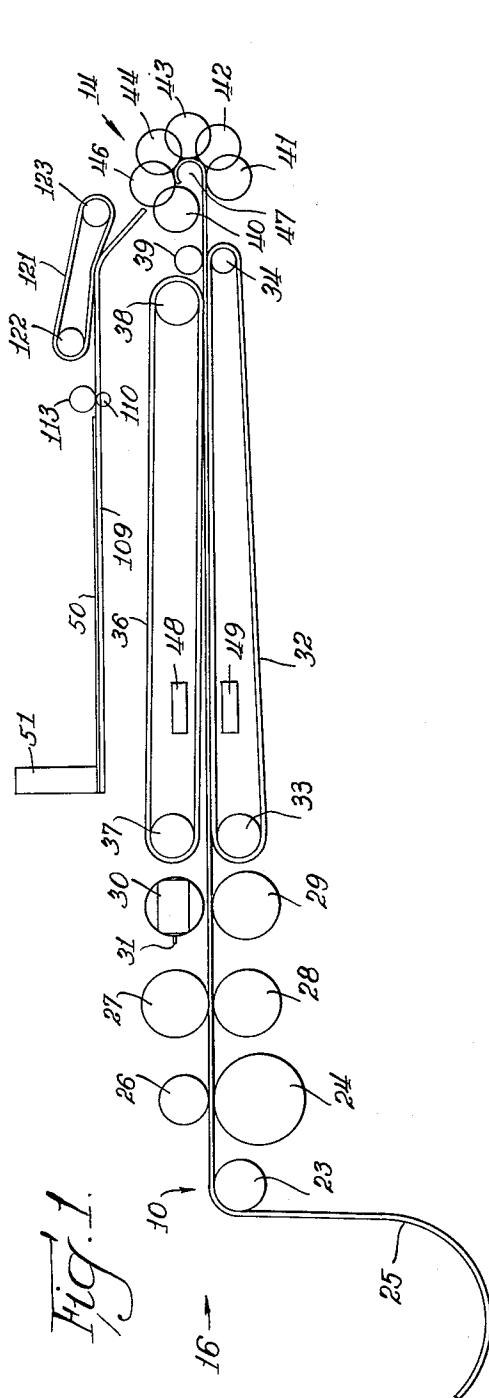
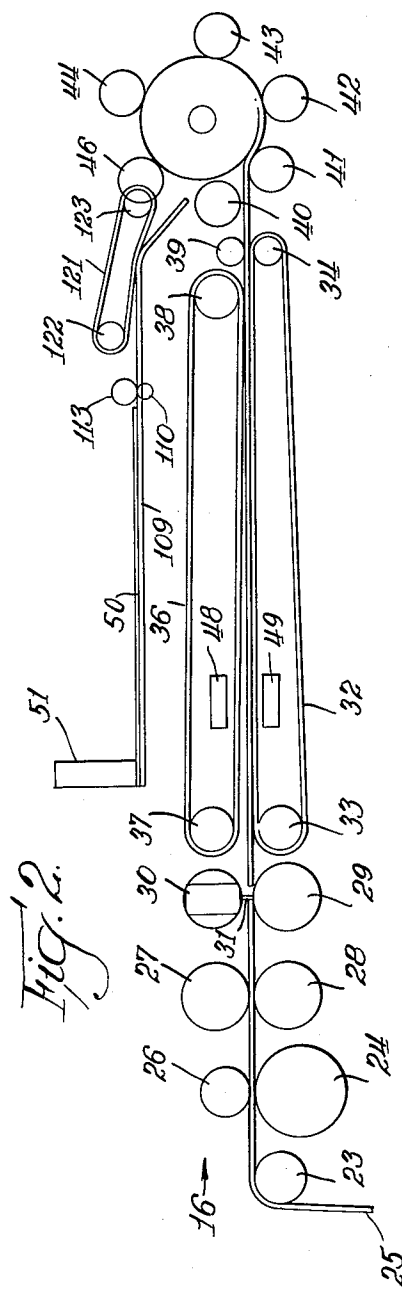


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STRIP ROLLING AND WRAPPING MACHINE

Filed June 10, 1959

11 Sheets-Sheet 1 .



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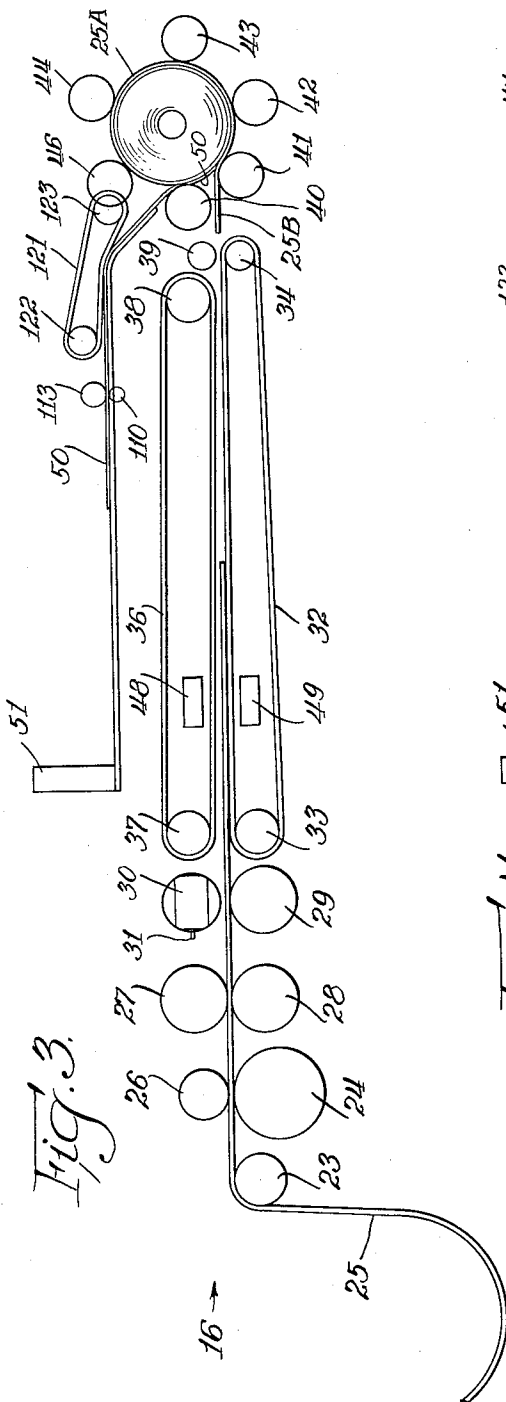
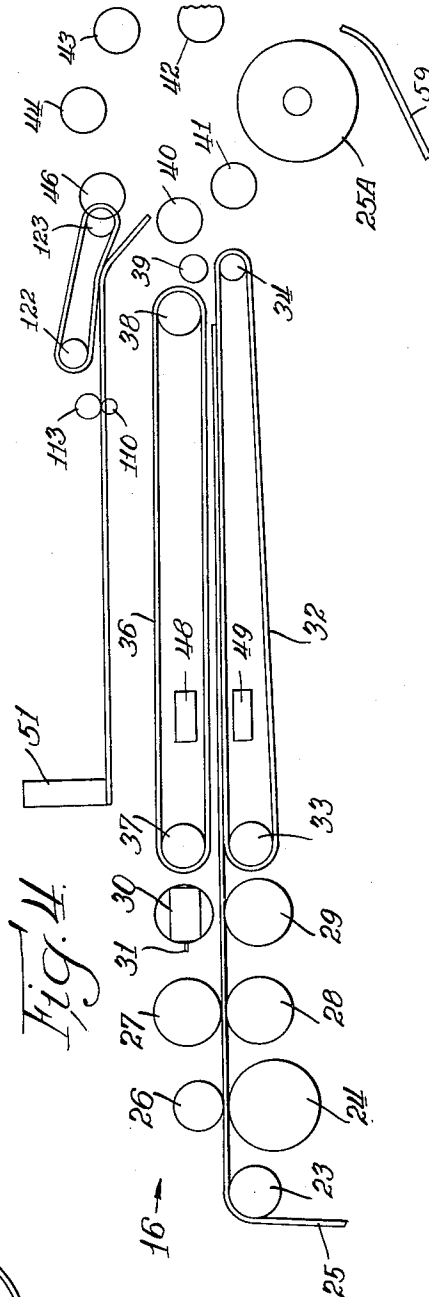
J. V. JOHANSEN ET AL

3,052,073

STRIP ROLLING AND WRAPPING MACHINE

Filed June 10, 1959

11 Sheets-Sheet 2



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3,052,073

STRIP ROLLING AND WRAPPING MACHINE

Filed June 10, 1959

11 Sheets-Sheet 3

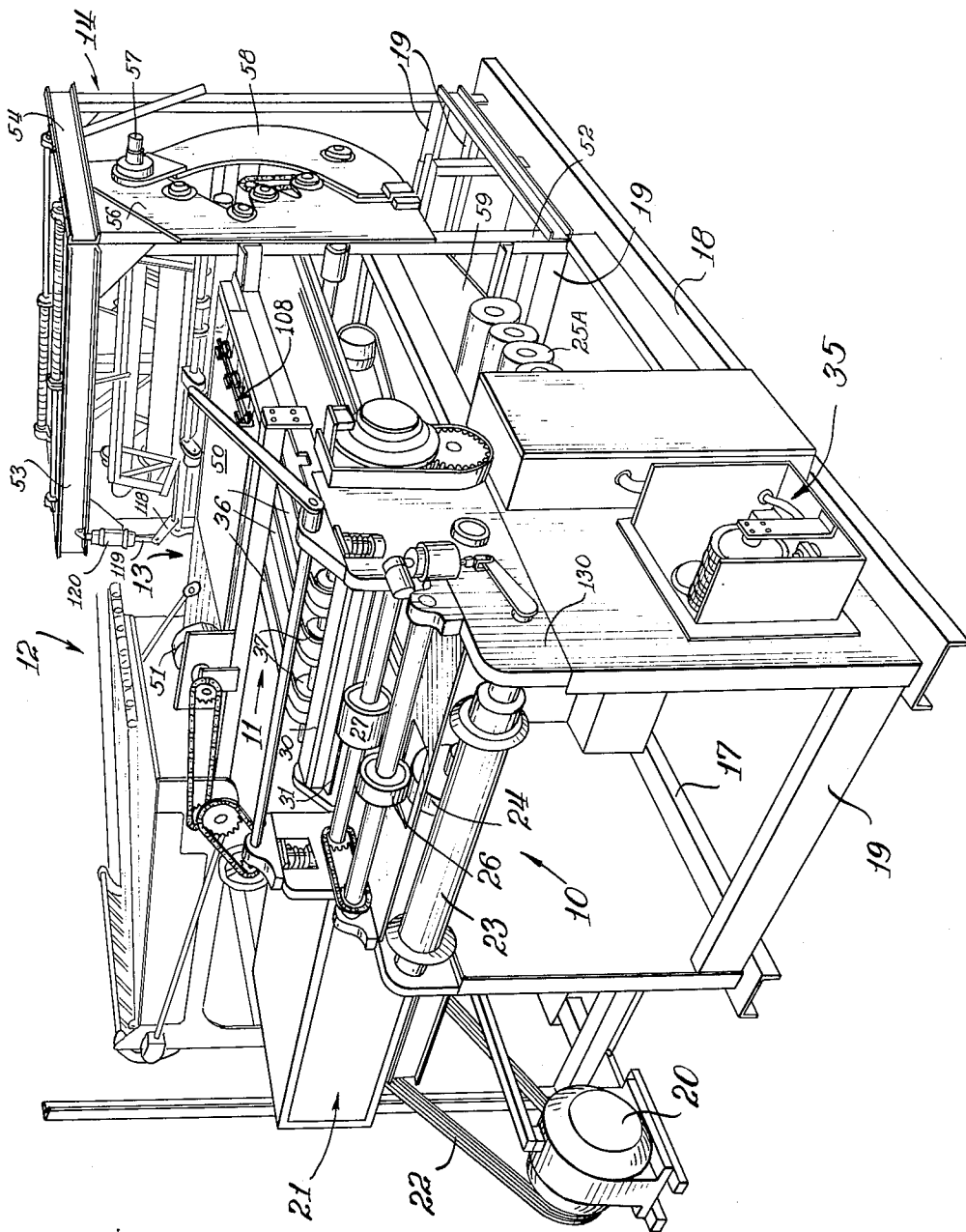


Fig. 5.

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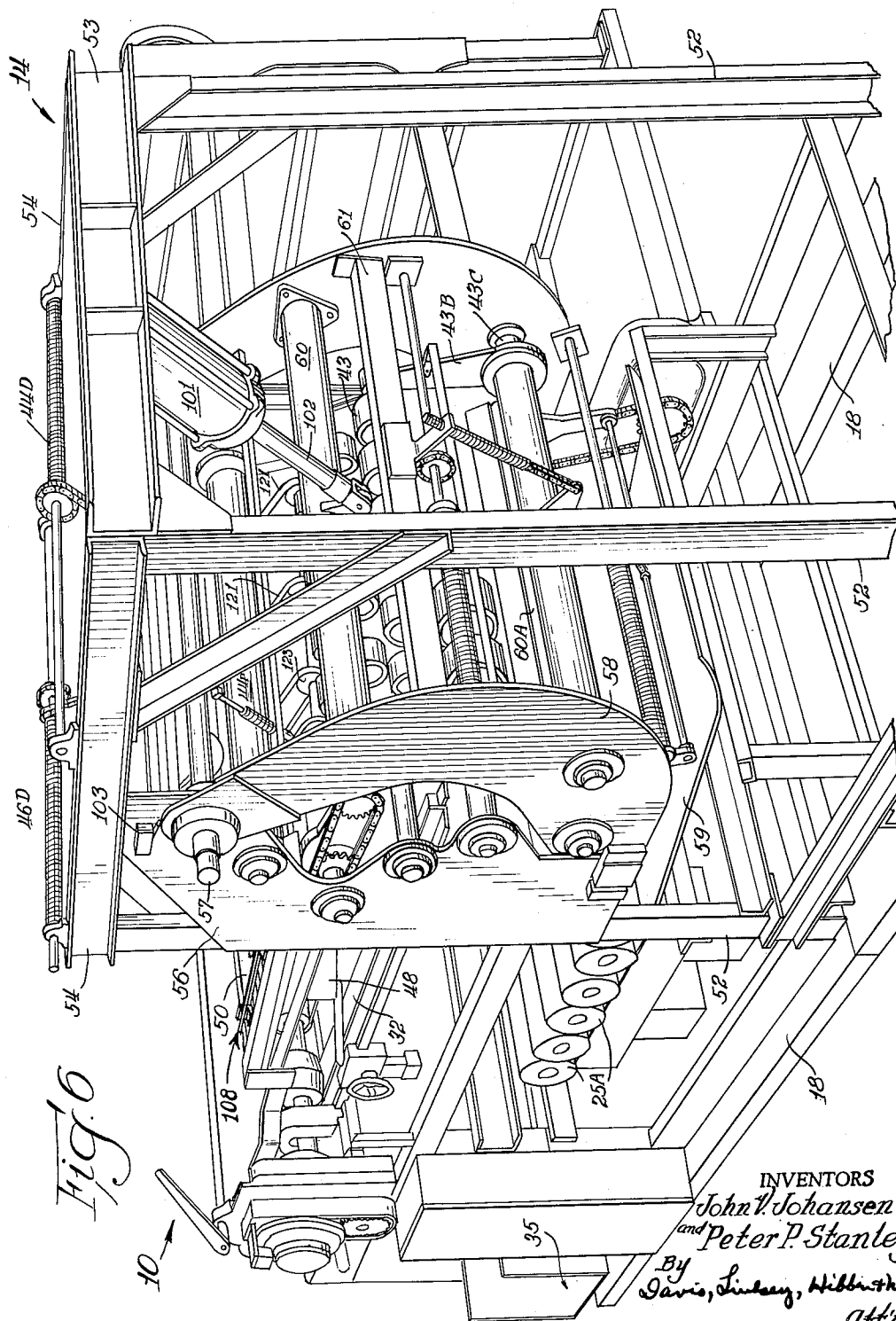
J. V. JOHANSEN ET AL

3,052,073

STRIP ROLLING AND WRAPPING MACHINE

Filed June 10, 1959

11 Sheets-Sheet 4



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3,052,073

STRIP ROLLING AND WRAPPING MACHINE

Filed June 10, 1959

11 Sheets-Sheet 5

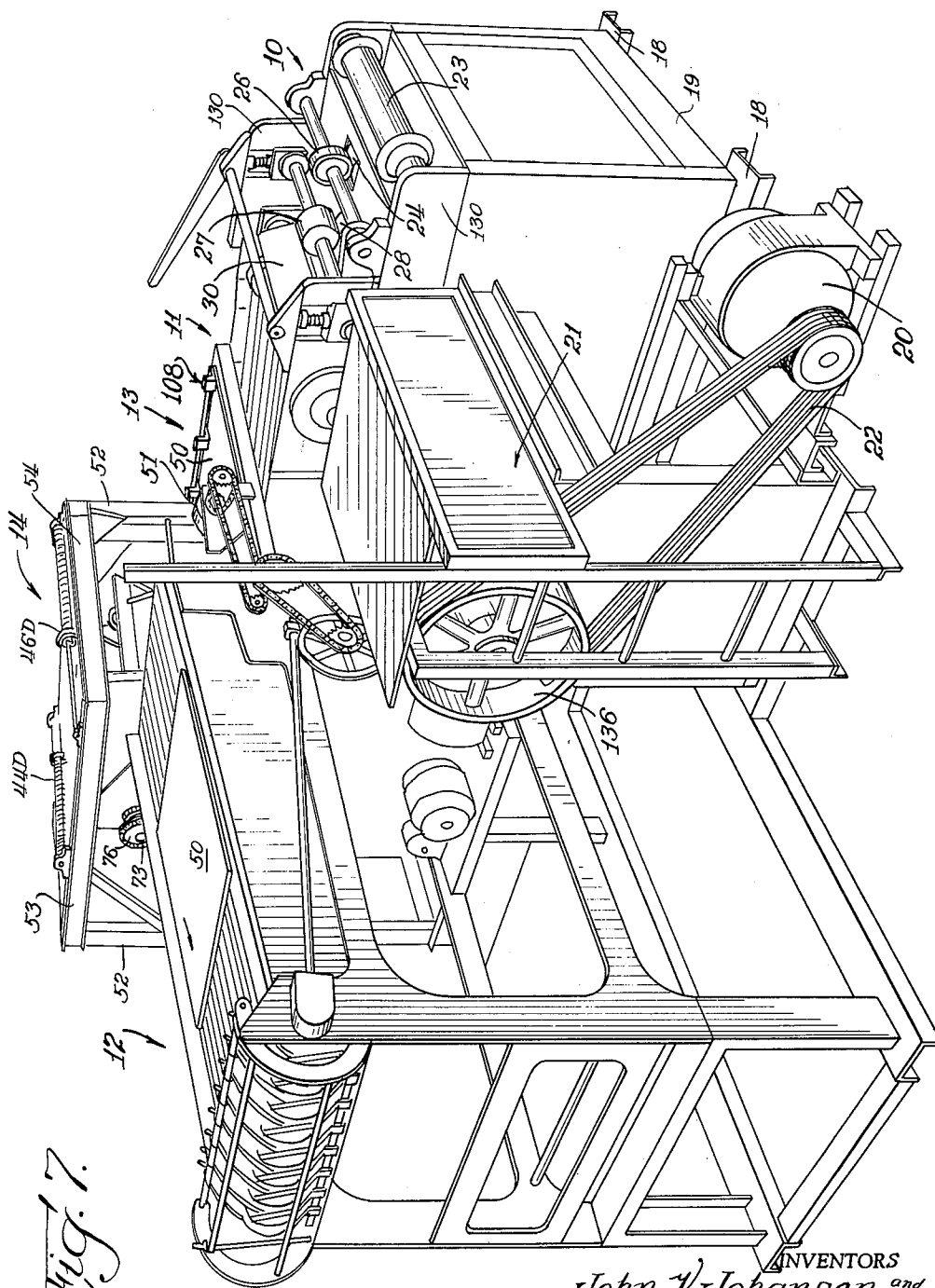


Fig. 7.

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STRIP ROLLING AND WRAPPING MACHINE

Filed June 10, 1959

11 Sheets-Sheet 6

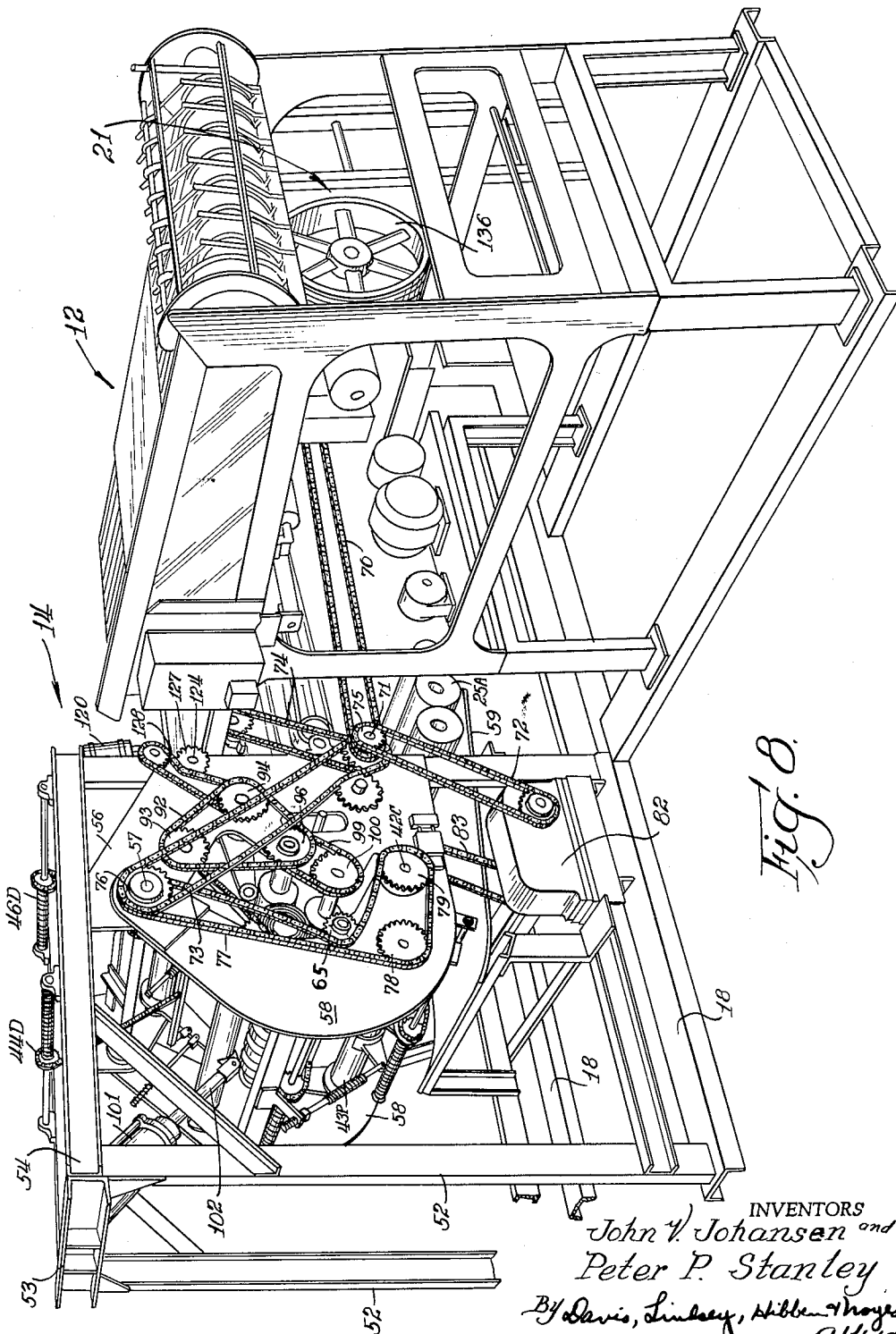


Fig. 8.

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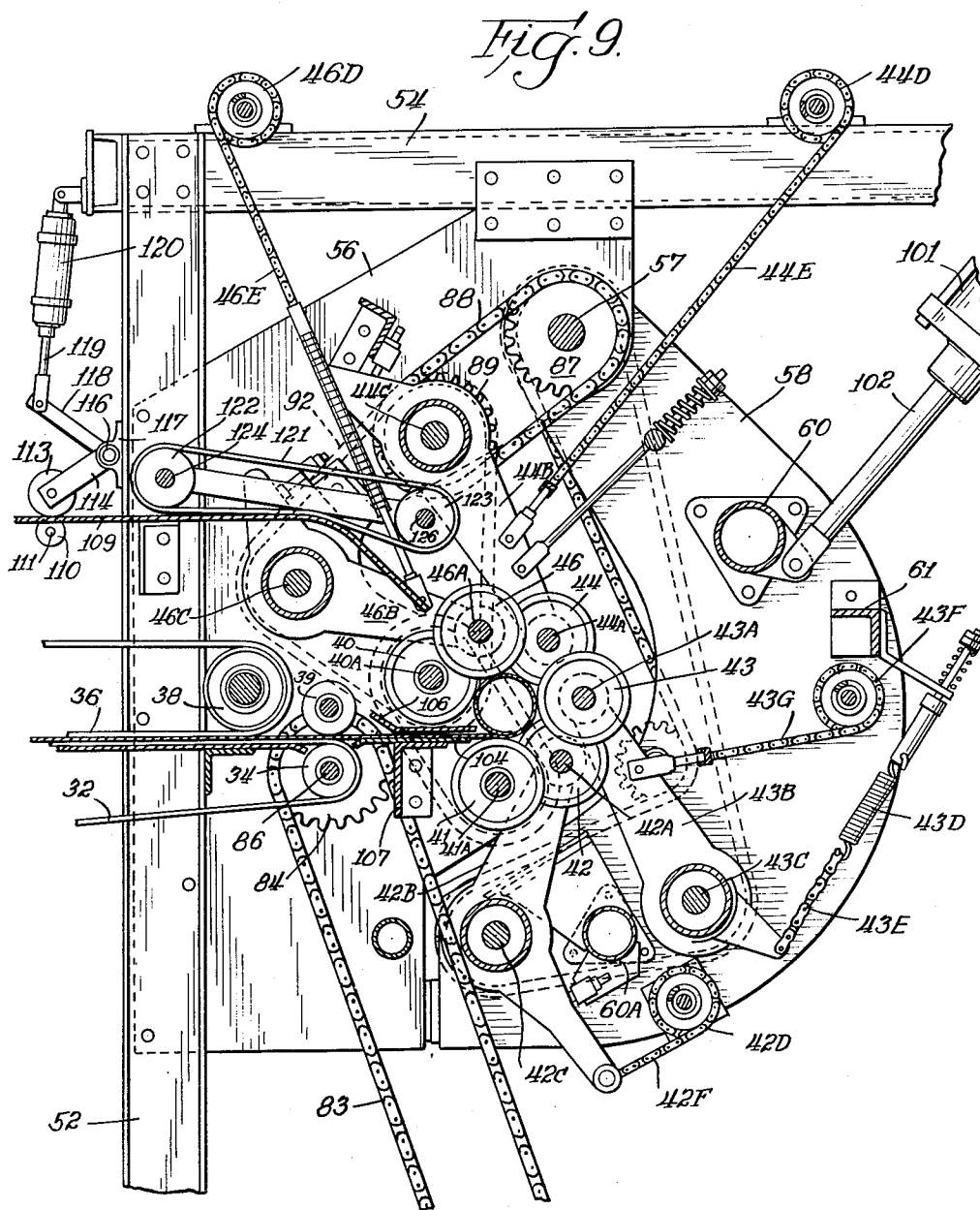
J. V. JOHANSEN ET AL

3,052,073

STRIP ROLLING AND WRAPPING MACHINE

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11 Sheets-Sheet 7

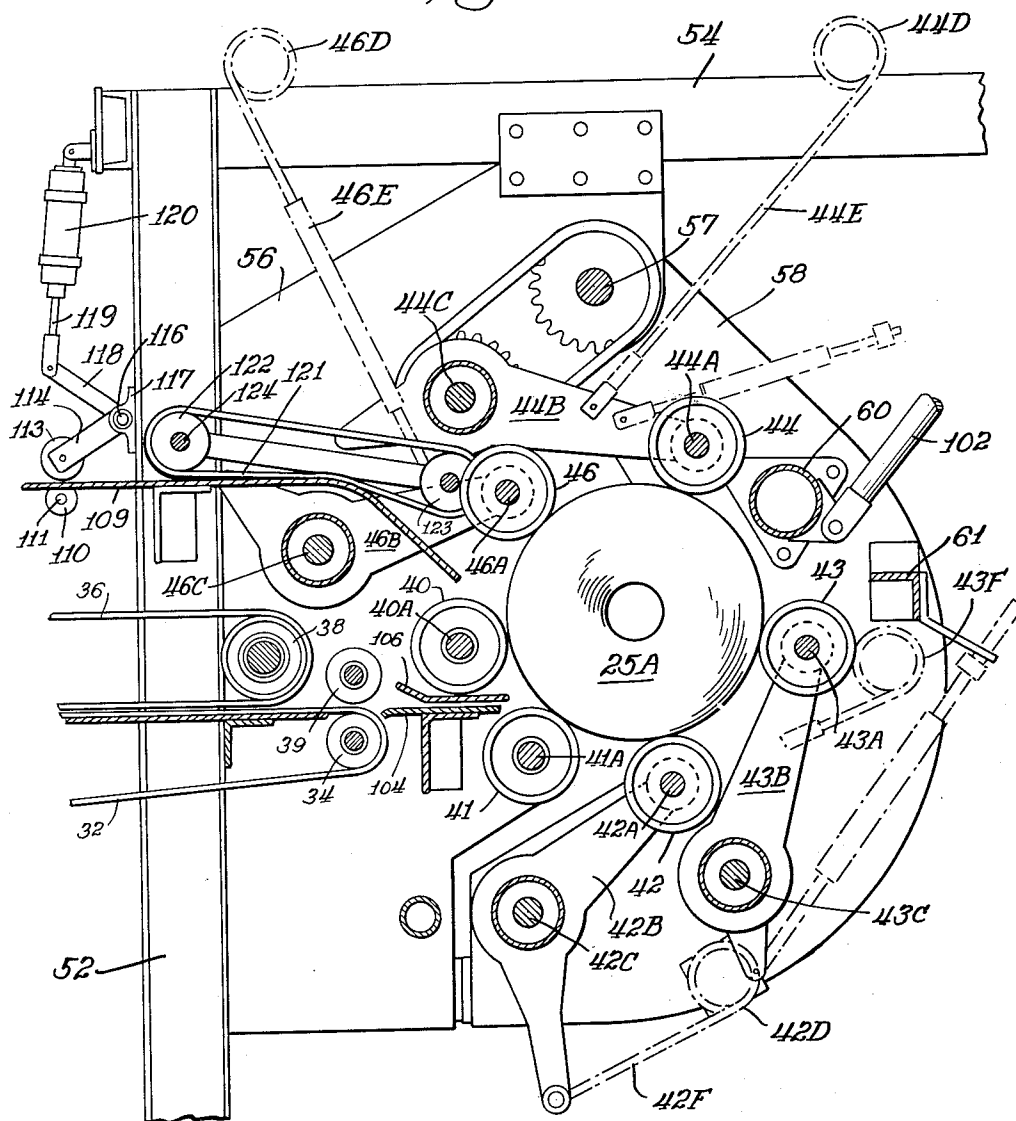


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3,052,073

11 Sheets-Sheet 8

Fig. 10.



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J. V. JOHANSEN ET AL

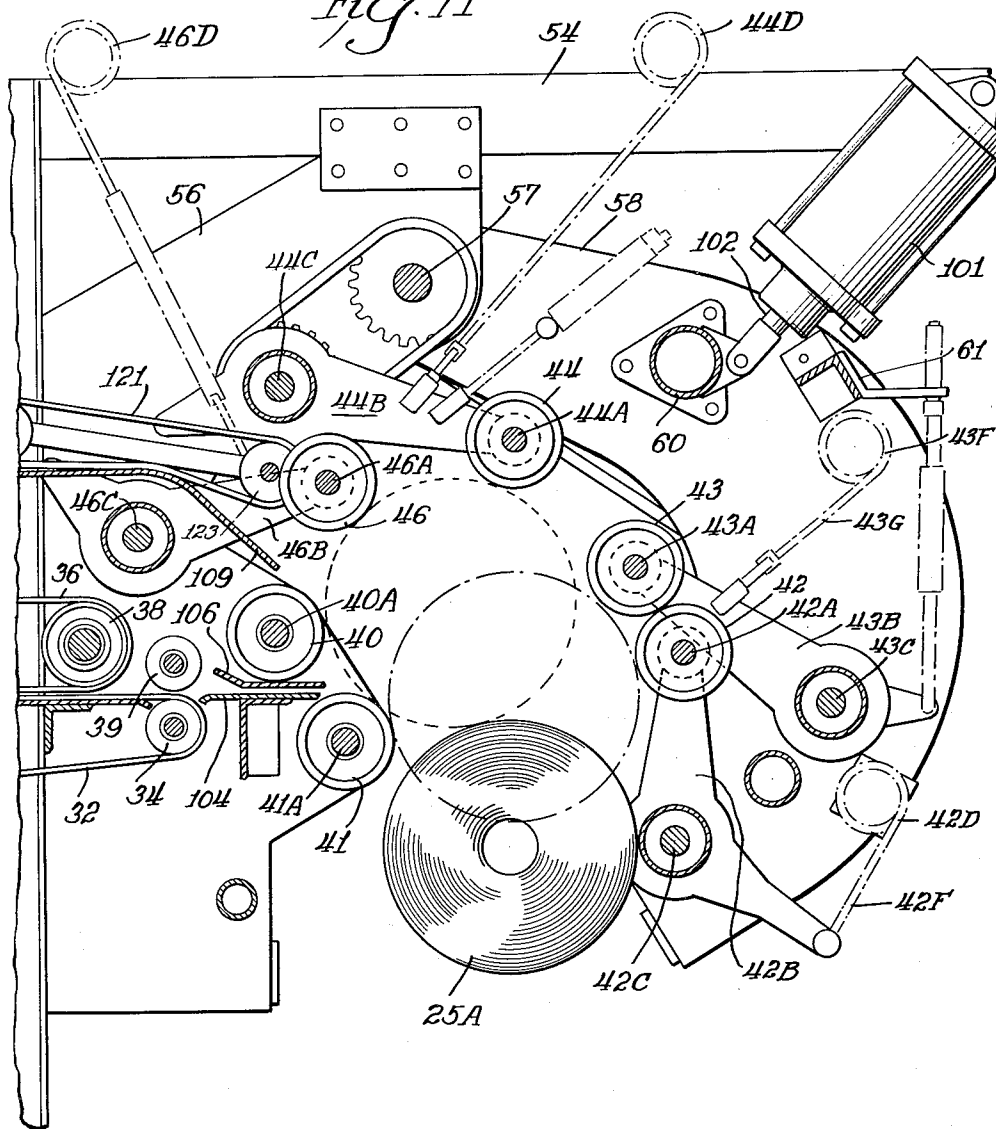
3,052,073

STRIP ROLLING AND WRAPPING MACHINE

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11 Sheets-Sheet 9

Fig. 11



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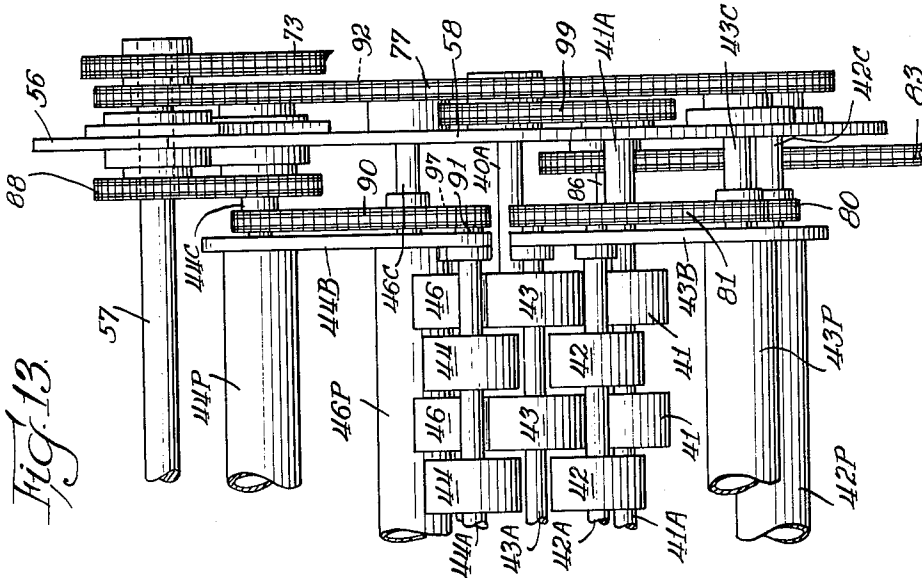
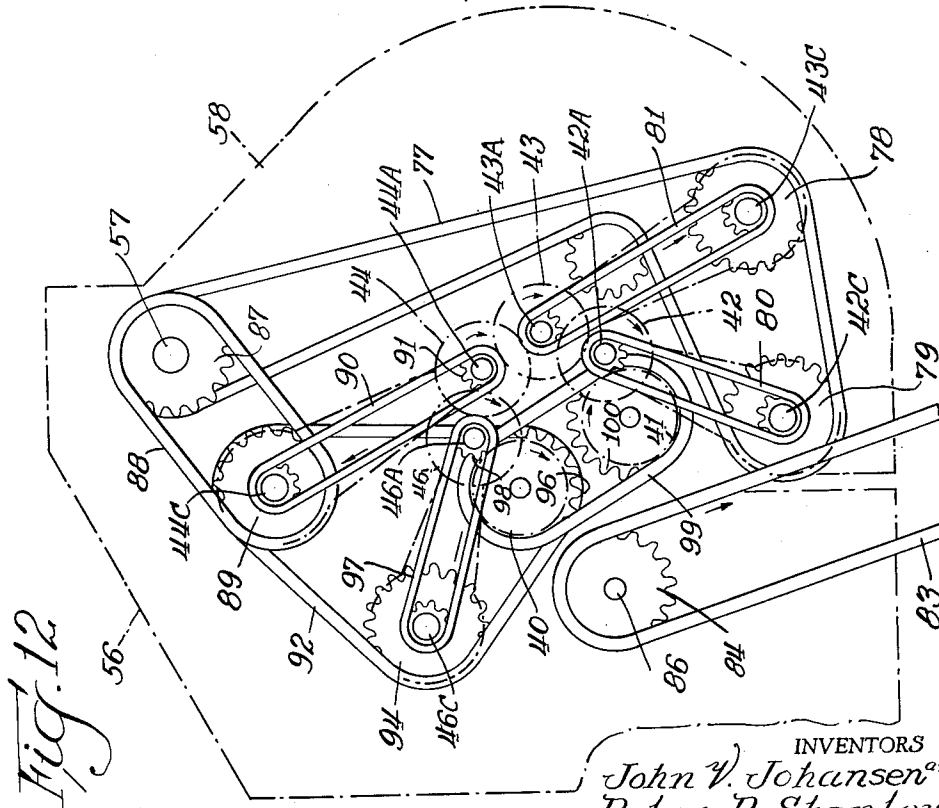
J. V. JOHANSEN ET AL

3,052,073

STRIP ROLLING AND WRAPPING MACHINE

Filed June 10, 1959

11 Sheets-Sheet 10



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3,052,073

STRIP ROLLING AND WRAPPING MACHINE

Filed June 10, 1959

11 Sheets-Sheet 11

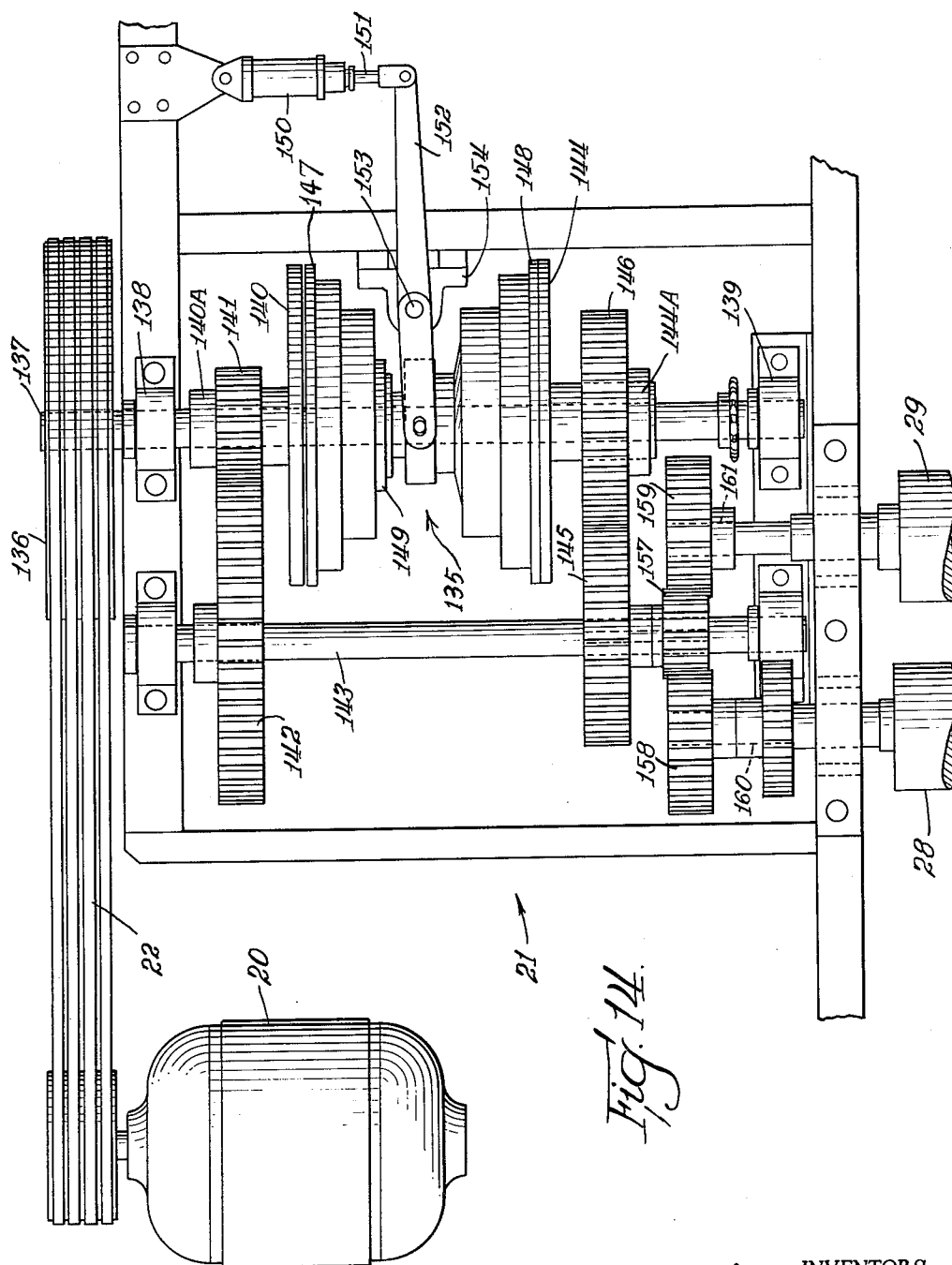


Fig. 11.

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3,052,073

STRIP ROLLING AND WRAPPING MACHINE

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Filed June 10, 1959, Ser. No. 819,270

9 Claims. (Cl. 53-118)

This invention relates to machines for preparing manufactured sheet material for shipment and sale and more particularly to a machine for automatically rolling a strip of sheet material into rolls of predetermined size and for simultaneously wrapping the same with a protective sheet.

One of the primary objects of the invention is to provide a rolling and wrapping machine whereby a continuous strip of sheet material, such as roofing felt and the like, may be continuously fed from a source of supply, cut into predetermined lengths, formed into rolls and simultaneously wrapped with a protective sheet.

Another object of the invention is the provision of improved means and mechanisms whereby the primary object of the invention as above stated may be accomplished.

Other and further objects of the invention will become apparent as this description progresses, reference being had to the accompanying drawings in which:

FIG. 1 is a diagrammatic view showing a strip of sheet material in its initial stage of being fed and formed into a roll;

FIG. 2 is a diagrammatic view similar to FIG. 1 showing the strip of sheet material immediately after it has been cut into the desired length and in its intermediate stage of being rolled up;

FIG. 3 is a diagrammatic view similar to FIGS. 1 and 2 but showing the manner in which a protective wrapping sheet is inserted into the roll as it is being wound;

FIG. 4 is a diagrammatic view similar to FIGS. 1 to 3, inclusive, showing a finished, wrapped roll as it is being dropped onto the storage plate and the relative position occupied by the next succeeding strip of sheet material to be rolled and wrapped;

FIG. 5 is a perspective view of a rolling and wrapping machine comprising one embodiment of the present invention and as viewed from the entry side of the machine;

FIG. 6 is a perspective view of the machine shown in FIG. 5 of the drawings as viewed from the rear or exit end thereof;

FIG. 7 is another perspective view of the machine shown in FIGS. 5 and 6 of the drawings as viewed from the other side of the machine as compared to the views of FIGS. 5 and 6;

FIG. 8 is a further perspective view of said machine as viewed from the other side of the exit end thereof;

FIG. 9 is a vertical sectional view of the rolling and wrapping section of the machine with the forming rollers in their initial, close clustered position;

FIG. 10 is a vertical sectional and partially diagrammatic view similar to FIG. 9 showing the roll forming and wrapping mechanism in the position occupied by it when the roll has increased in size;

FIG. 11 is a view similar to FIG. 10 but showing the roll in completely rolled and wrapped form and being ejected from the machine;

FIG. 12 is a somewhat diagrammatic view of the drive mechanism for the forming rollers;

FIG. 13 is a partial horizontal sectional view showing the forming rollers and the driving mechanism therefor; and

FIG. 14 is a plan view showing the mechanism for driving the initial set of feed rollers and also showing the speed reducing clutch whereby those rollers are intermittently driven at a reduced rate of speed upon severance of the strip by the cutter.

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Referring more particularly to FIGS. 5 to 8, inclusive, of the drawings, the rolling and wrapping machine comprising a preferred embodiment of the present invention comprises an entry portion designated generally by the numeral 10, a strip feeding portion 11, a sheet feeding apparatus 12, a sheet positioning and feeding platform 13 and a strip rolling and wrapping section 14. As shown in FIGS. 1 to 4, inclusive, the strip of sheet material 25 may be continuously fed into the machine from a source of supply (not shown), the direction of which is indicated generally by the numeral 16.

The rolling and wrapping machine is formed on a frame comprising two inverted parallel channel shaped base plates 17 and 18 on opposite sides thereof and cross tie bars 19 secured to and extending across the machine between the base plates. Vertically extending side plates and upright support members, to be referred to in more detail hereinafter, and secured to the base plates support various parts of the machine and the other members of the frame. An electric motor 20 is operably connected to a gear drive designated generally by the numeral 21 by means of a plurality of belts 22, the rotation and actuation of the various parts of the machine to be described hereinafter being effected by connection to the gear drive 21.

As shown more particularly in the diagrammatic views comprising FIGS. 1 to 4 of the drawings, the strip of sheet material 25 is fed from a source of supply over a supporting idler roller 23 at the entry end 10 of the machine and thence between a measuring roller 24 and a smaller back-up or pressure roller 26 rotatably mounted in alignment thereabove, the measuring roller 24 being rotated by engagement with the moving strip 25. From the measuring roller 24, the strip to be rolled and wrapped then passes between two driven feed rollers 27 and 28 whose axes are in vertical alignment and which are also driven from the gear drive 21 by shaft and gear mechanisms. The feed rollers 27 and 28 constitute the main gripping rollers at the entry end 10 which pull the strip material 25 into the machine and force it on through into other feed and actuating mechanisms.

From the feed rollers 27 and 28, the strip of sheet material 25 passes horizontally over a roller 29 above which is supported a transverse cutter member 30 having a knife blade 31 projecting horizontally from its vertical face and out of engagement with the strip 25. The cutter 30 normally is stationary and assumes the position shown in FIGS. 1, 3 and 4 but at the proper instant, as determined by adjustment of a control cam in the cam box 35 (see FIG. 5), the cutter 30 will be caused to rotate one revolution during which the knife blade 31 will engage the strip 25 and sever the same, as shown in FIG. 2. However, until a predetermined length of the strip 25 has passed beneath the cutter 30 and enters the rolling and wrapping section 14 of the machine, the cutter 30 remains inactive.

A plurality of aligned and spaced feed or conveyor belts 32 extend around spaced and driven pulleys 33 and 34 which are rotatable in the direction of movement of strip 25. The belts 32 support the strip 25 for further movement beyond the cutter member 30. Above and in alignment with the belts 32 are a similar set of spaced and driven conveyor belts 36 which extend around spaced pulleys 37 and 38. The belts 36 are spaced above the belts 32 a distance greater than the thickness of the strip 25 being passed therebetween and hence the belts do not effect a pinching or squeezing action thereagainst. The upper belts 36 serve primarily as guiding or confining members. The belts 32 and 36 deliver the strip under a plurality of driven feed rollers 39 which are in vertical alignment with the pulleys 34, and the rollers 39 and the pulleys 34 grip the strip 25 and force it on into the rolling mechanism.

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As further shown diagrammatically in FIGS. 1 to 4, inclusive, sheets of wrapping paper 50 are successively positioned on a table and plate 109 and are fed at intervals by a feed roller 110 and pressure rollers 113 to a plurality of conveyor belts 121 on spaced pulleys 122 and 123 which direct the sheets 50 into wrapping relation with the strip 25 being rolled.

The roll forming mechanism comprises a plurality of driven rollers 40, 41, 42, 43, 44 and 46 which are arranged in a cluster and rotatably mounted on spaced apart axes in their normal position as shown in FIGS. 1 to 4. An interior space 47 is thus formed by the opposed peripheral faces of the rolls 40 to 46, inclusive, and when the leading edge of the strip 25 is forced into the interior space 47 below the roll 40 and the roll 41 it will engage progressively the peripheral faces of the rolls 42, 43, 44, 46 and 40 and hence be caused to start rolling up on itself in the manner shown in FIG. 1. The rolls 40 and 41 are mounted on fixed axes so that as the strip 25 is continued to be fed into the interior space 47 between the rolls, the rolls 42, 43, 44 and 46 may move outwardly to their extreme outward positions shown in FIG. 3 so as to accommodate the strip 25 as it is continued to be rolled up in a roll of an ever increasing size.

When the cutter member 30 is rotated to sever the strip 25, a slow speed clutch shown in FIG. 14 of the drawings, is thrown into operation which causes the feed rolls 27 and 28 to be rotated at a reduced rate of speed while the forward portion of the strip which has been severed continues on through the belts 32 and 36 into the rolling mechanism, the speed of the belts 32 and 36 and the other portions of the machine continuing to operate at their same normal or fast speed. The feed rolls 27 and 28 will continue to operate at slow speed until the advanced strip has been completely rolled and wrapped and the machine opened as shown in FIG. 4 to eject the wrapped roll of sheet material.

An electric eye mechanism of standard construction and arrangement and comprising two units 48 and 49 are positioned in vertical alignment so that a light beam may pass vertically from one to the other between the laterally spaced belts 32 and 36 when a strip 25 does not present itself as a barrier. As long as the strip 25 is being passed along between the conveyor belts 32 and 36, the electric eye unit will remain ineffective but when the strip has been severed by the cutter 30 and a space opens up between the trailing edge of the advance strip 25 and the advance edge of the trailing strip 25, the light beam will then pass between the units 48 and 49 at the instant the trailing edge of the strip passes beyond the units.

Upon effective operation of the electric eye units 48 and 49, a protective sheet of wrapping paper 50 which has been previously fed onto the paper table 109 and to the trailing edge of which a coating of adhesive has been applied by a roller 51, is fed toward the partially rolled strip 25. The mechanism of the machine is so timed that the leading edge of the paper sheet 50 engages the back of the rotating roll of the strip 25 at a point when there remains only a six inch trailing length of the strip 25, the leading portion of the paper sheet 50 and the trailing end portion of the strip 25 thus overlapping to an extent of substantially six inches across their entire width. Upon continued rotation of the rolls 40 to 46, inclusive, the strip 25 will be completely formed into a roll and the paper sheet 50 will be wound and wrapped tightly around the rolled strip and sealed upon itself by the adhesive. The rolling action continues briefly to apply proper sealing pressure for a sufficient length of time.

By a mechanism to be described more fully hereinafter the rolls 42, 43 and 44 are moved away from the rolls 40, 41 and 46 to permit the completely rolled,

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wrapped and sealed roll of strip material 25 to fall out into a receiving plate below the machine. When this occurs, the feed rolls 27 and 28 resume their normal faster rate of rotation and the strip 25 is forced through the machine at the faster rate of speed and the cycle above described is repeated.

The mechanism embodied in the roll forming section 14 of the machine comprises an improvement over that shown in the prior Jensen Patent No. 2,795,384 of June 11, 1957 and has been so combined with a wrapping and strip feeding mechanism whereby the strip of sheet material 25 may be continuously fed to the machine and automatically rolled and wrapped with a protective sheet without the intervention of an operator. As shown more particularly in FIGS. 5, 6, 8 and 9 of the drawings, the strip rolling mechanism is contained within and supported by a rectangular frame comprising vertical uprights 52 secured at their lower ends to the base plates 18 and at their upper ends to transverse and longitudinally extending frame members 53 and 54. Supported on each side of the frame in parallel relation are stationary, vertical roll-supporting plates 56 having a fixed shaft 57 extending therebetween at the upper portions thereof, and pivotally supported by the shaft 57 also in parallel relation are curved roll-supporting plates 58. The plates 58 are adapted to be swung in unison from their top pivots 57 and away from the stationary plates 56 so as to open the machine at the bottom and permit a wrapped roll to be ejected therefrom onto the inclined receiving plate 59 therebeneath. In FIG. 6, a plurality of completely rolled and wrapped rolls 25A are shown on the receiving plate 59 ready for removal. The pivoted plates 58 are secured together for movement as a unit by cross pipes 60 and 60A, a tie bar 61 and the other cross shafts to be referred to hereinafter.

As shown more particularly in FIGS. 9 to 13, inclusive, of the drawings, the plurality of individual rollers 40 and 41 are fixedly mounted in spaced relation on rotatable transverse shafts 40A and 41A journaled in the stationary side plates 56 whereas the plurality of individual rollers 42, 43, 44 and 46 are fixed in spaced relation on transverse rotatable shafts 42A, 43A, 44A and 46A carried between angular rock levers 42B, 43B, 44B and 46B, respectively, which are pivotally mounted on shafts 42C, 43C, 44C and 46C projecting inwardly from the side plates 56 and 58 and joined as units by pipes 42P, 43P, 44P and 46P. The rollers 42, 43, 44 and 46 are thus adapted for movement upon turning of their respective rock levers about their respective pivots.

The rock levers 42B and 43B are urged in a counter-clockwise direction by springs 42D and 43D connected to the rock levers by chains 42F and 43E, respectively. In order to achieve the proper roller pressure as the roller 43 is moved outwardly due to the increasing size of the roll 25A during the roll forming operation, a spring 43F connected by a chain 43G to the rock lever 43B on the other side of the shaft 43C urges the roller in a clockwise direction. The other two movable forming rollers 44 and 46 by force of gravity swing downwardly with their rock levers 44B and 46B into their extreme downward position shown in FIG. 9 and this roller bearing force is adjusted somewhat by means of springs 44D and 46D connected to the rock levers 44B and 46B by chains 44E and 46E, respectively.

Each of the rollers 40 to 46, inclusive, are driven from the gear drive 21 by means of a plurality of endless chains, sprockets and shaft connections. As shown in FIG. 8, an endless chain 70 extends longitudinally from the gear drive to an idler shaft 71 carrying a triple sprocket 65 engaged with chains 72, 73 and 74 which transmit driving torque to various parts of the machine. The chain 73 extends diagonally upwardly around a double sprocket 76 rotatably mounted on the end of the shaft 57 projecting beyond the movable side plate 58, and a chain 77 ex-

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tends from the sprocket 76 downwardly around sprockets 78 and 79 fixed on the ends of the shafts 42c and 43c also projecting beyond the side plate 58 and thence around an idler sprocket 65. Referring to FIGS. 12 and 13, the movable rollers 42 and 43 are driven from the shafts 42c and 43c, respectively, by means of chains 80 and 81 extending around sprockets mounted on the shafts 42A and 42c and 43A and 43c, respectively.

The chain 72 drives a speed reducer 82 which in turn drives a chain 83 extending upwardly into driving relation with a sprocket 84 carried on a shaft 86 to which the pulley 34 is secured. The rear pulley 33 of the lower conveyor belts 32 is geared to the rear pulley 37 of the upper conveyor belts 36 by means of suitable gearing (not shown) and hence both conveyor belts 32 and 36 are driven through the speed reducer 82 by which their rate of movement may be varied as desired.

For driving the roller 44, the upper shaft 57, as shown in FIGS. 9 and 12, has a sprocket 87 secured thereto inside the movable plate 58 and around which extends a chain 88 connected to a double sprocket 89 rotatably mounted on the shaft 44c. A chain 90 connects the sprocket 89 with a sprocket 91 fixed to the shaft 44A and hence drives the roller 44 in a clockwise direction.

For driving the rollers 40 and 46, a triangularly arranged chain 92 extends around a sprocket 93 secured on the portion of the shaft 44c projecting outside of the stationary plate 56 and by which it is driven, and thence around double sprockets 94 and 96 rotatably mounted on shafts 46c and 40A, respectively. As shown in FIG. 12, a chain 97 extends from sprocket 94 around a sprocket 98 fixed on the roller shaft 46A whereby the plurality of movable rollers 46 are also rotated in a clockwise direction. A short chain 99 connects sprocket 96 with a sprocket 100 fixed on the roller shaft 41A and hence the plurality of rollers 41 are rotated in a clockwise direction.

By the aforescribed chain and sprocket mechanisms, the plurality of pressure and forming rollers 40 to 46, inclusive are driven in a clockwise direction at the same rate of speed at all times during the roll forming operation on the strip 25 so as to facilitate the forming and rolling action. It is to be noted that as the roll of strip material 25 increases in size during the roll forming operation the plurality of movable rollers 42, 43, 44 and 46 are forced to move outwardly by the increased size of the strip roll 25A as shown in FIG. 10, the contact between the strip roll and all the six forming rollers being maintained at all times. As shown in FIGS. 9 and 13, the rollers 40 to 46, inclusive, are nestled together in overlapping relationship in the initial stages of the roll forming operation. As the rock levers 42B, 43B, 44B and 46B swing about their pivots due to outward movement of the rollers 42, 43, 44 and 46, the chains 80, 81, 90 and 97 and their respectively engaged sprockets likewise swing in the same manner since they are carried thereby and hence their driving relationship with the plurality of movable forming rollers 42, 43, 44 and 46 remains undisturbed. Similarly, the chain 77 being mounted around two sprockets which are carried by the movable side plates 58 and around a sprocket at the pivot point of the side plates 58 continues to drive in the same manner in all positions of the side plates since the relationship between the sprockets remains the same whether the side plates 58 are in opened or closed positions.

Referring to FIGS. 6 and 8 to 11, inclusive, an air cylinder 101 having a piston rod 102 secured at its outer end to the cross pipe 69 is adapted to be actuated at the proper instant of time when the roll 25A is completely formed and wrapped whereby, as shown in FIG. 11, the rod 102 may be withdrawn into the cylinder and the side plates 58 pulled upwardly in a counterclockwise direction about the pivot 57, thus spreading the rolls 42 and 43 away from the rolls 41 and permitting the wrapped roll 25A of strip material to drop down onto the receiving plate 59. When the wrapped roll 25A has been ejected,

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the air piston 101 is again actuated to project the piston rod 102 and thus return the plates 58 and the forming rollers to their closed, nested positions of FIG. 9.

Operation of the air piston 101 is controlled by means of another cam (not shown) in the cam box 35. The cam is so constructed and arranged that when the strip 25 of sheet material has been completely rolled and wrapped, an electric switch (not shown) is actuated to operate an air valve (not shown) so as to direct air to the lower end of the air cylinder 101 and withdraw the piston rod 102. An electric switch control lever 103, as shown in FIG. 6 depends from the upper portion of one of the fixed side plates 56 and is tripped by engagement with the upper end of the movable side plate 58 as the side plate reaches its opened position. Tripping of the switch lever 103 actuates the air valve in the reverse direction and air is directed into the top of the air cylinder 101 to project the piston rod and restore the side plates 56 and the movable rollers to their closed positions of FIG. 9.

For the purpose of guiding the rapidly moving strip 25 into proper position to be rolled up in the central area 47 within the forming rolls 40 to 46, inclusive, there are provided between the forming rollers and the end of the conveyor belts 32, as shown in FIG. 9, horizontally disposed and vertically spaced plates 104 and 106, the lower plate 104 being supported on an adjustable cross bar 107 secured between the stationary side plates 56.

The paper feeding machine generally designated by the numeral 12 in FIGS. 5 and 7 may be of standard form and since it per se constitutes no part of the present invention it will not be described in detail. It is mounted on one side of the path of movement of the strip 25 and is adapted to feed in the usual manner and at the proper time a protective sheet 50, such as wrapping paper, onto the top surface of the sheet positioning and feeding platform or table 13 which is provided with a stop means 108 for engaging the side edge of the sheet. The paper table 13 is supported on the frame in horizontal position over the upper conveyor belts 36. As the paper sheet 50 is moved onto the table 13, an adhesive applying roller 51 supported at the entry end of the table is actuated to apply a suitable layer of adhesive along the upper surface of the trailing edge portion of the sheet 50.

A paper slide plate 109 comprises the front end of the table 13 and supports the paper sheet 50 at its front end and extends forwardly and diagonally downwardly toward the forming rolls 40 and 46, as shown in FIG. 9. The plate 109 is provided with a transverse slot in which is positioned the paper feed roller 110 secured on a cross shaft 111 having a sprocket (not shown) on one end engaged by the driving chain 74. The paper feed roller 110 is thus adapted to be in constant rotation.

Referring to FIGS. 5 and 9, a plurality of pressure rollers 113 are rotatably carried on the lower ends of pairs of arms 114 fixed on a rock shaft 116 extending across the machine and journaled in bearing blocks 117 on the frame. A lever 118 is fixed at its lower end to the rock shaft 116 and at its upper end it is pivotally connected to the lower end of a piston rod 119 of a vertically disposed air cylinder 120. The air cylinder is pivotally mounted at its upper end to the machine frame. In normal non-feeding position, the pressure rollers 113 are in raised position so as to be spaced above the constantly rotating paper feed roller 110 and hence when a paper sheet 50 is deposited on the paper table 13 with its leading edge portion extending over and in contact with the feed roller 110, it will not be fed toward the forming rolls 40 to 46, inclusive. However, when the severed strip 25 passes beyond the photo-electric cell units 48 and 49, the beam of light is permitted to pass between the two units to render them effective to control operation of an air valve (not shown) by means

of which air will be directed to the upper end of the air cylinder 120 to project the piston rod 119 downwardly from the air cylinder 120 and hence lower the pressure rollers 113 into engagement with the upper surface of the paper sheet 50 which is pressed thereby into tight frictional engagement with feed roller 110. The paper feed roller 110 thus will become effective to force the paper to the right, as viewed in FIG. 9, over the upper surface of the guide plate 109 and down into the rollers 40 to 46, inclusive. When the following strip 25 again passes between the photo-electric cell units 48 and 49, the pressure rollers 113 will be raised to inactive position.

Operation of the photo-electric cell units 48 and 49 will also effect feeding of the next succeeding sheet 50 from the paper feeding machine by the suction feeding mechanism so that immediately after the sheet 50 has been fed in between the forming rollers 40 to 46, inclusive, and the pressure feed rollers 113 are raised, the next sheet will be moved onto the table for the next succeeding feeding operation to the forming rollers.

To further assist feeding movement of the paper sheet 50 over the guide plate 109, there are provided a plurality of spaced belts 121 extending around spaced pulleys 122 and 123 fixed on transverse shafts 124 and 126, respectively. The shaft 124 is rotatably driven by a sprocket 127 (see FIG. 8) fixed to that portion of the shaft 124 which projects outside of the stationary side plate 56, the sprocket 127 being engaged and driven by a chain 128 connected to a sprocket (not shown) on shaft 46c. The paper feed belts 121 are thus constantly rotating at the same rate of speed as the feed roller 110 and when a paper sheet 50 is fed between the belts 121 and the guide plate 109, the sheet will be gripped and forced downwardly toward the forming rollers 40 to 46, inclusive.

When the forming rollers 40 to 46, inclusive, are in their initial forming or closed position, as shown in FIG. 9, the paper sheet 50 is not fed. However, as the rollers are spread apart due to the increasing size of the roll 25A of the strip 25 being rolled, the rollers 46 will move away from the stationary rollers 40 thereby providing a space through which the paper sheet 50 may pass. The feed of the paper sheet 50 is so timed by adjustment of a control cam in the cam box 35 that the leading edge of the paper sheet will enter into the restricted space between the strip roll 25A and approximately the last six inches of the trailing portion of the strip 25, as viewed in FIG. 1. Upon continued rotation of the roll 25A and strip 25 to complete the rolling operation, the first six inches of the leading portion of the paper sheet 50 are thus rolled up within the strip roll 25A and the sheet is tightly held therein. As the rolls 40 to 46, inclusive, continue to rotate, the paper sheet 50 is wound or wrapped tightly around the strip roll and upon itself with the trailing end portion of the paper sheet 50 having the adhesive thereon being pressed into intimate contact with a preceding portion of the paper sheet and adhered thereto. As described above, the machine is then opened up, and the wrapped roll 25A drops onto the receiving plate 59.

Returning to the entry portion 10 of the machine, the idler roller 23, the measuring roller 24, pressure roller 26, feed rollers 27 and 28, the roller 29 and the cutter 30 are journaled in side plates 130 on each side of the machine as shown in FIG. 5 of the drawings. The cam box 35 is mounted at the base of the frame and contains a plurality of cams (not shown) which are so constructed and arranged that they may effect operation of the various parts of the machine heretofore described at the desired instants of time. The details of the cams and cam connecting mechanisms are not shown in the drawings but it is to be understood that they are of standard, well-known construction for operation of electric switch mechanisms and being capable of adjustment

and variation whereby the timing of the machine functions may be varied. The general structure and operation of the measuring roller 25, the pressure roller 26, feed rollers 27 and 28, the cutter 30, the cams and switch controls and the manner in which they are actuated are illustrated generally by corresponding parts in the Westergaard Patent No. 2,403,147 of July 2, 1946 and hence a detailed description thereof is considered unnecessary for present purposes.

When the outer surface of the measuring roll 24 has rotated a sufficient number of revolutions to equal the length of the strip desired for shipment as a wrapped package, its respective control cam will close an electric switch to energize a solenoid which removes a stop pawl to permit the cutter member 30 to be rotated by a slip clutch, one member of which is constantly driven. This control mechanism is so arranged that only one revolution of the cutter member 30 is permitted and upon completion of that one revolution the pawl is restored to locking position and will prevent further rotation of the cutter 30.

As shown more particularly in FIG. 14 of the drawings, the speed reducing mechanism by which the feed rolls 27 and 28 are caused to rotate at a reduced rate of speed upon severance of the strip 25 by the cutter 30, comprises a clutch of the duplex type, indicated generally by the numeral 135, which is adapted to be moved automatically in one direction for high speed operation and in the other direction for operation at a reduced speed. The belts 22 from the motor 20 drive a pulley 136 secured on the end of a transverse shaft 137 journaled in bearing blocks 138 and 139 on the machine frame. A clutch member 140 is loosely mounted on the shaft 137 adjacent the bearing block 138 and has secured on its hub 140A a small gear 141 which is in constant mesh with a larger gear 142 secured on a jack shaft 143. A clutch member 144 having a hub portion 144A is loosely mounted on the shaft 137 adjacent the bearing block 139 and has secured to its hub a gear 146 which is in constant mesh with a gear 145 secured on the jack shaft 143 in spaced relation with respect to the gear 142.

The clutch 135 also has an axially movable portion mounted on the shaft 137 for rotation therewith so as to be driven thereby and located between the clutch members 140 and 144. This movable clutch portion comprises a clutch plate 147 engageable with clutch member 140 and a clutch plate 148 engageable at its other side with the clutch member 144. These clutch plates 147 and 148 are mounted on the opposite ends of a unitary annular structure 149 axially slidable on the shaft 137.

When the clutch plate 147 is in driving engagement with the clutch member 140, the jack shaft 143 will be rotated through the small gear 141 and the larger gear 142, the clutch plate 148 being out of engagement with the clutch member 144 at that time. However, when the clutch plate 148 is axially moved into engagement with the clutch member 144, driving engagement between the clutch plate 147 and the clutch member 140 will be broken off and the drive will then be from the shaft 137 through the clutch members 148 and 144, through the larger gear 146, the gear 145 to the jack shaft 143. When the drive to the jack shaft is through the small gear 141 due to engagement of the clutch plate 147 with the clutch member 140, the jack shaft will be caused to rotate at a low or reduced rate of speed but when the drive is through the larger gear 146 due to engagement of the clutch plate 148 with the clutch member 144, the jack shaft 143 will be rotated at a higher rate of speed.

To effect movement of the clutch plates 147 and 148 on the slidable clutch member 149 axially of the shaft 137 there is provided an air cylinder 150 having a piston rod 151 projecting therefrom and adapted to engage at its lower end a clutch operating lever 152 secured at its other end to a rock shaft 153 journaled in spaced bearing blocks 154 on the frame. Upon actuation of the air cylinder 150 and its piston rod 151 the clutch unit 149 will

be moved axially in one direction or the other depending upon whether the piston rod is withdrawn or projected with respect to the air cylinder 150. The air cylinder 150 is adapted to be controlled in its operation by a standard air valve (not shown) controlled by a suitable solenoid and switch mechanism under cam control (not shown) as the cutter 30 severs the strip.

The jack shaft 143 has secured to it adjacent the gear 145 a smaller gear 157 which is in constant mesh with gears 158 and 159 secured on the ends of shafts 160 and 161, respectively, projecting from the feed roller 28 and the roller 29. Thus, upon severance of the strip 25, the air piston 150 will be operated to cause the clutch to be moved into its low speed position whereby the feed rollers 27 and 28 and the roller 29 will be rotated at a reduced rate of speed thus insuring a gap between the leading edge of the unsevered strip and the trailing edge of the severed strip 25.

From the foregoing it is evident that the strip rolling and wrapping machine comprising the present invention is capable of entirely automatic operation without requiring the intervention of an operator. A strip of heavy flexible roofing material may be continuously fed into the rolling and wrapping machine from a large storage roll or from a continuously operable strip making machine at the end of which the present machine may be positioned. The strip is cut into the desired lengths, rolled into tight rolls without requiring the use of spools or the like and wrapped with an outer protective sheet which is sealed upon itself about the roll. Upon emerging from the machine, the rolls in properly measured lengths are ready for shipment.

Although there has been described above and illustrated in the accompanying drawings a preferred embodiment of the present invention, it is to be understood that changes and modifications in the details of structure and mode of operation may be made without departing from the spirit and scope of the appended claims.

We claim:

1. Apparatus for automatically rolling a strip of sheet material into a roll and for simultaneously wrapping the same with a protective sheet comprising first feeding means for continuously feeding a strip lengthwise, means for measuring a predetermined length of said strip upon continuous movement of said strip, cutting means adapted for intermittent operation for cutting said strip in predetermined measured lengths during continuous movement thereof past said cutting means, mechanism for successively receiving said cut strip lengths and rolling them upon themselves into regular rolls and for wrapping said rolls with a protective sheet, second feeding means between said cutting means and said rolling and wrapping mechanism for feeding said cut strip lengths into said rolling and wrapping mechanism, and means for intermittently feeding a protective sheet of wrapping material into said rolling and wrapping mechanism whereby prior to the completion of the rolling of said cut strip length into a roll the leading portion of said sheet and the trailing end portion of said strip lengths are disposed in overlapping relationship and said sheet is wrapped around said roll and upon itself upon continued operation of said rolling and wrapping mechanism.

2. An apparatus in accordance with claim 1 comprising means for applying a layer of adhesive material to one surface of the trailing end portion of said protective sheet.

3. An apparatus in accordance with claim 1 wherein said cutting means comprises an intermittently rotatable member extending transversely of said strip across the path of movement thereof, a cutting blade carried by said member and normally out of contact with said moving strip and adapted to engage and sever said strip upon rotation of said rotatable member and means for effecting rotation of said rotatable member for one revolution when

a predetermined length of said strip has passed said measuring means.

4. An apparatus in accordance with claim 1 wherein said means for intermittently feeding a protective sheet of wrapping material comprises sheet gripping means normally disengaged from said sheet in non-feeding relation and means for engaging said sheet gripping means with said sheet upon passage of the trailing end of said cut length of said strip beyond a control point.

5. An apparatus in accordance with claim 1 wherein said means for intermittently feeding a protective sheet of wrapping material comprises a continuously rotating feed roller driven at the same rate of speed as the second strip feeding means, means for supporting said protective sheet with one of the faces of its leading portions adjacent said feed roller, pressure means normally spaced from said feed roller and out of engagement with said sheet and adapted to be moved into pressing engagement with said sheet, and means for moving said pressure means into engagement with said sheet to press the same against said feed roller.

6. Apparatus for automatically rolling a strip of sheet material into a roll and for simultaneously wrapping the same with a protective sheet comprising first feeding means for continuously feeding a strip lengthwise, means for measuring a predetermined length of said strip upon continuous movement of said strip, cutting means adapted for intermittent operation for cutting said strip in predetermined measured lengths during continuous movement thereof past said cutting means, mechanism for successively receiving said cut strip lengths and rolling them upon themselves into regular rolls and for wrapping said rolls with a protective sheet, second feeding means between said cutting means and said rolling and wrapping mechanism for feeding said cut strip lengths into said rolling and wrapping mechanism, said first and second strip feeding means being adapted to be rotated at the same rapid rate of speed, speed reducing means adapted to be operably and intermittently connected to said first strip feeding means upon actuation of said first cutting means whereby the advance length of the severed strip is fed into the rolling and wrapping mechanism at the same rapid rate of speed and the following uncut strip is fed by said first feeding means at a reduced rate of speed, and means for intermittently feeding a protective sheet of wrapping material into said rolling and wrapping mechanism whereby prior to the completion of the rolling of said cut strip length into a roll the leading portion of said sheet and the trailing end portion of said strip lengths are disposed in overlapping relationship and said sheet is wrapped around said roll and upon itself upon continued operation of said rolling and wrapping mechanism.

7. Apparatus for automatically rolling a strip of sheet material into a roll and for simultaneously wrapping the same with a protective sheet comprising first feeding means for continuously feeding a strip lengthwise, means for measuring a predetermined length of said strip upon continuous movement of said strip, cutting means adapted for intermittent operation for cutting said strip in predetermined measured lengths during continuous movement thereof past said cutting means, mechanism for successively receiving said cut strip lengths and rolling them upon themselves into regular rolls and for wrapping said rolls with a protective sheet, second feeding means between said cutting means and said rolling and wrapping mechanism for feeding said cut strip lengths into said rolling and wrapping mechanism, said first and second strip feeding means being adapted to be rotated at the same rapid rate of speed, speed reducing means adapted to be operably and intermittently connected to said first strip feeding means upon actuation of said cutting means whereby the advance length of the severed strip is fed into the rolling and wrapping mechanism at the same rate of speed and the following uncut strip is fed by said

first feeding means at a reduced rate of speed so as to provide a gap between the trailing edge of the cut strip and the leading edge of the following strip, and means for intermittently feeding a protective sheet of wrapping material into said rolling and wrapping mechanism whereby prior to the completion of the rolling of said cut strip length into a roll the leading portion of said sheet and the trailing end portion of said strip lengths are disposed in overlapping relationship and said sheet is wrapped around said roll and upon itself upon continued operation of said rolling and wrapping mechanism, said intermittent feeding means comprising sheet gripping means normally disengaged from said sheet in non-feeding relation and means including a photo-electric cell having two spaced units for effecting engagement of said sheet gripping means with said sheet, said units being mounted in spaced relation from the opposite faces of said strip on opposite sides thereof and adapted to become effective upon formation of said gap and passage of said severed strip beyond said units.

8. Apparatus for automatically rolling a strip of sheet material into a roll and for simultaneously wrapping the same with a protective sheet comprising first feeding means for continuously feeding a strip lengthwise, means for measuring a predetermined length of said strip upon continuous movement of said strip, cutting means adapted for intermittent operation for cutting said strip in predetermined measured lengths during continuous movement thereof past said cutting means, mechanism for successively receiving said cut strip lengths and rolling them upon themselves into regular rolls and for wrapping said rolls with a protective sheet, second feeding means between said cutting means and said rolling and wrapping mechanism for feeding said cut strip lengths into said rolling and wrapping mechanism, said first and second strip feeding means being adapted to be rotated at the same rate of speed, speed varying means adapted to be operably and intermittently connected to one of said strip feeding means upon the cutting of said strip whereby the advance length of the severed strip is fed into the rolling and wrapping mechanism at a greater rate of speed than that at which the following uncut strip is fed by said first feeding means, and means for intermittently feeding a protective sheet of wrapping material into said rolling and wrapping mechanism whereby prior to the completion of the rolling of said cut strip length into a roll the leading portion of said sheet and the trailing end portion of said strip lengths are disposed in overlapping relationship and said sheet is wrapped around said roll and upon itself

upon continued operation of said rolling and wrapping mechanism.

9. Apparatus for automatically rolling a strip of sheet material into a roll and for simultaneously wrapping the same with a protective sheet comprising first feeding means for continuously feeding a strip lengthwise, means for measuring a predetermined length of said strip upon continuous movement of said strip, cutting means adapted for intermittent operation for cutting said strip in predetermined measured lengths during continuous movement thereof past said cutting means, mechanism for successively receiving said cut strip lengths and rolling them upon themselves into regular rolls and for wrapping said rolls with a protective sheet, second feeding means between said cutting means and said rolling and wrapping mechanism for feeding said cut strip lengths into said rolling and wrapping mechanism, said first and second strip feeding means being adapted to be rotated at the same rate of speed, speed varying means adapted to be operably and intermittently connected to one of said strip feeding means upon the cutting of said strip whereby the advance length of the severed strip is fed into the rolling and wrapping mechanism at a greater rate of speed than that at which the following uncut strip is fed by said first feeding means so as to provide a gap between the trailing edge of the cut strip and the leading edge of the following strip, means for intermittently feeding a protective sheet of wrapping material into said rolling and wrapping mechanism whereby prior to the completion of the rolling of said cut strip length into a roll the leading portion of said sheet and the trailing end portion of said strip lengths are disposed in overlapping relationship and said sheet is wrapped around said roll and upon itself upon continued operation of said rolling and wrapping mechanism and means for operating said intermittent feeding means and adapted to be set in operation upon the formation of said gap between said cut strip and following strip.

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