim 1 wherein the means for moving each pair of grips from the feed station to the transfer station is operable independently of the means for moving the other pair of grips and there is provided an interlock arrangement which prevents movement of a pair of grips if the other pair of grips is at the transfer station or moving towards the transfer station.

9. A laundry feeding machine as claimed in claim 1 wherein each grip comprises a pair of backwardly facing spring clips spaced apart sufficiently to allow the jaws of a clamp to fit between them means being provided for closing the clamp jaws onto the part between the clips of the leading edge of an article held in the grip.

10. A laundry feeding machine as claimed in claim 9 wherein the clamps are spring-loaded to the closed position and holding means are provided for holding the jaws open while approaching the grips and allowing them to close when between the clips.

11. A laundry feeding machine as claimed in claim 10 wherein the holding means comprises a latch for holding the jaws open against the spring bias and a trigger for releasing the latch, the trigger comprising a trigger arm projecting backwardly from the clamp and an engagement member on a support frame for the clips, the arrangement being such that as the clamps are brought back towards the clips and the leading edge of the article inserted thereby between the jaws, the trigger arm is deflected by the engagement member and releases the latch.

12. A laundry feeding machine as claimed in claim 10 wherein the clamps are slidably mounted on a beam extending across the machine and movable bodily back and forth over the conveyor, the holding means comprising a bar for each clamp extending along the beam and movable with respect to the beam to engage extensions of the clamp jaws and thereby control the opening of the jaws against the spring bias, means being provided for moving the bars in dependence on the forward position of the beam.

13. A laundry feeding machine as claimed in claim 12, wherein the bars are movable by an air ram controlled by a switch mounted on the beam and engaging a linear cam surface on the machine, the state of the switch being thereby governed by the position of the beam.

References Cited

UNITED STATES PATENTS

1,854,775	4/1932	Wichmann	271—85
2,654,969	10/1953	Woodward	38—143
2,959,412	11/1960	Sjostrom	271—84
3,231,267	1/1966	Boam et al.	271—85 X

EVON C. BLUNK, *Primary Examiner.*

RICHARD E. AEGERTER, *Examiner.*

M. L. AJEMAN, *Assistant Examiner.*