Sept. 25, 1956

A. M. SAQUET

2,764,082

MACHINES FOR STRAPPING BALES AND PACKAGES

Filed May 10, 1955

6 Sheets-Sheet 1

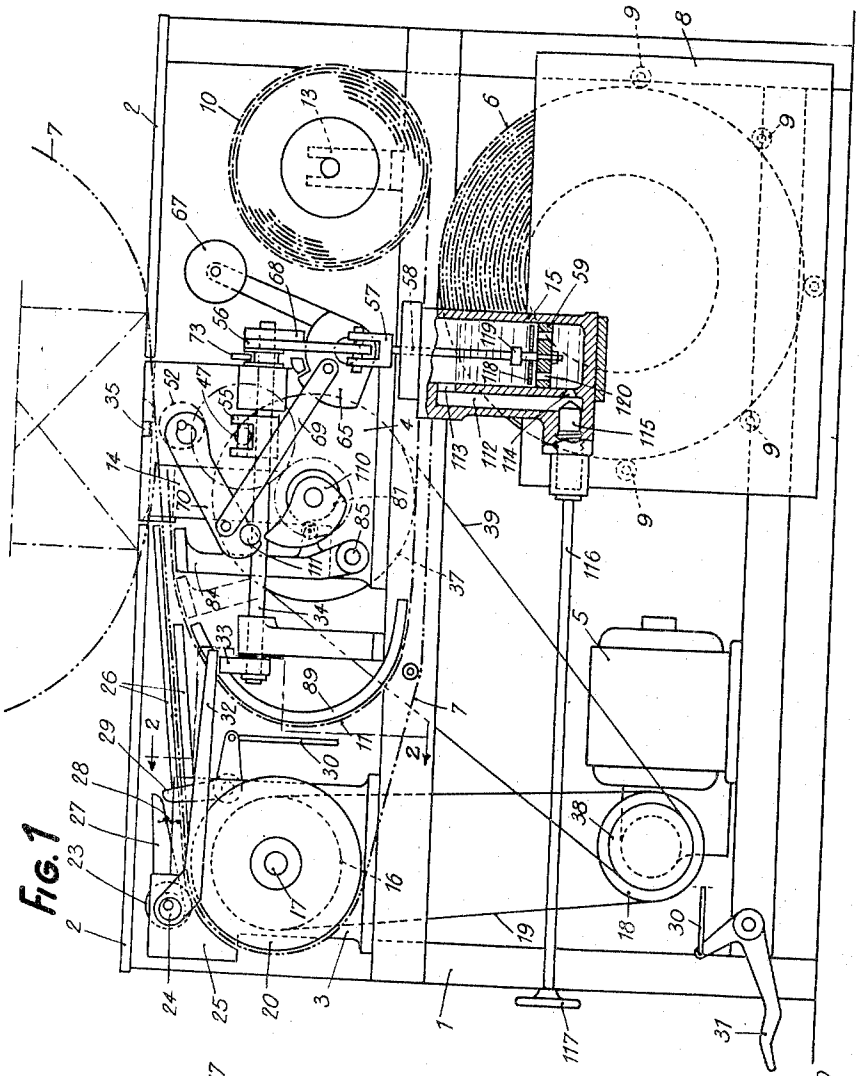


FIG. 1

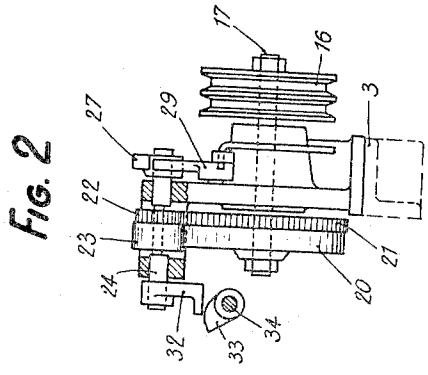


FIG. 2

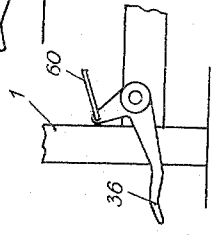


FIG. 3

INVENTOR

ANDRE MATHIEU SAQUET

By Young, Emery & Thompson

ATTYS

Sept. 25, 1956 A. M. SAQUET 2,764,082

MACHINES FOR STRAPPING BALES AND PACKAGES

Filed May 10, 1955

6 Sheets-Sheet 2

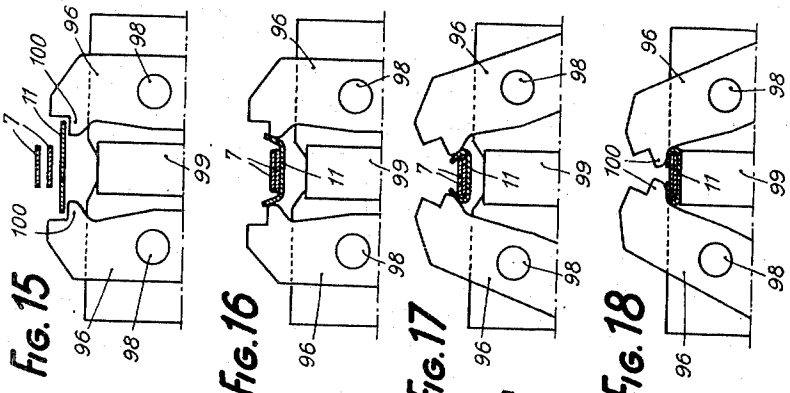


FIG. 15

FIG. 16

FIG. 17

FIG. 18

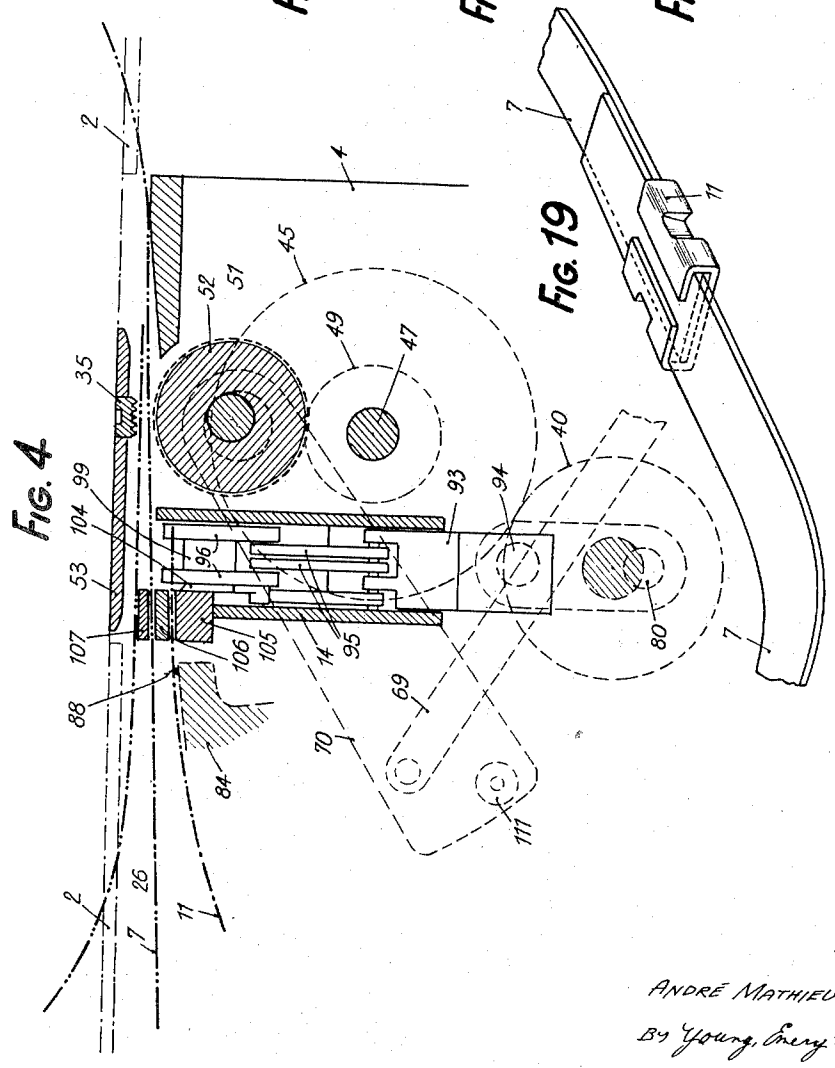


FIG. 4

FIG. 19

INVENTOR

ANDRÉ MATHIEU SAQUET

By Young, Emery & Thompson

ATTYS.

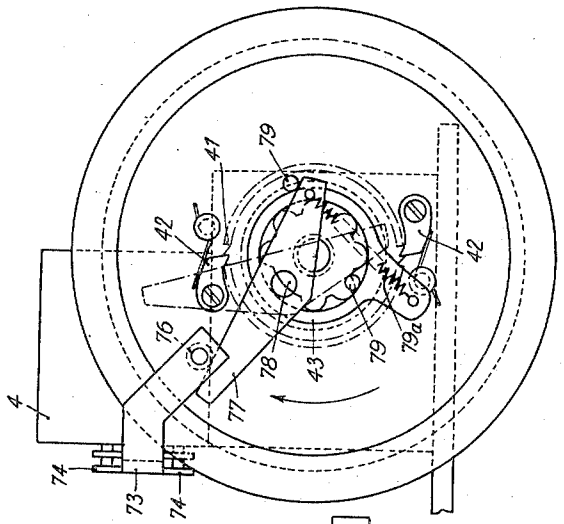
Sept. 25, 1956 A. M. SAQUET 2,764,082

MACHINES FOR STRAPPING BALES AND PACKAGES

Filed May 10, 1955

6 Sheets-Sheet 3

FIG. 10



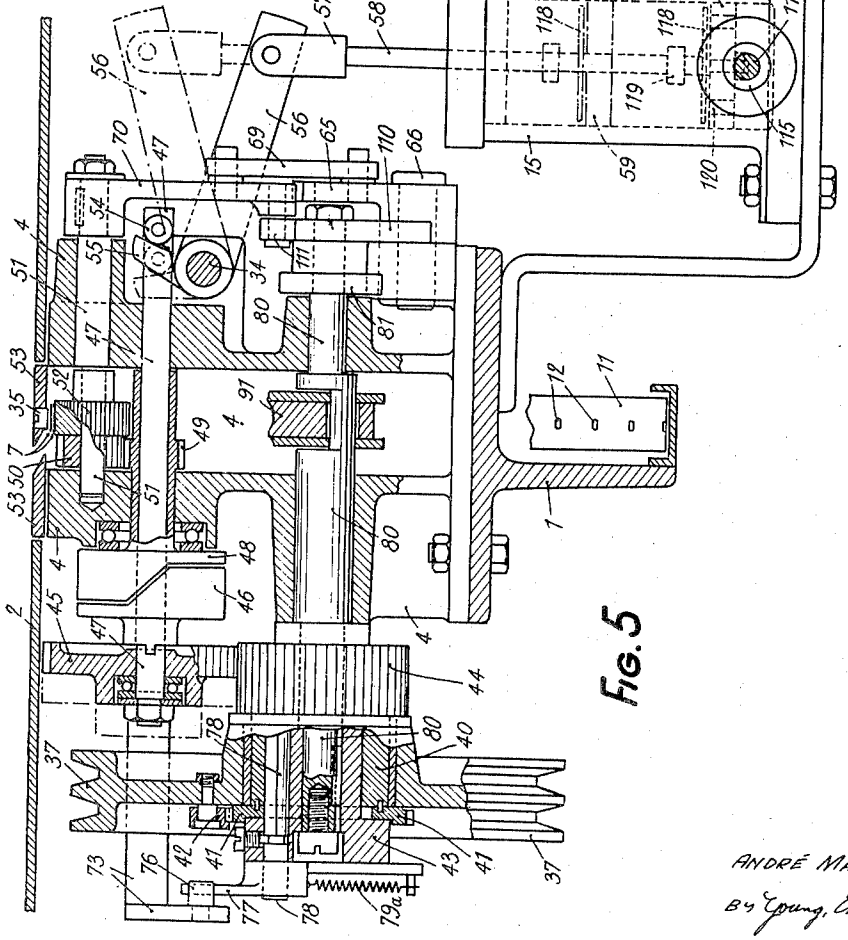


FIG. 5

INVENTOR

ANDRÉ MATHIEU SAQUET

By Young, Emery & Thompson

ATTYS.

Sept. 25, 1956

A. M. SAQUET

2,764,082

MACHINES FOR STRAPPING BALES AND PACKAGES

Filed May 10, 1955

6 Sheets-Sheet 4

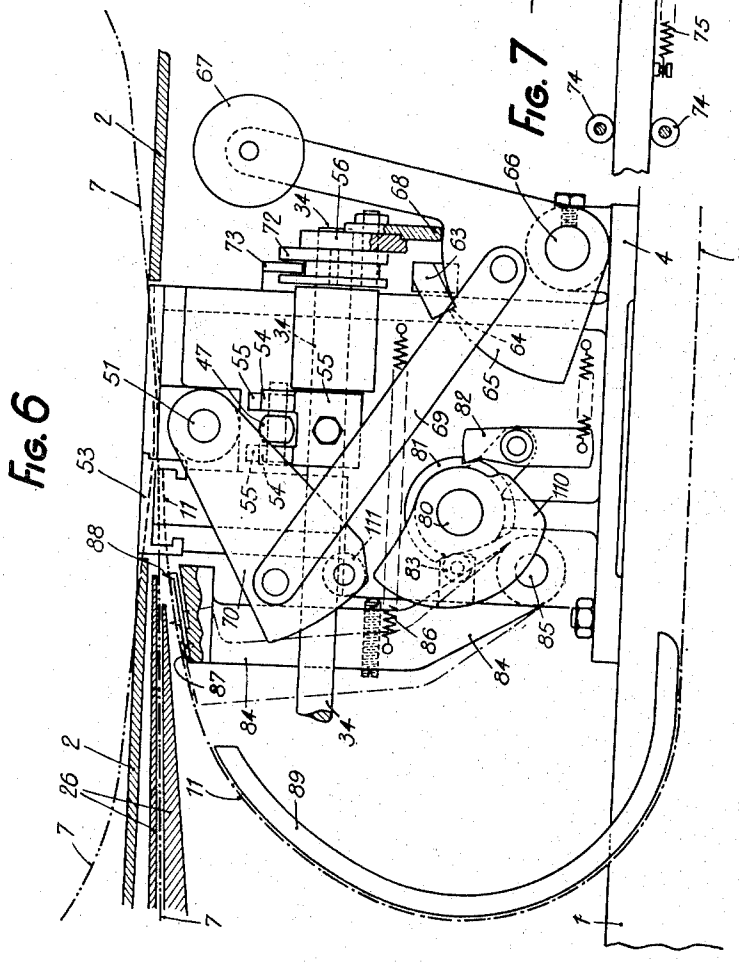


FIG. 6

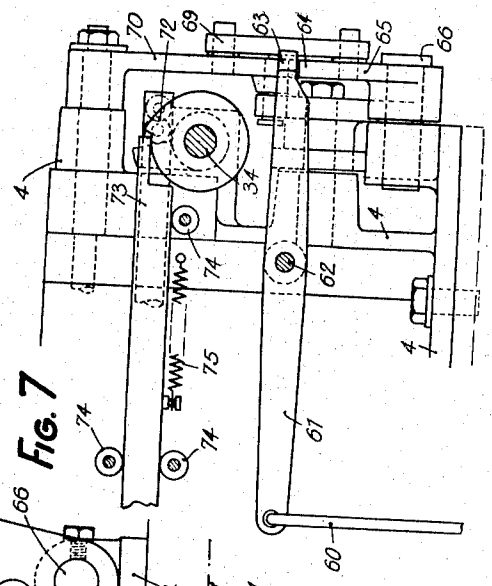


FIG. 7

INVENTOR

ANDRÉ MATHIEU SAQUET

By Young Emery & Thompson

ATTYS

Sept. 25, 1956 A. M. SAQUET 2,764,082

MACHINES FOR STRAPPING BALES AND PACKAGES

Filed May 10, 1955

6 Sheets-Sheet 5

FIG. 11

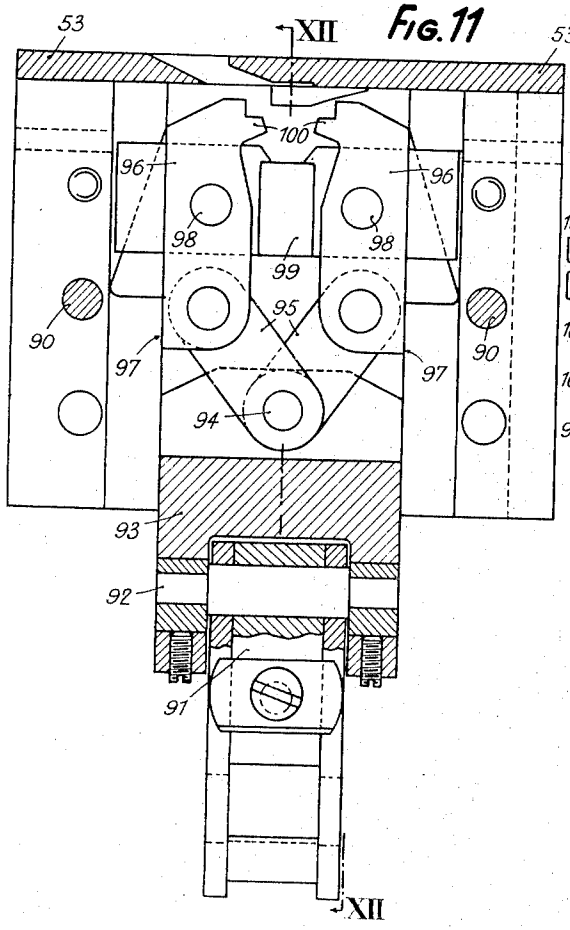


FIG. 12

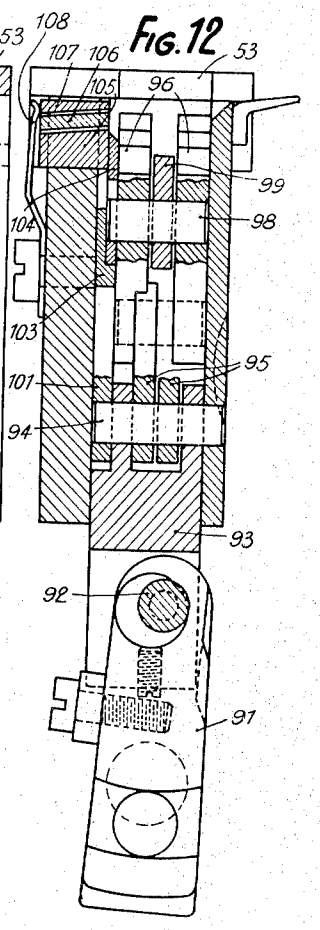


FIG. 9

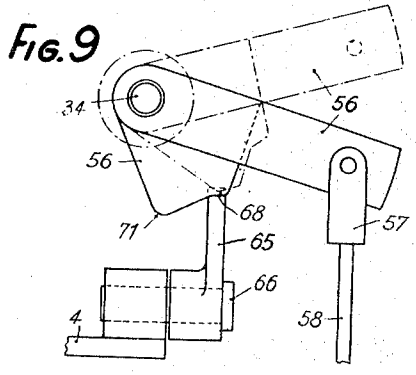
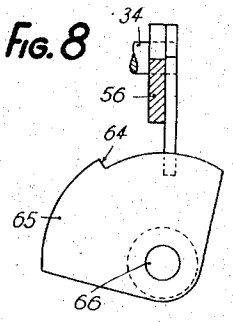


FIG. 8



INVENTOR

ANDRÉ MATHIEU SAQUET

By Young, Emery & Thompson

ATTYS

Sept. 25, 1956 A. M. SAQUET 2,764,082

MACHINES FOR STRAPPING BALES AND PACKAGES

Filed May 10, 1955

6 Sheets-Sheet 6

FIG. 13

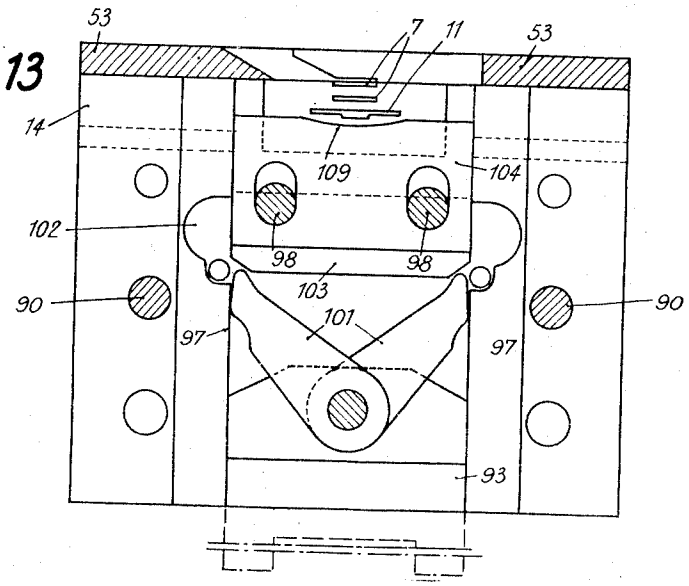
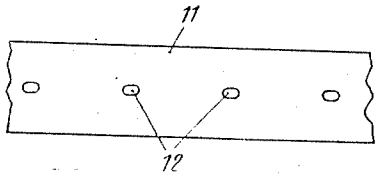


FIG. 14



INVENTOR
ANDRÉ MATHIEU SAQUET
By Young, Emery & Thompson
ATTYS.

United States Patent Office 2,764,082 Patented Sept. 25, 1956

2,764,082

MACHINES FOR STRAPPING BALES AND PACKAGES

Andre Mathieu Saquet, Paris, France, assignor to Societe a Responsabilite Limitee: Aucemo, Paris, France

Application May 10, 1955, Serial No. 507,439

Claims priority, application France May 17, 1954

8 Claims. (Cl. 100—30)

It is well known to use for bale strapping metal bands or metal strip the ends of which are interconnected by clinching upon the a seal. The metal strip is usually laid around the bale by means of portable devices in which case the output is relatively small. Machines have been, however, devised for bale strapping. Such machines which are ordinarily semi-automatic are constructed to match the size of the bale to be strapped i. e. are adapted to a type of bale having given dimensions. However the requirements of bale handling cannot as a rule be accommodated by this lack of adaptability of existing machines.

An object of the invention is to provide a universal machine for bale strapping whereby it becomes possible to adapt a strapping strip for hooping bales or packages having widely different sizes and shapes.

Another object of the invention is to provide a machine for strapping or girdling bales or packages of different natures calling for differently tensioned metal strips without requiring a dismantling of certain parts of the machine.

A further object of the invention is to provide a machine permitting the use of metal strip having different widths by the mere replacement of an improved removable tool assembly.

The invention relates generally to a machine for strapping or girdling bales or packages comprising an entirely accessible working plate on which the bale to be strapped is laid, a device for delivering and returning the metal strip for tightening the bale to be strapped, a tensioning device for the metal strip adapted around the bale, a power unit operating said delivering and returning device as well as the tensioning device, a device for successively feeding seal members to the clinching station, and a tool assembly so arranged at this clinching station as to permit the seal member to be adapted to the ends of the metal strip, this machine being moreover characterized by the provision of a dashpot brake for adjusting the tension with which the metal strip clamps the bale or package when the seal or clasp member is put into position.

According to practical features of the invention, a coupling is interposed between the power unit and the tensioning device for the metal strip, said coupling being de-clutched when a suitable resistance corresponding to a predetermined tension of the metal strip is exerted upon said tensioning device, and the dashpot brake so operates on the coupling as to enable the de-clutching time to be adjusted responsive to the clamping tension that it is desired to impart to the metal strip.

Advantageously the dashpot brake is constituted by a fluid brake and preferably by a hydraulic brake. This brake comprises, according to a preferred constructional form, a cylinder slidably receiving a piston the rod of which is positively connected to an element of the coupling, the cylinder chambers on the opposite sides of the piston being interconnected by a communication duct having interposed therein a throttling nozzle the cross sectional area of which may be regulated by means of a needle valve which can be actuated from outside the

machine, whereby a larger or lesser resistance to which a larger or lesser tension on the metal strip corresponds counteracts the piston movement. Ports adapted to be closed off during the operative stroke are preferably provided for ensuring a quick return of the piston to its inoperative position.

According to further features of the invention, tensioning of the metal strip is advantageously performed by a knurled wheel applied against said strip with a reduced force during the return motion of the metal strip by the delivering and returning device and with a larger force during the tensioning of the metal strip proper. Said knurled wheel is preferably mounted upon an eccentric shaft which is positively rotated during the returning and tensioning movements and carries a lever positively connected to a counter-weight capable of sequentially assuming an inoperative position wherein the knurled wheel is off the metal strip, a primary operative position wherein the efficient leverage of the counter-weight is reduced and which corresponds to a reduced force application of the knurled wheel against the metal strip for the return motion, and a secondary operative position wherein said efficient leverage is sufficient for ensuring a relatively strong application of the knurled wheel against the metal strip for tensioning the latter.

The counter-weight is preferably supported by a rockable sector which is partly released when the metal strip is returned and is then fully released when a resistance begins to check the rotation of the knurled wheel in view of the tensioning step.

The coupling which is interposed between the knurled wheel for tensioning the metal strip and the power unit is constituted by cam plates, the de-clutching being ensured owing to the axial sliding motion of the shaft carrying one of the plates, the dashpot brake adjusting the tension of the metal strip tending to counteract said axial displacement. This brake preferably engages a lever mounted fast upon an oscillatory lever carrying an arm positively connected to the shaft carrying the movable clutch plate, so that an angular motion of said shaft corresponds to this axial movement of the plate, and said shaft carries members adapted to put the delivering and returning device to its inoperative condition as soon as a slight tension exerts itself in the metal strip, also members for tripping the mechanism for positioning the seal member when said tension has substantially reached the desired value.

The tool assembly which is adapted to cut off the seal member and the metal strip and to position the seal member is removably fitted upon the machine, the replacement of this tool assembly by another one permitting metal strips having different widths to be used on one and the same machine. The elements of the tool assembly are controlled from another crankshaft or like member which is so actuated as to effect one revolution at each cycle of the machine, preferably through a coupling constituted by a cotter pin, which performs an automatic actuation when the tension of the metal strip has reached the desirable value.

Advantageously the tool assembly comprises a set of links performing the control of jaws adapted to fold back and clinch the seal member, and a set of pusher members which engage a knife that cuts off the seal member and the metal strip.

The operation of the machine is semi-automatic and the control is preferably effected by means of treadles actuated by the operator. After the bale or package has been placed on the machine plate, the operator operates the metal strip delivery. He then grasps the free end of the metal strip and forms a loop about the bale or package, whereupon he engages said end into a slot in the plate surmounting the tool assembly. It is then only sufficient

for him to depress the second treadle to cause a return of the excess metal strip, the clamping of the bale or package at the required tension and the laying of the seal member in an entirely automatic manner.

The following description which is given with reference to the accompanying drawings given non-limitatively will facilitate the understanding of the invention.

Fig. 1 is a general view in elevation and partly in section showing the mechanism of the machine for strapping bales or packages according to the invention.

Fig. 2 is a view of the machine bearing, taken on the lines 2—2 of Fig. 1.

Fig. 3 is a detail view showing the second treadle for operating the machine.

Fig. 4 is a sectional view drawn to a larger scale of the part of the central frame occupied by the knurled wheel and tool assembly, looking in the same direction as Fig. 1.

Fig. 5 is a sectional view of the central frame showing the control device and the dashpot brake, taken transversely of Figs. 1 and 4.

Fig. 6 is an elevational view, with certain parts in section, of a portion of the central frame in its inoperative position, the view being a part of Fig. 1 to an enlarged scale.

Fig. 7 is a detail view transverse to Fig. 6 and showing the levers which trip the cycle of the operations for clinching the seal member upon the metal strip.

Fig. 8 is a fragmentary view taken in a plane at right angles to that of Fig. 7.

Fig. 9 is a detail view taken in a plane parallel to that of Fig. 7 but offset to the latter.

Fig. 10 is a front view of the device which positions the seal member upon the ends of the metal strip.

Fig. 11 is a front view of the tool assembly.

Fig. 12 is a transverse sectional view along the line XII—XII of Fig. 11.

Fig. 13 is an elevational view, with some parts in section, of the tool assembly showing the knife and the pusher members.

Fig. 14 is a plan view of the band of seal members.

Figs. 15 to 18 are diagrams showing the manner in which the seal member is clinched upon the ends of the metal strip.

Fig. 19 is a perspective view showing the seal member after being positioned and clinched upon the metal strip.

Reference being had to the drawings, the machine comprises generally a frame 1 surmounted by a table-like plate 2 adapted to receive the bale or package to be strapped or hooped. In the frame are mounted a device called "bearing" in the present text and generally designated by the reference 3, a central frame designated in its entirety by the reference 4, a power unit 5 adapted to drive the movable members of the machine, a metal strip reel 6 which supplies the metal strip 7 and is accommodated in a recess defined by side plates 8 between which are arranged rollers 9, a reel 10 of seal members supplying a band of seal members 11 as shown in Fig. 14 and having middle perforations 12, said reel being carried by a hub member revoluble upon a reel carrier 13 on the frame 1, an interchangeable tool assembly 14 fitted in the central frame 4 and adapted to ensure proper positioning of the seal member upon the ends of the metal strip on completion of the strapping operation, and a dashpot brake 15.

The chief elements of the machine will now be set forth in detail while stressing at each occurrence their function in the general operation.

The bearing 3 comprises a power pulley 16 fast upon the shaft 17 and driven from the pulley 18 of the power unit through the belt 19. The shaft 17 carries a roller 20 angularly movable with a toothed member 21 which meshes with another toothed member 22 on a further roller 23 carried by an eccentric shaft 24. The metal strip 7 which is held by an input guide 25 passes between the rollers 20 and 23 and reaches the guide 26 which leads it to the slot in the plate 2 through which it emerges. The rollers 20 and 23 are operative upon the metal strip 7 between the guides 25 and 26. The shaft 24 carries a stop lever 27 urged downwardly by a spring 28 toward a position wherein the roller 23 is applied against the roller 20 so as to clamp the metal strip 7 and to cause its displacement while the power unit 5 is running. A rocker-like cranked lever 29 may engage by its end under the end portion of the stop lever 27 so as to hold the two rollers spaced from each other, which position they occupy as the seal member is laid for example. A junction rod 30 engages the other arm of the cranked lever 29. This rod is connected to a treadle 31 mounted upon the frame 1 of the machine. A pressure exerted by the operator upon the treadle 31 rocks the cranked lever 29 the end of which escapes from the stop lever 27 so that the roller 23 is applied against the periphery of the roller 20 and clamps the metal strip. The actuation of the treadle 31 also closes a switch (not shown) which trips the operation of the power unit 5 in one direction. The rollers 20 and 23 are then revolved in a manner which can be clearly seen in Fig. 1, and the metal strip 7 is delivered in the direction of the plate 2. The operator keeps his foot on the treadle 31 as long as metal strip must be delivered. When he moves his foot off the treadle, the suply of the metal strip is interrupted since the power unit 5 stops. The eccentric shaft 24 also carries a lifting lever 32 the end portion of which is abutted on a cam 33 fast upon a shaft 34 the function of which will be explained hereafter.

At the outset of the step of strapping the bale or package, the operator lays the latter on the plate 2, as shown in Fig. 1. He then controls the delivery of metal strip as above described. He then grasps the end portion of the metal strip 7, bends it to form a loop about the bale or package and engages the free end of the metal strip into the slot in the plate 2 under the cleat 35 as visible particularly in Figs. 5 and 6. In order to tighten the metal strip about the bale or package, it is then only sufficient to cause a backward return of the metal strip 7. There is provided to that effect on the frame 1 of the machine a second treadle 36 which actuates a switch (not shown) intended to cause the operation of the power unit 5 in the reverse direction. As a result of this, the rollers 20 and 23 are driven in the reverse direction for drawing the metal strip rearwardly. This return motion is continued until the lever 32 is positively lifted by the cam 33 on the shaft 34, so as to move the roller 23 off the roller 20, whereupon the rocking lever 29 automatically trips itself under the end of the lever 27 which has thus been positively lifted for bringing the bearing 3 back into the position that it occupied before the delivery control of the metal strip at the beginning of the bale-strapping operation.

The central frame 4 which is shown in detail in Fig. 5 comprises a driving pulley 37 revolved by the power unit 5 through a pulley 38 and a belt 39. The pulley 37 is mounted idly on a hub member 40 angularly movable with a ratchet 41 with which cooperates a pawl 42 carried by the side plate of the pulley 37 so as to drive the hub member 40 when the pulley 37 is revolved in one direction, while said pulley rotates idly in the other direction. The positive drive of the hub member 40 is only ensured from the power unit 5 when the latter revolves in the direction corresponding to the return of the metal strip 7 rearwardly after the loop has been formed about the bale or package as above set forth.

The hub member 40 rotates idly on the pin carrier 43 and transmits its rotation through a gear 44 to a further gear 45 angularly movable with a driving plate 46 fast upon a sliding shaft 47 and cooperating with a cam plate 48 rigid with a sleeve carrying a gear 49 which meshes with a gear 50 fast upon an eccentered shaft 51 which carries a knurled wheel 52 as illustrated by Figs. 4 and 5. The eccentric shaft 51 is revolubly supported in the central frame 4. The knurled wheel 52 is thus normally driven in rotation when the power unit 5 rotates in the

suitable direction and thus comes into engagement with the lower end portion of the metal strip 7 the two end portions of which are superimposed in the space between the knurled wheel 52 and the cleat 35 (Fig. 5) after the formation of the loop about the bale or package. The cleat 35 is carried by small plates 53 defining the slot for the insertion of the metal strip end in the machine plate 2.

The sliding shaft 47 carries an abutment 54 with which cooperates a fork member 55 on a brake lever 56 carried by the shaft 34. When the lever 56 occupies the position shown in full lines on Fig. 5, the drive is performed between the plates 46, 48. The lever 56 is associated at its free end with the yoke-shaped cap 57 of the rod 58 of a piston 59 slidably housed in the cylinder or body 15 of the machine brake. The full line position of the lever 56 corresponds to the lower position of the piston 59. When this piston goes up in the cylinder, the lever 56 is swung upwardly into the position shown in dotted lines on Fig. 5. This motion results from the sliding movement of the shaft 47 leftwards and moves the plates 46, 48 out of mutual engagement. Toward the end of this motion, there is no longer any drive of the knurled wheel 52.

The treadle 36 which controls the start of the prime mover 5 in the direction corresponding to the return of the metal strip is associated with a rod 60 which, when said treadle is depressed, returns a holding lever 61 (Fig. 7) fitted upon a pin 62 and having its beak portion 63 engaged against a holding notch 64 in a sector 65 pivotally supported by the central frame 4 by a pin 66 and carrying a counter-weight 67 which tends to rock it down. The withdrawal of the beak portion 63 permits the sector 65 partly to rock, so that its holding notch then comes into engagement with a boss 68 on the lever 56. The sector 65 is hinged to a connecting link 69 having its other end hinged to a lever 70 keyed to the eccentric shaft 51 and having its motion controlling the angular displacement of said shaft 51 and consequently the extent of application of the knurled wheel 52 against the lower end portion of the metal strip 7. When the sector 65 has rocked to the extent of one step as indicated hereinbefore, its stopping notch 64 comes into engagement with the boss 68 on the lever 56, and the knurled wheel 52 is applied with a relatively small force against the lower end of the metal strip 7. At the proper time the power unit 5 rotates in such a direction as will perform a return of the metal strip since the operator has depressed the returning treadle 36, thus unlocking the sector 65 while causing a slight displacement of the knurled wheel 52 toward the metal strip at the outset of its backward return. The knurled wheel 52 then cooperates with the rollers 20 and 23 but the movement of the metal strip 7 is faster than the angular motion of the knurled wheel 52. The upper end portion of the metal strip, which is inserted by the operator into the slot in the plate 2 after a strip loop has been formed about the bale or package to be strapped, is held stationary by the cleat 35. This return motion of the metal strip takes place until the time when the metal strip tightens the bale with a reduced force.

When the metal strip tightens the bale or package, its return motion is considerably slowed down. A resistance results which exerts itself upon the knurled wheel 52 in contact with the lower end portion of the metal strip 7. The resisting torque is transmitted to the plate 48 which is engaged with the driving plate 46 so that the ramps on the plate 46 slide along those of the plate 48 while causing a leftward glide of the shaft 47 until the two plates are fully declutched from each other.

During this leftward sliding motion of the shaft 47, the abutment 54 which engages the fork member 55 causes an upward rocking motion of the lever 56 and an angular displacement of the shaft 34. The movement of the lever 56 is slowed down by the action of the brake 15 the function of which is explained hereafter in detail.

During its angular motion, the shaft 34 then causes through its cam 33 the actuation of the lifting lever 32 which moves the rollers 20 and 23 off each other. During the upward rocking motion of the lever 56, the boss 68 on said lever escapes from the stop notch 64 in the sector 65. This sector then rocks to the extent of a further step under the action of the counter-weight 67 and the resultant motion is transmitted by the link 69 to the lever 70 which therefore strongly applies the knurled wheel 52 against the lower end portion of the metal strip 7. This strong application of the knurled wheel 52 produces a clamping action of the metal strip about the bale with an adjustable strength as is described hereafter.

Toward the end of the upward rocking motion of the lever 56, the boss 71 on this lever rests upon the periphery of the sector 65. At this moment the plates 46 and 48 move off to a sufficient distance for interrupting any drive of the knurled wheel 52, the end portions of the metal strip being simply held in the position in which they are situated. The shaft 34 also carries a cam 72 which, toward the end of the rocking motion of the lever 56, imparts a sliding motion to a pusher rod 73 which is guided through rollers 74 (Fig. 7) and is displaced leftward (looking at Fig. 7) against the action of a return spring 75. As is visible in Figs. 5 and 10, the pusher rod 73 is provided at its end with a finger member 76 normally located in front of a finger member 77 for actuating the pin 78. The method of assembly of this part of the device is clearly shown by Fig. 10. The lever 77 is urged by a spring 79 which engages this lever 77 and a portion of the pin carrier 43 and which, when the lever 77 is freed owing to the withdrawal of the finger member 76 under the action of the rod 73, causes a displacement of the semi-circular pin 78, thus rendering the pin carrier 43 angularly movable with the hub member 40. Consequently the pin carrier 43 is revolved and effects a revolution. At the end of this revolution the lever 77 abuts the finger member 76 which has been brought back to its initial position inasmuch as the dog on the cam 72 has then escaped from the end of the rod 73 and the latter has been moved backwardly by its spring 75. The pin 78 is then also returned to its initial position, which decouples the pin carrier 43 from the hub member 40. It will be seen from Fig. 10 that abutments 79 are provided for limiting the angular displacement of the lever 77 to the suitable extent.

The pin carrier 43 is keyed upon a crankshaft 80 which is thus angularly driven for effecting a revolution with a view to achieving the laying of the metal member forming the seal upon the end portions of the metal strip as indicated hereafter.

The crankshaft 80 carries a cam 81 (Figs. 5 and 6) with the periphery of which cooperates a holding pawl 82 which holds said shaft in the required angular position prior to each revolution. The outline of the cam 81 comes into engagement with a roller 83 carried by a feed arm 84 pivotally mounted about a pin 85 and resiliently urged toward the position shown in full lines on Fig. 6 by a spring 86. The feed arm 84 carries at its free end a blade 87 having a prong 88 engageable into the middle apertures 12 of the band of seals 11. In the position shown in full lines on Fig. 6, the feed arm 84 has shifted a metal seal over the tool assembly 14 for effecting the clinching operation. During the rotation of the crankshaft 80 and in the course of the hereinafter described clinching operations, the arm 84 is positively displaced leftwards (looking at Fig. 6) by the cam 81 so as to assume the position shown in dotted lines. The prong 88 is then applied against the band of seals 11 beyond the next middle aperture 12. Once the strapping of the bale has been completed, the spring 86 returns the arm 84 to the position shown in full lines, the prong being engaged into the aperture in the next metal seal for bringing the latter above the tool assembly 14. It will be noticed by

examining Fig. 6 that the band of seal members **11** is led by a guide **89** so as to present itself just over the feed arm **84**.

Clinching of the metal seal is performed by the tool block **14** shown in Figs. 11 to 13 and interchangeably secured to the machine by pins **90**. As is visible on these figures, the crankshaft carries a connecting rod **91** which comes into engagement with the axis **92** of a seal member **93** slidably mounted in the tool block **14**. Pivotally supported by a pin **94** engaged through the seal member **93** are a pair of links **95** having their opposite ends hinged to jaws **96** having heel portions slidably engaged through grooves **97** in the tool block **14**. Said jaws **96** are connected by pins **98** to an anvil member **99** and carry at their end beak portions **100** which perform the clinching operation as hereinafter described. The axis 94 of the seal member **93** is also used for mounting a pair of pusher members **101** guided by the grooves 97 but capable of escaping sidewise above these grooves through recesses **102**. These pusher members normally engage the heel portion **103** of a knife **104** having elongated holes through which are slidably received the pins **98**. As visible in Fig. 12, the front part of the tool block **14** receives a carrier for counter blades **105**, an intermediate counter blade **106** and an upper counter blade **107**. The latter is positioned under the plates **53**. The lower end portion of the metal strip **7** is engaged between the counter blades **106** and **107**. The upper end portion having served for forming the loop is inserted between the plate **53** and the upper counter blade **107**, whereupon the seal penetrates into the tool block between the carrier **105** and the counter blade **106**. Such counter blades and the associated carrier are held in the tool block by a leaf spring **108**.

During a revolution of the crankshaft **80**, the movable assembly of the tool block **14** performs a reciprocating movement and is returned every time to the lower position. At the beginning of the displacement, the seal member **93** raises at the same time the links **95** and the pusher members **101**. The cutting edge **109** of the knife **104** is thus positioned at the outset of the operation under the band of seal members. During this upward displacement the knife successively cuts off the band of seal members **11** and then the lower end portion of the metal strip **7**. The upward motion of the knife **104** is then stopped and the pusher members **101** escape through the recesses **102**. In the course of this motion, the jaws **96** which initially occupied the position shown in Fig. 15 are pushed upwardly. The heel portions of the jaws are guided through the grooves **97**, and the beak portions **100** first crimp down the side wings of the seal member as shown in Fig. 16. Where the grooves **97** come to an end, the jaws **96** are no longer held and under the action of the oblique thrusts exerted by the links **95**, said jaws **96** are clinched inwardly as shown by Fig. 17 owing to a pivotal motion about their pins **98**. The beak portions of the jaws **96** then come into adjacent positions level or substantially level with the V-shaped part of the anvil member **99** for completing the clinching operation as represented by Fig. 18. The marginal edges of the anvil member **99** come into engagement with the edges of the seal member **11** for achieving the clinching operation shown in perspective on Fig. 19.

The crankshaft **80** also carries a raising cam **110** which, as the end of the clinching operation is reached, engages a roller **111** carried by the lever **70**. The outline of this cam **110** is such as to cause an angular displacement of the lever **70** clockwise (looking at Fig. 6). This motion is then transmitted by the connecting link **69** to the sector **65** which is returned to its initial position, the beak portion **63** of the holding lever **61** being engaged with the stopping notch **64** in the sector **65** for again holding the same in the position shown in full lines on Fig. 6. All the other parts of the machine also resume the position which they occupied at the outset of an operative cycle.

A detailed description of the dashpot brake associated with the machine and permitting the clamping tension of the metal strip to be regulated will now be given. As is shown particularly on Fig. 1, the body **15** of the brake includes a cylinder and a channel **112** establishing a communication between the cylinder chambers located on the opposite sides of the piston **59** through a port **113** and a nozzle **114** the cross sectional area of which is adjusted by means of a needle valve **115** controlled from without by a rod **116** and a hand wheel **117**. A closing valve **118** is arranged for motion between the piston **59** and an abutment **119** carried by the rod of the piston **59**. This closing valve **118** cooperates with ports **120** in the piston. When a resistance exerts itself on the knurled wheel **52** as described in the foregoing and the shaft **47** has a tendency to move leftward (looking at Fig. 5) for lifting the lever **56**, the brake partly checks this motion of the lever **56**. The cylinder and the communication channel **112** are filled with a fluid advantageously constituted by oily petroleum. As the piston **59** tends to be swiftly shifted upwards, the valve **118** is applied against the ports **120** and the liquid situated above the piston must flow back to the chamber provided under its lower face through the channel **112** and the nozzle **114**. The resistance exerted to the displacement of the shaft **47** by the piston is consequently in terms of the adjustment of the nozzle **114**. Conversely the downward motion of the piston is facilitated by the rise of the valve **118**.

It will be seen that the adjustment of the nozzle **114** permits the resistance opposed by the piston or the brake to the motion of the shaft **47** and consequently to the declutching of the plates **46, 48** to be regulated. The drag of the metal strip by knurled wheel **52** and consequently the extent of tightening of the bale during the strapping operation are proportional to said resistance and therefore of the adjustment of the dashpot brake. The possibility is thus afforded by adjusting the cross sectional area of the nozzle **114** by means of the hand wheel **117** to strap bales or packages made of thin cardboard or wooden cases while applying the degree of tightening which is necessary in every instance. The purpose of the brake as thus provided is therefore to adjust the time when the plates **46** and **48** are de-clutched and consequently the clamping force at which the resistance exerted upon the metal strip on the knurled wheel **52** manifesting itself in the form of a resistant torque applied to the plate **48**, exceeds the resistance to the displacement exerted by the brake **15**.

The entire operation of the machine will be easily understood from a reading of the foregoing description:

After having laid the bale to be strapped on the plate **2** of the machine, the operator who has preliminarily adjusted the cross sectional area of the nozzle **114** by means of the hand wheel **117** and due regard being paid to the nature of the bale, depresses the treadle **31** which controls the delivery of metal strip through the rollers **20** and **23**. He then grasps the metal strip as delivered and inserts its free extremity under the plate **53** of the tool block, said extremity forming the upper end portion of the metal strip which is laid over its lower end portion and over a metal seal member that has been positioned by the feed arm **84**. The operator who has released the treadle **31** as soon as a sufficient length of metal strip has been payed out then depresses the return treadle **36**, thereby causing the power unit **5** to rotate in the reverse direction. The rollers **20** and **23** then return the metal strip rearwardly for clamping the bale or package, while the other members of the machine are also driven by the ratchet device **41—42**. The pressure exerted upon the treadle **36** has caused the beak portion **63** to escape from the notch **64** in the sector **65** which then rocks to the extent of one step under the action of the counter-

weight 67. Therefore the knurled wheel 52 is slightly applied against the metal strip. As soon as the tension of the metal strip increases, the plate 46 shows a tendency to move off the plate 48, whereupon the arm 56 is slightly lifted and the sector 65 thus released rocks to the extent of a further step, whereby the operative leverage of the counterweight 67 is substantially increased and the knurled wheel 52 is powerfully applied against the lower end portion of the metal strip. The rollers 20 and 23 are spaced from each other, and the tensioning of the metal strip is merely ensured by the wheel 52, the upper end portion being held in position by the cleat 35. When the desired degree of clamping has been reached, the plates 46 and 48 are de-clutched, the lever 56 is fully raised, and the crankshaft then effects a revolution to clinch the metal seal member upon the end portions of the metal strip as described in the foregoing. The cams on the shaft 80 provide for the feed of the metal seal members 11 and the return of the knurled wheel 52 off the metal strip also for the raising of the counterweight 67, whereby the machine is ready for a further operation.

What is claimed is:

1. In a bale-strapping machine using metal strip and comprising a working table for receiving the bales to be strapped, means to hold a reserve of metal strip, means for delivering and pulling back the metal strip for strapping each bale, means for tensioning the metal strip thus pulled back, a power unit operating said last mentioned means, means to hold a reserve of seal members, a clinching station, means for feeding seal members in succession to said station, and a tool assembly arranged at said station for swaging each seal member about the meeting ends of the metal strip hooped about a bale, a two-part coupling interposed between the power unit and the means for tensioning the metal strip, a hydraulic cylinder, a plunger slidably housed in said cylinder, means interconnecting said plunger and a part of said coupling, and braking means for checking the motion of the piston through said cylinder and constituting a dashpot brake for adjusting the tension of application of the metal strip about the bale, said plunger defining a pair of chambers in said cylinder, a channel providing communication between said chambers, a throttling port in said channel, means for adjusting the flow area of said port and therefore the resistance to the motion of the piston and the tension under which the metal strip is applied about the bale, and ports closed off during the operating stroke of the plunger while permitting quick return thereof.

2. In a bale-strapping machine using metal strip and comprising a table for receiving the bale to be strapped, means to hold a reserve of metal strip, means for delivering and returning the strip by pulling action for tightly hooping the bale, a power unit for operating the strip-delivering and pulling means, means to hold a stock of seal members, a clinching station, means for feeding the seal members to said clinching station, and a tool assembly arranged at said station for adapting each seal member in succession to the meeting ends of the strip girdling the bale, a knurled wheel for tensioning the metal strip, means for applying said wheel to the strip while exerting a small pressure thereon while the strip is returned by pulling action and while exerting a large pressure thereon while the strip is subjected to the hooping tension, said power unit also revolving said knurled wheel, a two-part coupling interposed between said power unit and the knurled wheel, and dashpot braking means for de-clutching said coupling responsive to a predetermined tension of application of the metal strip about the bale.

3. In a bale-strapping machine according to claim 2, an eccentric shaft carrying the knurled wheel, a train of gears driving said eccentric shaft from the power unit through the coupling, and means for setting the angular position of said eccentric shaft for adjusting the degree of the force with which the knurled wheel is applied to the metal strip.

4. In a bale-strapping machine using metal strip comprising a working table for the bale or package to be strapped, means to hold a reserve of strip, means for delivering and returning by a pulling stress the metal strip for girdling the bale, a power unit operating said means, means to hold a stock of seal members, a clinching station, means for feeding each seal member to said station, and a tool assembly arranged at said station for adapting and swaging each seal member over the meeting ends of the bale-girdling strip, a knurled wheel for tensioning the metal strip, an eccentric shaft carrying said wheel, a train of gears operating the knurled wheel from the power unit, a two-part coupling interposed between the power unit and the train of gears, an arm for controlling the position of said eccentric shaft, a rockable sector, a link connecting said sector to said shaft, a counterweight carried by said sector, means holding said sector in three successive positions, namely an inoperative position, a partly rocked position and a fully rocked position for keeping the knurled wheel off the metal strip and then for applying it with a reduced force and afterwards with a larger force against the metal strip respectively, and dashpot braking means controlling a part of said coupling and performing the declutching thereof responsive to a predetermined girdling tension of said strip around the bale.

5. In a bale-strapping machine using metal strip comprising a working table for laying the bale or package to be strapped, means to hold a reserve of metal strip, means for delivering and returning by a pulling stress the metal strip for girdling the bale, strip-tensioning means, a power unit for jointly operating said means, means to hold a stock of seal members, a clinching station, means for feeding each seal member in succession to said station, and a tool assembly arranged at said station for applying and swaging each seal member about the meeting ends of the strip girdling the bale, a two-part coupling interposed between said power unit and said tensioning means, the parts of the coupling comprising a pair of plates having ramps, a slidable shaft on which one of said plates is mounted in fixed relation, the axial sliding motion of the shaft performing a declutching action, and dashpot braking means positively connected to the slidable shaft for permitting said shaft to slide and therefore declutching to occur responsive to a predetermined girdling tension of the metal strip about the bale.

6. In a bale-strapping machine according to claim 5, said dashpot braking means comprising a hydraulic cylinder, a plunger slidably mounted in this cylinder for defining two chambers therein, a communication channel having a throttled port interconnecting said chambers, a needle valve for adjusting the cross sectional area of said channel, a transverse oscillatable shaft, an arm carried by said shaft and connected to the piston, a heel portion on said oscillatable shaft, and a projection on the slidable shaft of the coupling, said projection being engageable by said heel portion whereby the dashpot braking means does not permit said shaft to slide and does not allow declutching to occur except responsive to a predetermined girdling pressure of the metal strip around the bale in terms of the degree of adjustment of said needle valve.

7. In a bale-strapping machine according to claim 6, a cam carried by the oscillatable shaft, and means actuated by said cam for bringing into inoperative position the strip-delivering and strip-returning means.

8. In a bale-strapping machine using metal strip comprising a working table for supporting the bales to be strapped, means to hold a reserve of metal strip, means for delivering and pulling back the strip girdling and clamping a bale on the table, tensioning means, a power unit for operating said means, means to hold a stock of seal members, a clinching station, means for feeding each seal member to said station sequentially, and a tool assembly arranged at said station for applying and swaging

said seal members about the meeting ends of the metal strip that girdles the bale, dashpot braking means for adjusting the girdling tension of the metal strip about the bale, a coupling interposed between the power unit and the tensioning means, said coupling being controlled by said dashpot braking means, a primary control device including a treadle operating said strip-delivering and pulling means in one direction, a secondary control device including a treadle operating the last-cited means in the

opposite direction by the energy of the power unit, and ratchet means interposed between the coupling and the power unit for driving said coupling only when the metal strip is returned by being pulled back by said means.

References Cited in the file of this patent

UNITED STATES PATENTS

2,707,429 Leslie et al. ---------- May 3, 1955