July 17, 1956 J. T. MURRELL ET AL 2,754,958

STAPLING MECHANISM

Filed Oct. 19, 1953 2 Sheets-Sheet 1

FIG. 3.

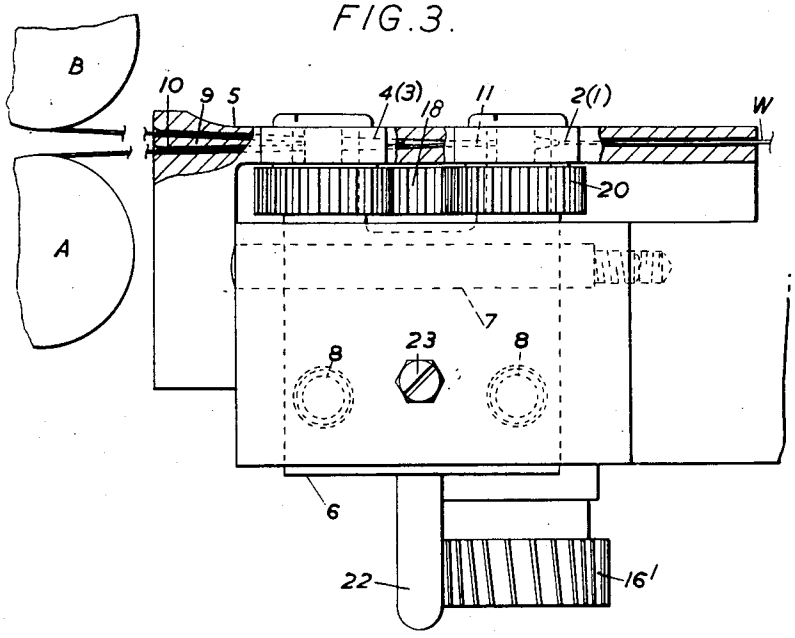
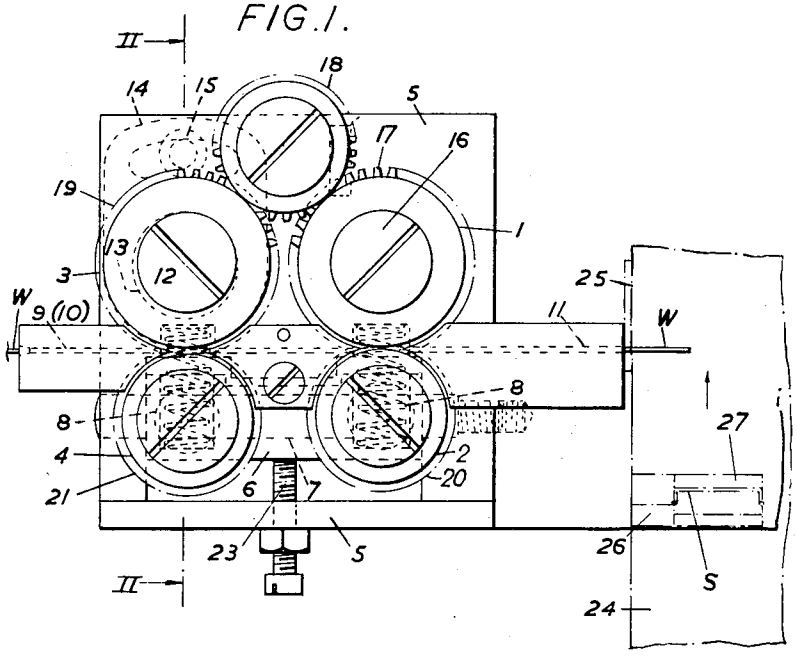


FIG. 1.



Inventors
John Thomas Murrell
George Turrall
By Baldwin & Wight
Attorney

July 17, 1956 J. T. MURRELL ET AL 2,754,958

STAPLING MECHANISM

Filed Oct. 19, 1953 2 Sheets-Sheet 2

FIG. 2.

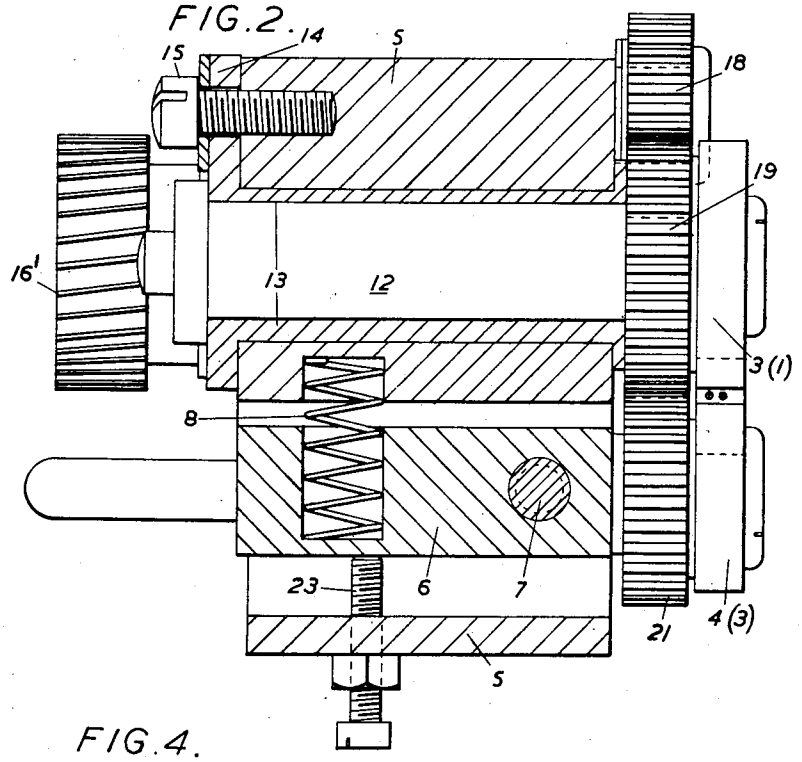


FIG. 4.

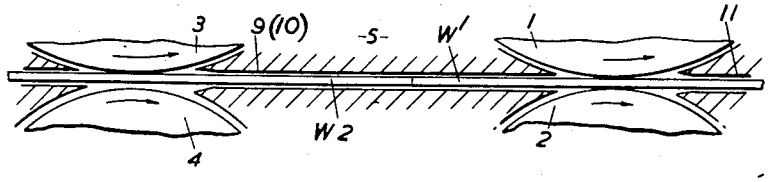
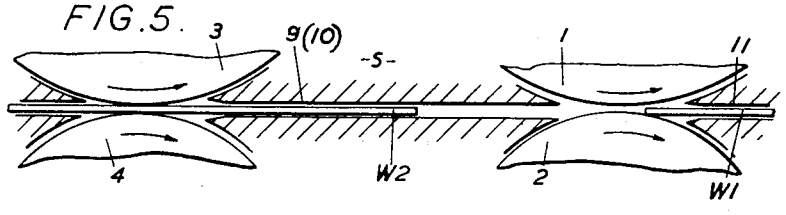


FIG. 5.



Inventors
John Thomas Murrell
George Turrall
By
Baldwin & Wright
Attorney

United States Patent Office 2,754,958 Patented July 17, 1956

2,754,958

STAPLING MECHANISM

John Thomas Murrell, Barking, and George Turrall, Wandsworth Common, England, assignors to R. W. Crabtree & Sons Limited

Application October 19, 1953, Serial No. 386,888

12 Claims. (Cl. 203—65)

This invention relates to stapling mechanism of the kind which is employed in printing, box-making and other machines for the purpose of stapling together a number of webs or sheets of papers, card or similar material to form the product of the machine.

In such machines the staples are formed as they are about to be inserted for which purpose wire is fed from a supply spool to a device which cuts lengths of staple-forming wire, forms the staples and inserts them.

The demand for the wire is such that it is frequently necessary in the course of a production run to replenish the wire supply and this involves stopping the machine while wire from a new spool is applied to the wire feeding device: the wire employed is of small diameter and the introduction of the leading end of the wire from the new spool is not alway easy so that the change-over to a new spool takes some time and causes a loss in production. In addition, an operator has to watch the spool in use so as to make the necessary change when the spool is about to become exhausted and, to avoid the possibility of the wire supply running out before the wire supply has been replenished, the operator is compelled to make the change before the spool has become completely exhausted so that some wastage of wire occurs.

The main object of this invention is to provide a wire-feed mechanism which will enable the wire feed to the staple cutting, forming and inserting device (hereinafter referred to as the staple forming device) to be continuously maintained from a number of spools without the necessity for stopping the wire-consuming machine.

Broadly stated the present invention consists in providing a wire-feed mechanism which is arranged to detect when the supply of wire from one spool or other source of supply is about to be exhausted and to operate thereupon automatically to take the leading end of wire from another spool to maintain the feed of wire to the staple forming mechanism.

The detection can be provided by passing the wire from a spool in use between two components which are held apart so long as wire is present between them but which move together when the end of the wire arrives, the resulting relative movement of the components causing the leading end of wire from a fresh spool to be taken and fed forward to the staple forming device. The two detecting components can be constituted by feed rolls which are driven to feed the wire to the staple forming device, and in such a case, when the wire passes out of the nip of the rolls, another pair of rolls is caused to nip the leading end of the fresh wire and advance it to the feed rolls.

A preferred form of construction is shown in the accompanying drawings in which Figure 1 is a plan view, Figure 2 a section on the line II—II, Fig. 1, and Fig. 3 a side elevation of a wire feed unit. Figs. 4 and 5 are diagrammatic views showing the manner of operation of a device according to this invention.

Referring to the drawings the mechanism shown is intended to advance continuously staple forming wire

W from a supply spool so that lengths can be successively sheared from its projecting end by a cutter, the sheared length being taken by a stapling machine which forms the length of wire into a staple and forces the staple through sheets or plies to be stapled together: the mechanism is arranged to enable the wire when it is exhausted to be replaced automatically by another wire.

To effect this two pairs of feed rolls 1, 2 and 3, 4 are provided: the rolls 1, 3 of the two pairs are carried by a fixed frame 5 while the rolls 2 and 4 are carried by a frame 6 mounted on a pivot pin 7 on the fixed frame 5.

The frame 6 is urged to rock on the pivot by springs 8, which are so arranged with respect to the pivot pin as to afford a bias urging the rolls 2, 4 towards the rolls 1 and 3. The rolls 3 and 4 have a slightly greater distance between their centres of rotation than the rolls 1, 2 so that so long as wire (indicated at W) is located between the primary rolls, 1, 2 those rolls alone grip and advance the wire, the wire passing freely between the secondary rolls 3, 4.

The fixed frame 5 is formed with two converging wire guides 9, 10 for wire drawn from two separate spools A, B; the two guides converge into a single guide 11 at a point between the primary rolls 1, 2 and the secondary rolls 3, 4, all the guides cutting into the nip between the two pairs of rolls.

So long as wire passing through one guide, say the guide 9, from one spool B is present between the primary rolls 1, 2 wire drawn from the other spool A can be introduced through the other guide 10 between the secondary rolls 3, 4 up to the point of convergence.

When the end of the wire from the spool B in use passes out of the nip of the primary rolls 1, 2, the pivoted frame 6 is allowed to rock to carry the pairs of rolls towards one another: the secondary rolls 3, 4 are now able to bite upon and advance the wire from the other spool A to the nip of the primary rolls 1, 2 which then maintain the wire feed but with wire taken from the fresh spool A.

The wire feed having now been replenished by wire taken from the fresh spool, wire from another spool replacing the exhausted spool B is passed, at any time while the wire is passing from the fresh spool A, between the secondary rolls 3, 4 which are again held apart by the wire between the primary rolls 1, 2 so that the mechanism is ready for a further automatic replenishing action when the fresh spool A is itself exhausted.

The action will be clearly seen from Figs. 4 and 5: Fig. 4 shows the setting of the parts when the wire in use (indicated at W_1) is being fed by the primary rolls 1, 2 but is about to expire; Fig. 5 shows the setting of the parts when the expiring wire W_1 has passed out of the nip of the primary rolls 1, 2 and the replenishing wire (indicated at W_2) is being fed forward by the secondary rolls 3, 4 to the nip of the primary rolls 1, 2.

The point at which the two guides 9, 10 converge would be arranged as closely as possible to the nip between the primary rolls 1, 2 so that, the trailing end of the wire W_1, which is about to be replenished, will be followed very closely by the leading end of the fresh wire W_2: the secondary rolls 3, 4 will thus advance the replenishing wire only a very small distance from the point of convergence to the nip of the primary rolls 1, 2; the leading end of the fresh wire W_2 having passed into the nip of the primary rolls 1, 2 will then engage the trailing end of the replenished wire W_1 and advance it to the staple forming mechanism so that no wastage of wire occurs.

The axes of rotation of the rolls 1—4 can be fixed at the centres necessary to hold the rolls 3, 4 at a slightly greater separation than the rolls 1, 2: it is however preferred to arrange for adjustment of the distances of one or other pair of rolls: as shown, this is effected by mounting the spindle 12 carrying the roll 3 of the secondary

pair in an eccentric bush **13** having an adjusting flange **14** receiving a locking screw **15**.

Drive to the rolls is effected through a gear **16'** on the spindle **16** of the primary roll **1**, this spindle having a gear **17** which transmits drive through an intermediate gear **18** to a gear **19** on the spindle **12** of the secondary roll **3**: the gear **17** also meshes with a gear **20** on the other primary roll **2** and the gear **19** meshes with a gear **21** on the other secondary roll **4** so that all the rollers are driven in unison.

For the purpose of enabling the pivoted frame **6** to be moved by hand to separate the pairs of rolls when initially threading wire into position, the frame **6** is provided with an arm **22** and a screw **23** is provided to limit adjustably the approach of the rolls under the action of the springs **8**.

Reference will again be made to Fig. 1 which shows one application of a wire feed mechanism according to this invention, the application being to a stapling mechanism according to the invention described in the specification of the pending application Ser. No. 328,578 and now Patent No. 2,709,808.

That stapling mechanism employs a staple forming cylinder **24** which as it rotates operates a cutter **25** disposed to sever a staple-forming length of wire, this length being taken by beaks **26** disposed on the periphery of the cylinder about a staple-forming recess **27** in the cylinder: cooperating with this recess is a punch which is fixed to a punch cylinder so that as the cylinders rotate the punch runs into and out of the recess **27** and in so doing forces the cut length of wire into the recess to form a staple indicated at S. In such an application the cutter **24** will be disposed to shear off the requisite length of wire from the end of the wire as it is advanced out of the guide **11** by the action of the feed rolls as has been described.

It will be obvious that an arrangement according to this invention enables an operator at any time while wire is being drawn from a spool, to dispose the leading end of fresh wire from another spool in a position ready to be taken when the first expires: the operator is thus afforded ample time to carry out this operation and is relieved of the necessity for observing when the supply of wire should be transferred to a new spool: these advantages are obtained in addition to the avoidance of stopping the machine.

What we claim is:

1. For use with a continuously acting wire-consuming stapling machine, a wire-feeding mechanism comprising a pair of wire-advancing devices to receive respectively the leading ends of a wire supply from two different sources, and means controlled by the presence of wire at one of the advancing devices automatically to hold the other advancing device inactive and to render the other advancing device active to advance wire as the trailing end of the wire being fed passes the said one device.

2. For use with a continuously acting wire-consuming stapling machine, a wire feeding mechanism comprising a wire-feeding device, a wire advancing device, the two devices being arranged to receive the leading ends of wire from two supply sources, and means controlled automatically by the presence of wire at the feeding device to render the advancing device inoperative, and to render the advancing device operative to advance wire to the feeding device when the trailing end of the wire being fed by the feeding device passes said feeding device whereby an automatic continuous feed of wire is effected.

3. For use with a wire-consuming stapling mechanism, a wire feed mechanism comprising driven feed rolls biased to move relatively towards one another, means mounting said feed rolls for relative movement towards and away from one another, means to advance wire taken from one of two sources of supply to a position between the feed rolls to hold them apart, and means mounting said advancing means and operatively connecting said advancing means to said feed rolls for movement with said feed rolls, the presence of wire between said feed rolls maintaining them relatively apart against their bias and rendering said advancing means inactive, the passage of the trailing end of said wire from between said feed rolls permitting said feed rolls to move relatively towards one another under the influence of their bias and rendering said advancing means active to advance wire from the other source of supply to a position between the feed rolls.

4. A wire-feed mechanism as claimed in claim 3 and wherein the advancing means comprises a second pair of driven rolls having a greater separation than the feed rolls, the wire from both sources of supply being passed between the rolls of the second pair, which rolls are relatively movable towards and away from one another in unison with the corresponding movement of the feed rolls.

5. A wire feed mechanism as claimed in claim 4 and wherein one of the rolls of each pair is carried by a first support and the other rolls are carried by a second support movable relatively to the first support and being urged to carry the rolls toward one another.

6. A wire feed mechanism as claimed in claim 5 and wherein the second support is pivotally carried by the first.

7. A wire feed mechanism as claimed in claim 6 and having separate converging guides to direct wire from the two sources of supply between the rolls of the second pair, the guides converging to a single delivery guide.

8. A wire feed mechanism as claimed in claim 7 wherein the converging guides are arranged to converge into the single delivery guide at a zone between the first and second pairs of rolls.

9. A wire feed mechanism as claimed in claim 4 and having separate converging guides to direct wire from the two sources of supply between the rolls of the second pair, the guides converging to a single delivery guide.

10. A wire feed mechanism as claimed in claim 9 and wherein the converging guides are arranged to converge into the single delivery guide at a zone between the first and second pairs of rolls.

11. A wire feed mechanism as claimed in claim 5 and having separate converging guides to direct wire from the two sources of supply between the rolls of the second pair, the guides converging to a single delivery guide.

12. A wire feed mechanism as claimed in claim 11 and wherein the converging guides are arranged to converge into the single delivery guide at a zone between the first and second pairs of rolls.

References Cited in the file of this patent

UNITED STATES PATENTS

2,351,111	Davis	June 13, 1944
2,613,706	Smith	Oct. 14, 1952
2,640,654	Schweiter	June 2, 1953