April 2, 1957 H. M. CLARK, JR., ET AL 2,787,368

TOW FEEDING MACHINE

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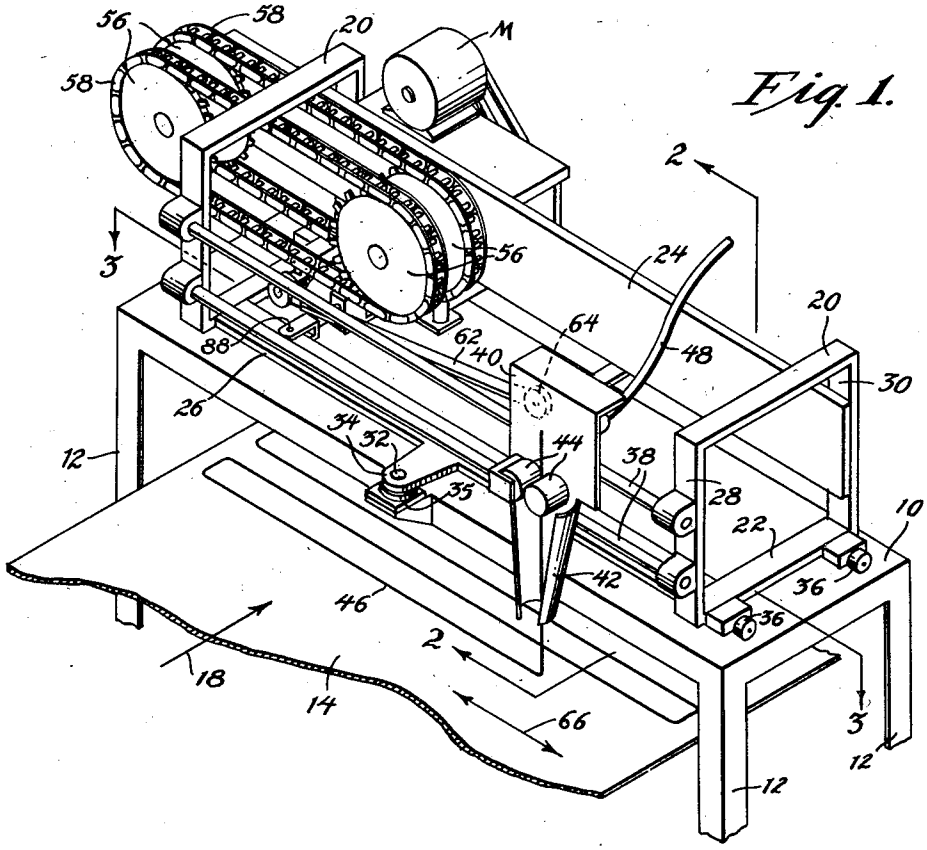


Fig. 1.

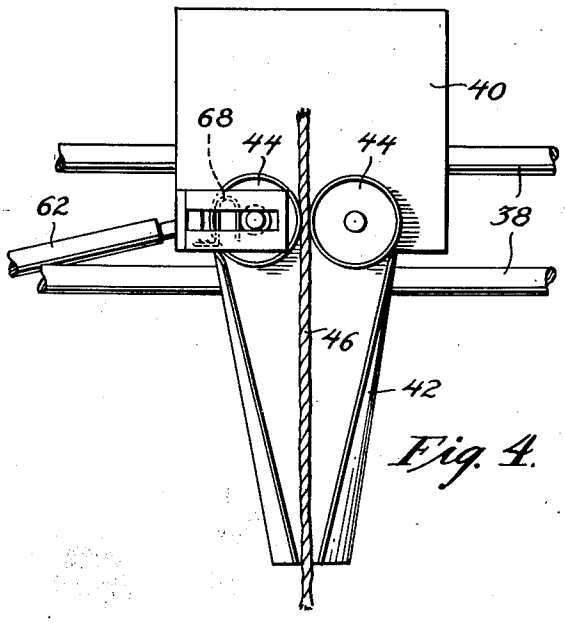


Fig. 4.

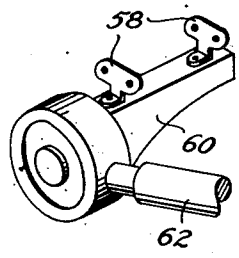


Fig. 8.

INVENTORS.
HOWARD M. CLARK, JR.
SAMUEL S. LEOTTA
BY Louis Necho
ATTORNEY.

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Fig. 9.

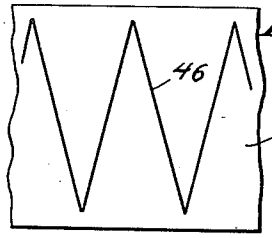
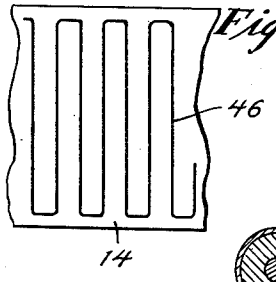


Fig. 10.



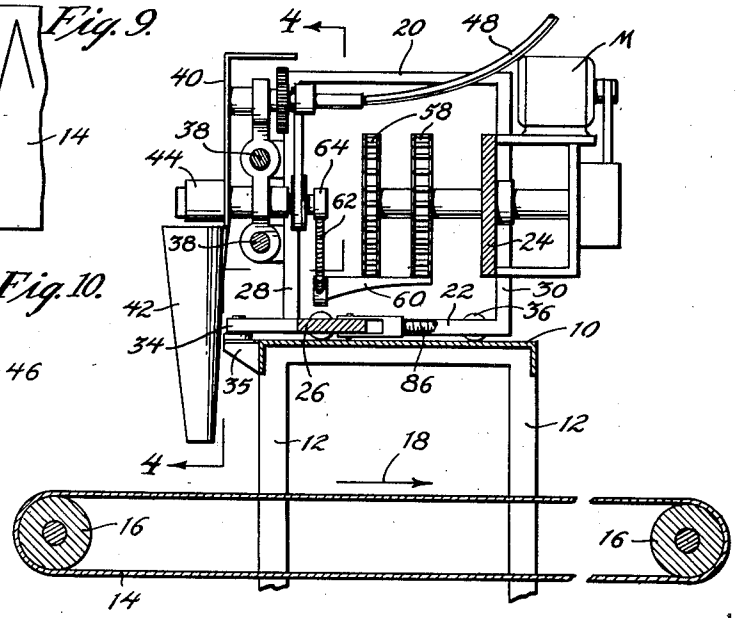


Fig. 2.

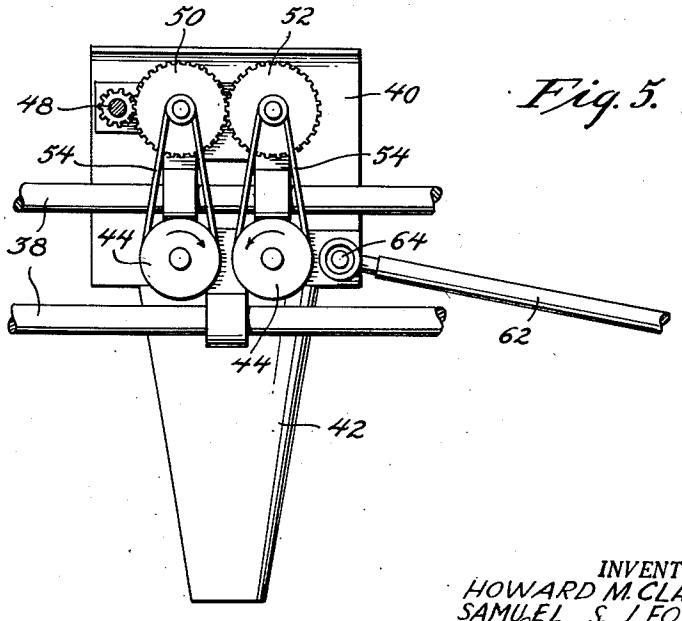


Fig. 5.

INVENTORS.
HOWARD M. CLARK, JR.
SAMUEL S. LEOTTA
BY Louis Mecke
ATTORNEY.

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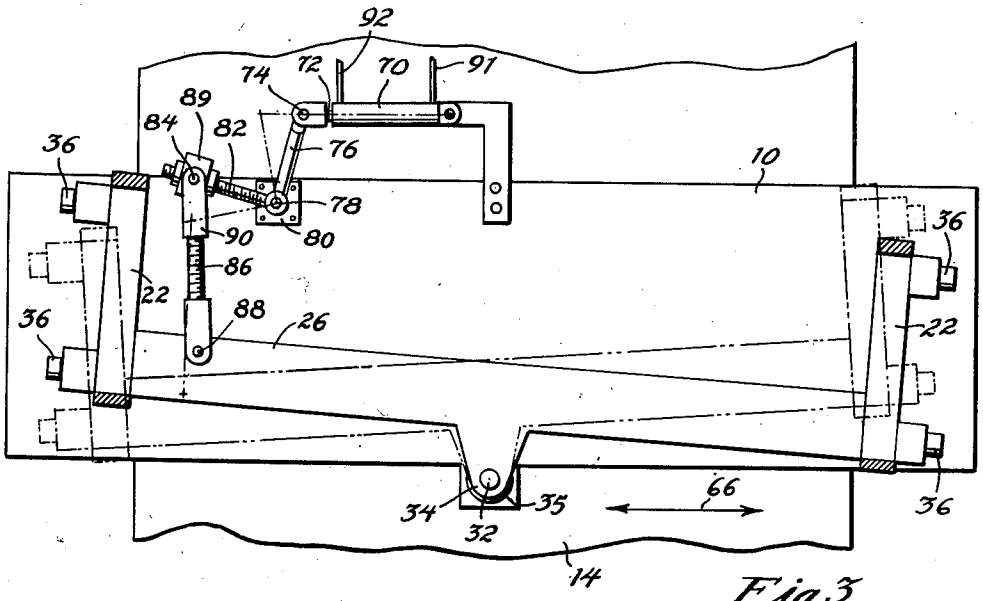


Fig. 3.

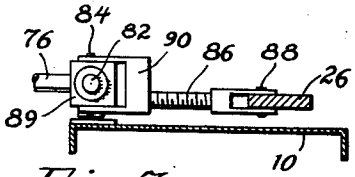


Fig. 7.

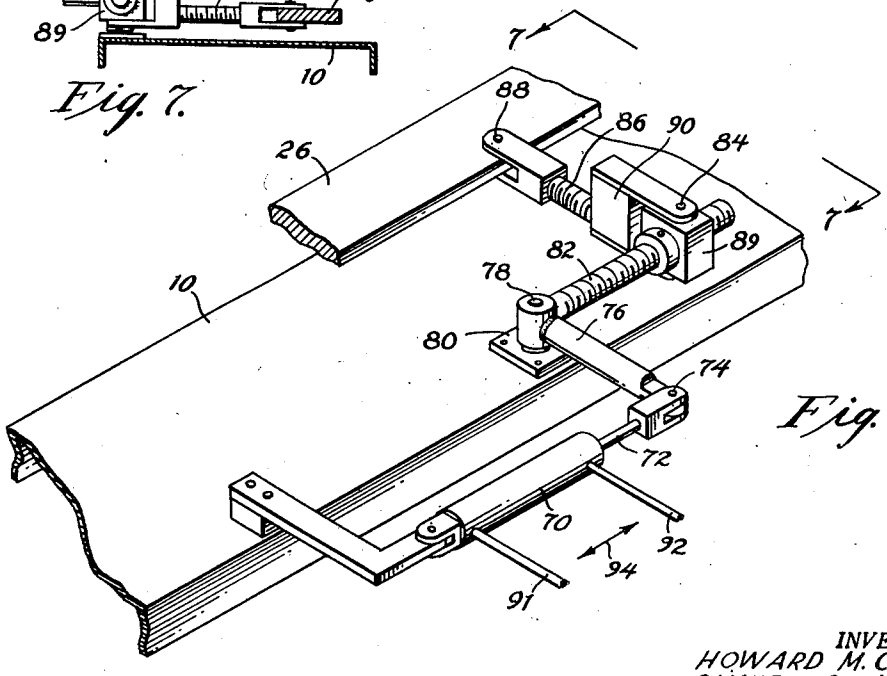


Fig. 6.

INVENTORS.
HOWARD M. CLARK, JR.
SAMUEL S. LEOTTA
BY Louis Necho
ATTORNEY.

United States Patent Office

2,787,368

Patented Apr. 2, 1957

2,787,368

TOW FEEDING MACHINE

Howard M. Clark, Jr., Willow Grove, and Samuel S. Leotta, Hatboro, Pa., assignors to The National Drying Machinery Co., Philadelphia, Pa., a corporation of Pennsylvania

Application June 14, 1954, Serial No. 436,335

3 Claims. (Cl. 203—25)

In the drying of tow and other products, such as heavy yarn, rope, or tape etc., it is customary to feed the tow onto an endless, moving conveyor transversely of the direction of movement of the conveyor through the drying chamber. For proper drying, and to prevent marking, it is desirable that the successive portions of tow be spaced so as not to touch each other. To this end, the conveyor receiving the tow must travel at a rate of speed, with reference to the rate at which the tow is fed onto the conveyor, such that the tow will be laid on the conveyor in a zig-zag pattern. This practice insures that the successive portions of tow will not touch each other but it also materially reduces the quantity of tow that can be laid on a given area of the conveyor and therefore the over-all efficiency of the operation is reduced.

If, in order to speed the drying operation, the speed of the conveyor is increased, the spaces between the successive portions of tow, or the angle between the joined ends of the successive portions, is also increased thus further decreasing the amount of tow that can be laid on a given area of the conveyor and further decreasing the efficiency.

It is therefore one object of this invention to produce an improved apparatus whereby the conveyor can be moved at an efficient rate of speed and whereby the tow will be laid on the conveyor along closely spaced substantially parallel lines thereby materially increasing the amount of tow that can be placed on a given area of the conveyor and thus increasing the efficiency.

It has heretofore been proposed to feed the tow onto the conveyor through a nozzle which is rotatable about a horizontal axis located above, and disposed parallel to, the direction of movement of the conveyor so as to swing like a pendulum transversely of the conveyor. This type of apparatus is passably satisfactory when the conveyor is relatively narrow so that a relatively short nozzle which is pivoted at a point relatively close to the conveyor and which swings through a relatively short arc can be used. But, as the width of the conveyor is increased, the length of the nozzle, and the distance between the pivot of the nozzle and the conveyor must be correspondingly increased. For obvious reasons a long nozzle which swings rapidly through a long arc is not practical. Furthermore, a nozzle which swings like a pendulum, imparts considerable momentum to the wet tow as the bottom end of the nozzle reaches the opposite ends of its stroke. If the bottom end of the swinging nozzle is allowed to move to a point quite close to either edge of the conveyor, the momentum tends to throw the tow over the edge of the conveyor. If the bottom end of the nozzle is not allowed to come close to the edges of the conveyor, substantial marginal areas along the opposite edges of the conveyor will remain unused. It is therefore a further object of the invention to produce an improved apparatus in which a very short nozzle, which moves horizontally across the conveyor, can be used regardless of the width of the conveyor and in which the space between the bottom edge of the nozzle and the conveyor is small and constant. A

pendulum-like swinging feeder is operative, subject to the above mentioned limitations, to lay tow on a narrow conveyor, but, because of its swinging motion it cannot be used for laying the finished tow, or the like, in a shipping or storing box in which the tow must be packed by a side to side motion. In other words it cannot be used for loading or packing a box. It is therefore a still further object of the invention to produce an improved apparatus which may be used for packing or loading tow, or the like, in a box or container as well as laying the tow on a conveyor without any change in the apparatus itself. These and other objects are attained by my invention as set forth in the following specification and as illustrated in the accompanying drawings in which:

Fig. 1 is a fragmentary perspective view of a tow feeding apparatus embodying my invention, certain parts being omitted.

Fig. 2 is a vertical sectional view on line 2—2 on Fig. 1.

Fig. 3 is a view, partly in horizontal section and partly in plan, looking in the direction of line 3—3 on Fig. 1.

Fig. 4 is a fragmentary, enlarged front elevational view of the tow feeding mechanism shown in Fig. 1.

Fig. 5 is a rear elevational view of Fig. 4.

Fig. 6 is a fragmentary, enlarged perspective view of the feeder rocking mechanism which is shown in plan in Fig. 3.

Fig. 7 is a fragmentary elevational view looking in the direction of line 7—7 on Fig. 6.

Fig. 8 is a fragmentary, enlarged, perspective view showing details of construction.

Fig. 9 is a diagrammatic plan view showing the conventional manner of laying the tow on a conveyor.

Fig. 10 is similar to Fig. 9 but showing how the tow is laid on the conveyor by means of an apparatus embodying my invention.

The apparatus illustrated includes a fixed supporting frame, a conveyor, means for moving the conveyor at the desired speed, a tow feeder, means for reciprocating the tow feeder in a fixed horizontal plane transversely of the conveyor, and means for moving the feeder a predetermined distance in the direction of the movement of the conveyor as the feeder reaches the end of its stroke at either edge of the conveyor.

The fixed support includes a table top or platform 10 carried by legs 12. Below the platform 10 is a conveyor 14 which is propelled by suitably driven sprockets 16, or the like, in the direction of arrow 18 in Figs. 1 and 2.

The apparatus also includes a carriage formed spaced frames each of which consists of transverse upper and lower members 20 and 22, and front and rear vertical members 28 and 30. The vertical members 30 of the spaced frames carry an elongated bracing member 24 and the lower transverse members 22 carry, or have secured to them, an elongated brace member 26. The carriage is pivotally mounted above platform 10 by means of a pin or the like 32 which engages a lug 34 on the center of bracing member 26, and a corresponding lug 35, on the front edge of platform 10. The lower carriage members 22 are provided with rollers 36 which ride on platform 10. By this means, the carriage may be rotated or rocked in a horizontal plane about pin 32 as an axis.

The feeder carriage also includes rods or shafts 38 on which is slidably mounted a bracket 40 which carries a nozzle 42 which may be of the form shown in Fig. 1, or of any other desired form. Above nozzle 42 is a pair of driven nip rolls 44 which feed the tow 46, or the like, downwardly through nozzle 42. The rolls 44 are rotated in opposite directions by any suitable means as shown by the arrows in Fig. 6. As illustrated, a flexible shaft 48, rotated by a motor not shown, is operatively connected to gear 50 which meshes with gear 52. The shafts

of gears 50 and 52 are connected by belts 54 to the shafts of rolls 44 to rotate the latter as best shown in Figs. 5 and 6.

The bracket 40 is reciprocated transversely of conveyor 14 by any suitable means. As illustrated, one or more pairs of sprocket wheels 56 are rotated by a motor M and are engaged by sprocket chains 58. To the sprocket chains 58 is secured an arm 60 which is rotatably engaged by one end of a rod 62 the other end of which is pivoted to bracket 40 as at 64. By this arrangement, when sprocket wheels 56 are rotated, bracket 40, rolls 44 and feeder 42 are reciprocated on rods 38, or transversely of the conveyor, as shown by arrow 66 in Figs. 1 and 3.

In order to insure adequate contact between the nip rolls and the tow, one of the rolls is movably mounted and is urged against the other roll by means of a spring or the like 68.

The apparatus above described is operative and has advantages over a pendulum-like, swinging nozzle but, if the conveyor is moved at a speed sufficient to prevent the tow from piling up on the conveyor, or to prevent the successive rows of tow from touching each other, the tow will be laid on the conveyor in a wide open zig-zag pattern as shown in somewhat exaggerated fashion in Fig. 9. As above stated, this materially reduces the amount of tow laid on a given area of the conveyor and materially reduces the efficiency of the apparatus.

In order to overcome this difficulty and in order to lay the tow on the conveyor in substantially the pattern shown in Fig. 10, I provide means for rocking the carriage, at the end of each stroke or reciprocation, in a direction to move the feeder 42 in the direction of the movement of the conveyor so as to lay the beginning of the next course of tow closer to the corresponding end of the previous course than would be possible if the feeder reciprocated in a fixed vertical plane. To this end, I use the mechanism best shown in Fig. 6. This mechanism includes a double-acting air cylinder 70 the piston rod 72 of which is pivotally connected as at 74, to one arm 76 of a bell crank which pivotally engages a stud 78 carried by a bracket 80 secured to platform 10. The other arm 82 of the bell crank is pivotally connected as at 84 to arm 86 which is pivotally connected as at 88 to the forward transverse frame member 26 of the carriage as best shown in Figs. 3 and 6. Arms 82 and 86 are threaded and threadedly and adjustably engage nut 89 and bracket 90, respectively, so as to regulate the rocking movement of the carriage. Cylinder 70 is provided with inlet pipes 91 and 92 for the admission of fluid under pressure to reciprocate piston rod 72 in the direction of arrow 94 in Fig. 6.

The operation is as follows:

The tow is threaded between rolls 44, flexible shaft 48 is set in motion and motor M is energized to rotate sprocket wheels 56 and reciprocate the feeder bracket 40, and the tow feeder 42, transversely of the conveyor so as to lay the tow on the conveyor while the latter moves in the direction of arrow 18. When the feeder reaches the limit of its movement at one side of the conveyor, air is admitted into cylinder 78 through pipe 91 to rock the carriage to the solid line position of Fig. 3, in which feeder 42 is moved a predetermined distance in the direction of movement of the conveyor. When the feeder reaches the limit of its movement in the opposite direction, air is admitted to cylinder 78 through pipe 92 to rock the carriage in the opposite direction, or to the position shown in broken lines in Fig. 3, in which the opposite direction is again moved a predetermined distance in the direction of the movement of the conveyor. The alternate admission of air to opposite sides of the cylinder is effected by means of limit switches adapted to be closed when the carriage reaches the opposite limits of its stroke. Since this is conventional and well known, the switches and the valves controlled thereby are not shown nor described.

This movement of the feeder in the direction of the movement of the conveyor, at the end of the conveyor has an "anticipating" effect as far as the movement of the conveyor relative to the vertical axis of the feeder is concerned and causes the tow to come to rest on the conveyor in relatively close substantially parallel rows which are normal to the direction of movement of the conveyor as shown in Fig. 10. Without this rocking of the carriage, and if the apparatus is operated at the same speed, the tow will be fed onto the conveyor in the zig-zag pattern of Fig. 9. A comparison of Fig. 9 with Fig. 10 will show that my invention, the amount of tow deposited on a given area of the conveyor is greatly increased.

It will be noted that the bottom end of the non-swinging feeder can be kept close to the conveyor and that it moves in a path which is at all times parallel to the surface of the conveyor. Because the discharge end of the feeder points straight down toward the conveyor the movement of the feeder transversely of the conveyor does not impart any appreciable lateral momentum to the relatively short piece of tow between the lower end of the feeder and the conveyor. Therefore the margins of the pattern of tow produced on the conveyor can be closely controlled and made fairly straight and uniform. This enables the apparatus to be used for laying the tow in successive layers in a shipping or storing container which can not be done if a feeder which swings arcuately, or like a pendulum, is used. Also, because the lower end of the feeder moves in a fixed path which is close and parallel to the surface of the conveyor, a very short feeder can be used regardless of the width of the conveyor.

If desired, dash pots, springs, or other dampening means may be used to cushion the reciprocal movement of the feeder as well as the rocking movement of the carriage. Also, instead of driving rolls 44 by means of flexible shaft 48, a motor can be mounted on bracket 40 and coupled to the shafts of the rolls.

What we claim is:

1. A tow feeding machine including a fixed frame, a carriage, a pivot connecting said carriage to said frame, a track carried by said carriage, a bracket slidable on said track, a first actuating means for reciprocating said bracket on said track, said means including an endless chain, sprocket wheels supporting and driving said chain, a pitman arm, means pivotally connecting one end of said pitman arm to said bracket, and means connecting the other end of said pitman arm to said chain, a tow feeder carried by said bracket and adapted to overhang an endless moving belt adapted to receive tow from said feeder, and a second actuating means operatively connected to said carriage and operative to rock said carriage about said pivot to move said feeder in the direction of the movement of said belt at the end of each movement of said feeder relative to said track.

2. The structure recited in claim 1 in which said second actuating means includes a double acting air cylinder operatively connected to said carriage.

3. The structure recited in claim 1 and rotary rolls carried by said bracket in advance of said feeder for forcing the tow through said feeder and means for driving said rolls.

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