

May 21, 1968

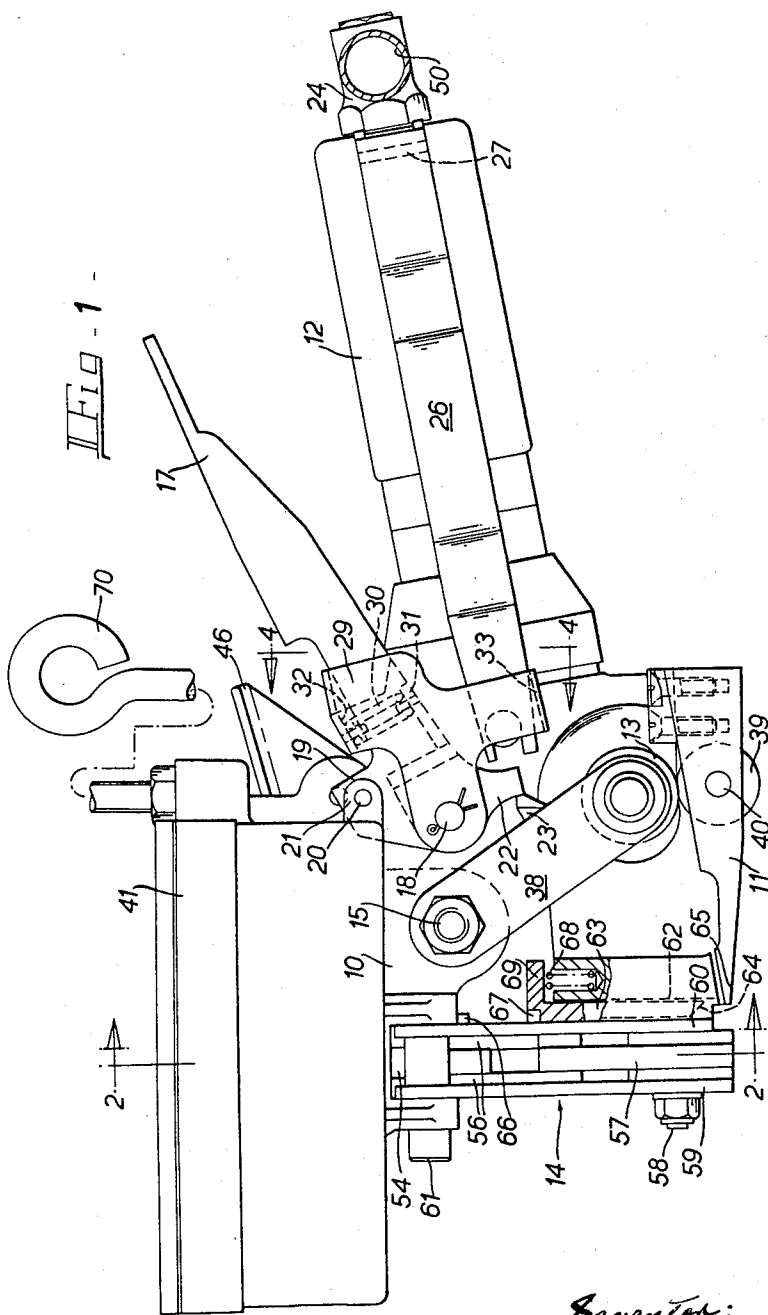
R. D. SANSUM

3,384,131

POWER-OPERATED STRAPPING TOOL

Filed Feb. 7, 1966

4 Sheets-Sheet 1



Inventor:
Robert D. Sansum
By Lemon, Palmer,
Stewart & Estabrook
Attorneys

May 21, 1968

R. D. SANSUM

3,384,131

POWER-OPERATED STRAPPING TOOL

Filed Feb. 7, 1966

4 Sheets-Sheet 2

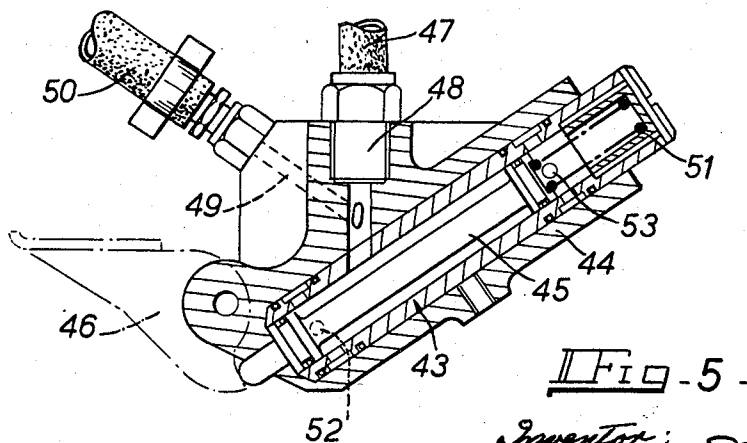
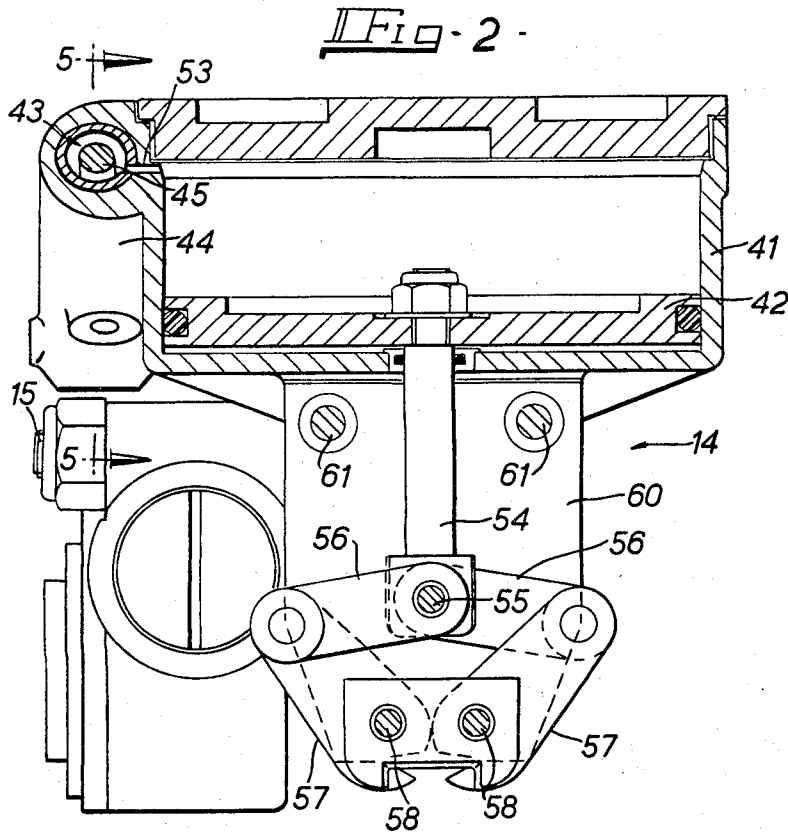


FIG. 5

Inventor: Robert D. Sansum
By Remon, Palmer, Stewart & Estabrook, Attorneys

May 21, 1968

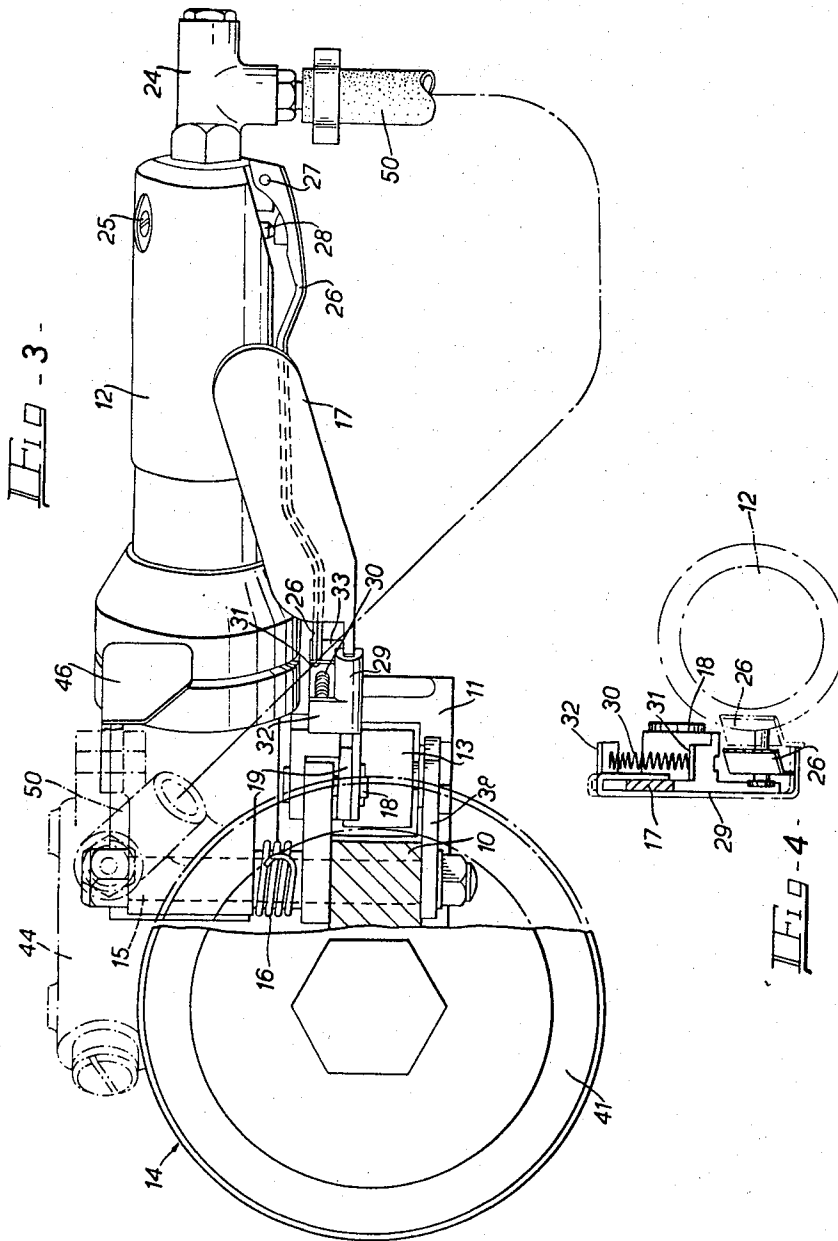
R. D. SANSUM

3,384,131

POWER-OPERATED STRAPPING TOOL

Filed Feb. 7, 1966

4 Sheets-Sheet 3



Inventor:
Robert D. Sansum
By Kemor Palmer,
Stewart & Estabrook
Attorneys

May 21, 1968

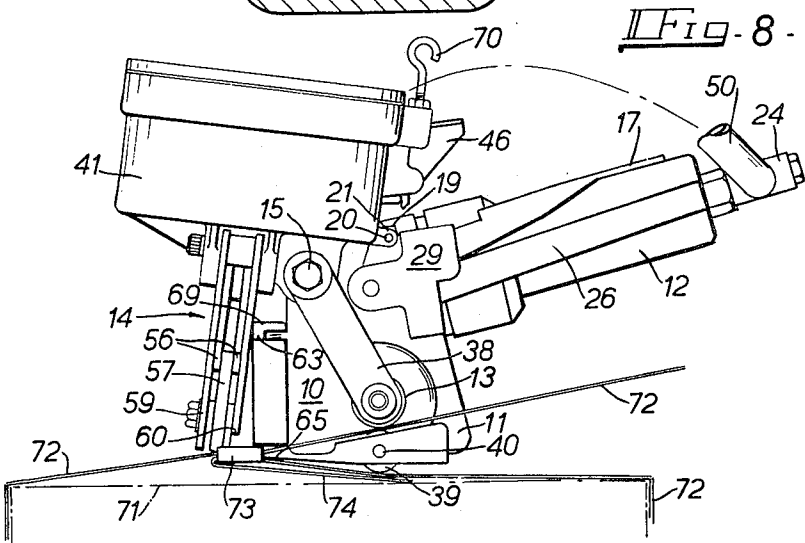
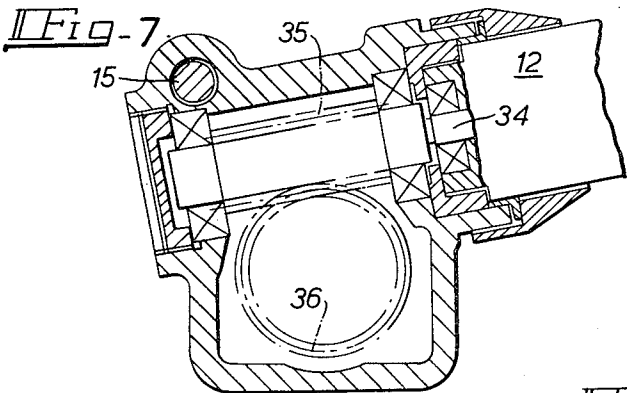
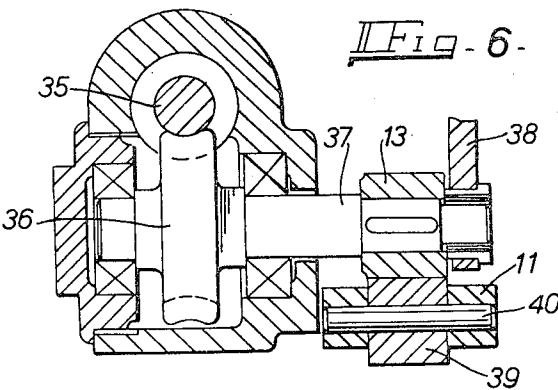
R. D. SANSUM

3,384,131

POWER-OPERATED STRAPPING TOOL

Filed Feb. 7, 1966

4 Sheets-Sheet 4



Inventor: Robert D. Sansum
By Remon Palmer,
Stewart & Estabrook,
Attorneys

1

3,384,131

POWER-OPERATED STRAPPING TOOL

Robert David Sansum, Enfield, England, assignor to Gerard Industries Limited, London, England, a British company

Filed Feb. 7, 1966, Ser. No. 525,694

Claims priority, application Great Britain, Feb. 12, 1965, 49,584/64

9 Claims. (Cl. 140—93.2)

ABSTRACT OF THE DISCLOSURE

A power-operated strapping tool for tensioning and securing a strap of metal around a package having an air motor assembly including a rotary gripper wheel for engaging and applying tension to the strapping. A strap severing means is embodied in the tool and upon severing the strap at the end of a cycle of operation of said tool results in a sudden release of tension on the gripper wheel and a stopping of the motor.

The present invention consists in a power-operated strapping tool of the kind described comprising a body, a foot rigid with the body, means for holding one end of the loop with respect to the body, and an air motor assembly including a rotary gripper wheel rotatable by the motor, which assembly is pivoted to the body about an axis parallel to that of the gripper wheel for movement of the gripper wheel towards and away from a normal position in which the gripper wheel will engage strapping passing over the foot, and so arranged that tension applied to the strapping by rotation of the gripper wheel urges the motor assembly about the pivotal axis in the direction for movement of the gripper wheel towards the foot, the tool further comprising strap jointing means which at least during tensioning is rigid with the body, strap severing means between the joint forming means and the gripper wheel, a motor control member mounted on the motor and normally urged towards the "off" position, and a latch mounted on the body and adapted to retain the motor control member in the "on" position after manual actuation of the motor control member, the arrangement being such that after the tensioning and jointing of the strapping, upon severing the strapping portion between the joint and the gripper wheel, the resulting sudden relaxation of tension causes reaction pivotal movement of the motor control member with respect to the latch sufficient to release the control member from the latch.

In operation, at the end of the tensioning rotation of the gripper wheel the motor stalls and holds the strapping under pre-determined tension until completion of the jointing operation. The automatic release of the motor control member according to the invention at the instant of severing removes air pressure from the motor at the moment its torque is no longer required and prevents the motor racing.

The motor control member is preferably movable relative to the motor in a direction parallel to the pivotal axis. The latch may be lightly spring urged towards the direction in which the control member moves for release from the latch and have a sear extending towards the control member the tip of which holds the control member "on" in the retaining position and the side of which the control member engages on releasing movement so that on return of the motor assembly to its normal position the latch is taken with it and the spring compressed. The latch is then self-engaging as the spring will move

2

it to the retaining position when the motor control member is next actuated.

Although in normal operation the strapping is left under tension by the motor until completion of the jointing operation, as a precaution, the gripper wheel drive is preferably so arranged that, if the motor, after tensioning, is accidentally switched off, no relaxation of tension occurs. The motor may, for example, drive the gripper wheel through irreversible worm gearing.

The jointing and severing means may be hand operated but is preferably power driven by compressed air. The jointing means is preferably of the type for making a joint including a seal or sleeve around the overlapping ends of the strapping loop.

An embodiment of the invention will now be described by way of example with reference to the accompanying drawings in which,

FIGURE 1 is a side view of a tool according to the present invention in the closed position with sealing means of the tool in an inoperative condition.

FIGURE 2 is a section of the tool on line 2—2 of FIGURE 1, showing the sealing means in an operative condition.

FIGURE 3 is a plan view of the tool, partly in section, FIGURE 4 is a fragmentary section on line 4—4 of FIGURE 1,

FIGURE 5 is a fragmentary section on line 5—5 of FIGURE 2,

FIGURES 6 and 7 are fragmentary sectional views of transmission gearing included in the tool, and

FIGURE 8 is a side view similar to FIGURE 1 but on a reduced scale and showing the tool open and in position for tensioning strapping around a package.

The tool comprises three main components, a body 10 including a strap foot 11, a tension assembly including an air motor 12 driving a gripper wheel 13 and a pneumatically powered sealer head 14. These three main components are pivotally connected together with about a horizontal axis by a main pivot pin 15 and urged to the position shown in FIGURE 1 by a torsion spring 16 around the main pivot pin 15. Their relative movement is under the control of a tool opening arm 17 pivoted at one end to the body 10 for angular movement in a vertical plane by a pivot pin 18 parallel to the main pivot pin 15. An upwardly directed nose 19 of the arm 17, above the pivot pin 18, is pivotally connected by a pin 20 to and between a pair of spaced brackets 21 on the sealer head 14. Angular movement of the arm 17, and therefore of the sealer head 14, relative to the body 10 is limited by the engagement of a heel 22, FIG. 1, on the arm 17 below the pivot pin 18 with an abutment 23 on the body. The air motor 12 of the tension assembly is supplied with compressed air through a T-piece 24 and a restricting valve 25 in the outer end of the air motor. A motor control member 26 extending alongside the air motor 12 and pivoted to the outer end of the air motor by a pivot 27 operates a valve member 28, FIGURE 3, of the restricting valve 25 to admit air to the air motor.

A latch 29 is also pivoted to the body 10 on the pivot pin 18 by which the arm 17 is pivoted to the body. The latch 29 is urged in an anti-clockwise direction as seen in FIGURE 1, by a compression spring 30 bearing at one end on a lug 31 on the arm 17, as shown most clearly in FIGURE 4, and at the other end against a lug 32 on the latch 29. On the lower edge of the latch 29 is an inwardly directed flange 33 forming a sear the upper side of which, when the tool is in the condition shown in FIGURE 1, is engaged by the lower edge of the control member 26, as shown in full lines in FIGURE 4. In this condition of the tool the compression spring 30 is compressed. When the control member 26 is pressed inwards towards

3

the air motor to an "on" position in which it operates the valve member 28, it passes beyond the tip of the flange 33 which is moved upwards by the compression spring 30 so that its tip engages the face of the control member 26 to hold the control member "on," as indicated by broken lines in FIGURE 4.

A drive shaft 34 of the air motor 12 drives a worm 35, as shown in FIGURES 6 and 7, in mesh with a worm wheel 36 which transmits the drive to a shaft 37 to which is keyed the gripper wheel 13, FIGURE 6. The worm gearing is irreversible. The end of the shaft 37 outside the gripper wheel 13 is journaled in one end of a carrier 38 pivoted at the opposite end on the main pivot pin 15. Pivotal movement of the air motor assembly about the main pivot pin 15 moves the gripper wheel 13 towards or away from the strap foot 11 of the body 10 and into or out of contact with a roller 39 carried on a spindle 40 mounted in the strap foot 11.

The sealer head 14 includes an air cylinder 41 in which works a piston 42, as shown in FIGURE 2, under the control of a piston valve 43, shown in detail in FIGURE 5, in a housing 44 on one side of the cylinder 41. The piston 45 of the valve 43 is operable by a thumb lever 46 pivoted on the housing 44. Compressed air is supplied to the piston valve 43 by an air line 47 connected to an entry 48 in the housing 44 leading to the piston valve. The air for the air motor 12 is also taken from the entry 48 by way of a passage 49 opening to one end of a pipe 50 connected at its other end to the T-piece 24. The piston 45 of the piston valve 43 is loaded by a valve spring 51 towards the position shown in FIGURE 5 in which air is admitted to the bottom of the cylinder through a bottom passage 52 leading from the piston valve 43. When the thumb lever 46 is pressed down, the piston 45 is moved, against the action of the valve spring 51, to a position in which air passes through a top passage 53 to the top of the cylinder 41. FIGURE 2, so that air pressure is removed from the underside of the piston 42 in the cylinder and applied to the top of the piston 42 to cause the piston to be moved downwards in the cylinder.

The piston 42 in the cylinder 41, as shown in FIGURE 2, is connected to a piston rod 54 and through a cross-head pin 55 and toggle links 56 to sealing jaws 57 angularly movable about parallel jaw pivots 58 supported in front and rear end plates 59 and 60 respectively, FIGURE 1, secured by bolts 61 to the underside of the cylinder 41 in front of the strap foot 11. In FIGURE 2, the sealing jaws 57 are shown in the closed condition. Behind the rear end plate 60 in a guideway 62, FIGURE 1, in the front face of the body 10 is a vertically slidable cutter blade 63, the tip 64 of which is chamfered on the side towards the sealing jaws 57 and the opposite face of which co-operates with the sharp edge of a toe 65 on the strap foot 11 for cutting strapping. The movable cutter blade 63 is actuated towards the lower end of the downward movement of the piston rod 54 on engagement by a rearward extension 66 of the cross-head pin 55 with the bottom of a groove 67 in the front face of the cutter blade 63 in which the extension 66 moves. The cutter blade 63 is normally urged to its raised inoperative position by a compression spring 68 which bears at its lower end on the body 10 and at its upper end on the underside of a rearward flange 69 at the top of the cutter blade.

A lifting eye 70 is provided on the sealer head 14 by means of which the tool can be supported in use from suitable counter-balancing means.

In the tying of a package 71, as shown in FIGURE 8, metal strapping 72 drawn from a dispenser, not shown, is inserted through a push type seal 73 of sleeve form, drawn by hand in a loop around the package 71, and the free end 74 of the strapping 72 again inserted through the seal 73 by about six inches. This protruding amount of the free end 74 is bent back under the seal 73 and the slack strapping 72 brought into contact with the package 71 by pulling the surplus strapping back towards the dis-

4

penser through the seal by hand. The strapping is then ready for insertion in the tool.

The tool is opened by gripping and squeezing together by hand the opening arm 17 and the air motor 12. Because of the limitation of the movement of the opening arm 17 by the engagement of its heel 22 with the abutment 23 on the body 10, the relative movement between the opening arm 17 and air motor 12 is shared so that the sealing jaws 57 are moved away from the body 10 and the gripper wheel 13 is raised from the roller 39, as shown in FIGURE 8. While the tool is in this condition the strapping 72 is inserted laterally under the sealing jaws 57 and between the gripper wheel 13 and roller 39. On release of the opening arm 17 and air motor 12 the torsion spring 16 restores the main components of the tool to the position shown in FIGURE 1 with the sealing jaws 57 straddling the seal 73, and the overlapping portions of the strapping which the seal encloses, and the gripper wheel 13 grips the portion of the strapping 72 extending from the seal towards the dispenser. The air motor control member 26 is then pressed inwards to the "on" position and retained in that position by the tip of the latch 29 as previously described. The gripper wheel 13 is caused to rotate in the direction to tension the loop and pulls the strapping through the seal 73, one end of which abuts the toe 65 of the strap foot 11. The tension applied to the strapping by the rotation of the gripper wheel 13 urges the air motor assembly about the main pivot pin 15 in the direction of movement of the gripper wheel towards the strap foot 11. When the tension predetermined by the adjustment of the restricting valve 25 is reached, the air motor stalls. If at this stage the air motor should inadvertently be switched "off" tension will be retained by the irreversible worm gearing.

When the air motor 12 stalls the operator presses down the thumb lever 46 which, as previously described, causes the piston 42 to be moved downwards in the cylinder 41 of the sealer head 14 to move the sealing jaws 57 inwards and crimp the seal 73. Towards the end of this crimping movement of the sealing jaws the chamfered tip 64 of the cutter blade 63 is moved downwards between the end of the seal and the toe 65 on the strap foot 11 to sever the surplus strapping close to the seal.

The sudden relaxation of tension on the gripper wheel 13 causes the air motor to jerk upwards. This lifts the motor control member 26 above the flange 33 of the latch 29 and allows it to spring outwards and cut off the air supply to the air motor. When the air motor drops back to its normal position shown in FIGURE 1 the control member 26 is again above the upper side of the flange 33 of the latch 29 and the latch is moved down with it, compressing the compression spring 30 ready for re-engagement of the latch on the next operation of the control member 26.

The thumb lever 46 is then released by the operator so that the piston 45 of the piston valve 43 is returned to its normal position by the valve spring 51 thus diverting the air to the bottom of the cylinder 41 to cause the piston 42 to rise to its top position in the cylinder and open the sealing jaw members 57 to release the tool from the completed loop of strapping 72 around the package 71.

I claim:

1. A power-operated tool for tensioning and securing the ends of metal strapping looped around a package comprising a body, a foot rigid with the body, means for holding one end of the loop of strapping with respect to the body, and an air motor assembly including a rotary gripper wheel rotatable by the motor, which assembly is pivoted to the body about an axis parallel to that of the gripper wheel for movement of the gripper wheel towards and away from a normal position in which the gripper wheel will engage strapping passing over the foot, and so arranged that tension applied to the strapping by rotation of the gripper wheel urges the motor assembly about the pivotal axis in the direction for movement of the

5

gripper wheel towards the foot, the tool further comprising strap jointing means which at least during tensioning is rigid with the body, strap severing means between the joint forming means and the gripper wheel, a motor control member mounted on the motor and normally urged towards the "off" position, and a latch mounted on the body and adapted to retain the motor control member in the "on" position after manual actuation of the motor control member, the arrangement being such that after the tensioning and jointing of the strapping, upon severing the strapping portion between the joint and the gripper wheel, the resulting sudden relaxation of tension causes reaction pivotal movement of the motor control member with respect to the latch sufficient to release the control member from the latch.

2. A power-operated strapping tool according to claim 1 wherein the motor control member is movable relative to the motor in a direction parallel to the pivotal axis.

3. A power-operated strapping tool according to claim 1 wherein the latch is self engaging with the control member to retain the control member in the "on" position.

4. A power-operated strapping tool according to claim 3 wherein the latch is spring urged towards the direction in which the control member moves for release from the latch and has a sear extending towards the control member the tip of which sear holds the control member "on" in the retaining position and a side of which sear the control member engages on releasing movement so that on return of the motor assembly to its normal position the latch is taken with it and the spring compressed.

6

5. A power-operated strapping tool according to claim 1 wherein the gripper wheel is driven by the motor through a drive so arranged that, if the motor, after tensioning, is accidentally switched off, no relaxation of tension occurs.

6. A power-operated strapping tool according to claim 5 wherein the gripper wheel is driven through irreversible worm gearing.

7. A power-operated strapping tool according to claim 1 wherein the strap jointing and severing means are power driven by compressed air.

8. A power-operated strapping tool according to claim 7 wherein the strap jointing means comprises jaw members operable through the piston of an air cylinder controlled by a manually-operated valve.

9. A power-operated strapping tool according to claim 8 wherein the strap severing means comprises a cutter blade actuated through the piston towards the end of the jointing operation of the jaw members to co-operate with a toe of the foot and sever the strapping.

References Cited

UNITED STATES PATENTS

3,150,694	9/1964	Meier	140—123.6
3,198,218	8/1965	Ericsson et al.	140—93.4
3,211,186	10/1965	Bushman	140—93.4
3,329,178	7/1967	Plunkett	140—93.4

CHARLES W. LANHAM, *Primary Examiner.*

L. A. LARSON, *Assistant Examiner.*