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STAPLING MECHANISM

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5 Claims. (Cl. 1—2)

The invention forming the subject of the present application, (which is a division of my co-pending application Serial No. 68,683, filed March 13, 1936, for improvements in Brush machines) relates to wire staple forming and driving mechanism for general use.

The object of the present invention is to provide novel mechanism of simple and efficient construction and operation whereby wire staples are rapidly and accurately produced.

Another object of the invention is to provide a mechanism of the character mentioned whereby the staples thus produced are driven in successive order into wood, paper or other suitable material.

With these objects in view, and others which will appear, my invention embodies novel features of construction and combinations which will be hereinafter described, the scope of the invention being expressed in the appended claims.

In the drawings—

Figure 1 is a sectional elevation of staple forming and driving mechanism embodying the principle of my invention.

Fig. 2 is a partial horizontal section, in a plane through the plunger slide, as on the line 2—2 of Fig. 1.

Fig. 3 is a perspective view of wire feeding and cutting devices, together with an orbitally movable mandrel which coats therewith and with a fixed staple former to shape succeeding staples in the path of the plunger.

Fig. 4 is a sectional rear elevation of the wire feeding and cutting devices, the mandrel and associated plunger guide with its staple former.

Fig. 5 is an enlarged view of the lower end of a plunger guide constituting the staple former, showing the adjacent fixed members of the wire cutter, and also showing a staple as produced in the staple former.

Fig. 6 is a horizontal section, as on the line 6—6 of Fig. 5, but showing the movable cutter member in co-operative relation to the fixed cutter member and the leading end of the staple wire as severed preparatory to its insertion in the staple former about the mandrel.

Fig. 7 is a transverse vertical section through the wire feeding wheels and adjuncts.

Referring to the drawings, 35 designates a portion of a supporting frame, and 39 designates the main shaft of the machine.

217 designates a vertically reciprocative plunger, the upper end of which is fixed to a vertical slide 237 mounted in a vertical guideway 239 in the frame structure. This slide is connected by means of a link 242 with one arm 243 of a lever

which is fulcrumed on the frame structure, the other arm 244 being pivotally connected by means of a link 245 to the plain face of a cam 246 fast on the main shaft 39. Thus the plunger is vertically reciprocated.

239 designates a stationary staple former comprising a block through which the plunger reciprocates, said block having grooved inner walls to which the plunger is slidably fitted. This block is preferably composed of two mating sections (Figs. 4 and 5) which are fixed in a vertically channeled block 241 fastened to the frame structure. The grooved inner walls of the spaced members of the staple former are adapted to receive and support the depending legs of a staple (S) which is formed and seated between such members, as follows:

A short mandrel 264 of appropriate form is movable in a vertical orbital path traversing the vertical slot of the staple former. This mandrel projects endwise from a bar 265 which is pivoted, at 266, between a pair of depending lugs 267 on the foot 268 of a pendant lever 269, whereof the upper end is slotted as at 270 and slidably fulcrumed on a pin 271 fixed to a bracket 272 on the frame structure. The bar 265 has a slight vertical rocking motion, and is maintained with its acting or mandrel end resiliently raised by means of a spring 367 which is interposed between the bar and the heel of the lever foot 268. The lower forward portion of the lever is pivotally connected to a crank 368 on one end of a short longitudinal shaft 369 having its bearings in the bracket 370 on one side of the frame structure. Fast on the other end of the shaft 369 is a bevel gear 371 in mesh with a similar gear 372 on a short transverse shaft 273 having its bearings in the bracket 370 and also in a bracket 274 also mounted on the frame structure. Fast on the shaft 273 is a sprocket wheel 275 which is connected by means of a chain 276 with a similar wheel 277 on a short shaft 140 suitably mounted below the main shaft. The shaft 140 has fixed thereon a sprocket wheel 142 which is connected with and driven from a similar wheel 143 on the main shaft by a chain 144. Hence the shaft 369 is continuously rotated and the crank 368 thereon actuates the lever 269 in a manner to impart a vertical orbital movement to the foot of the lever and the associated mandrel supporting bar 265, whereby the mandrel is drawn upwardly, into and from the staple former by a continuous sweeping motion.

Adjacent one side of the mandrel 264 is a vertically movable cutter head 273 formed with a beveled vertical face 279. This head is formed

on the expended free end of a horizontal lever 280 pivotally mounted at 281 in a yoke member 282 on an arm 283 which is resiliently supported by a suitable spring 284 secured thereto and to a pin 285 on the frame structure.

The beveled cutter head 278 and the adjacent end of the lever 280 are longitudinally perforated, as at 286, for the passage therethrough of a longitudinal strand of wire (W) which is threaded through a suitable guide tube 287 carried by the lever 280. The body of the wire in its passage to the tube extends between a pair of suitably-disposed feed wheels 288 the lower of which is journaled on a stud shaft 289 projecting from the resiliently supported arm 283 and the upper of which wheels is loose on the transverse shaft 273. Secured to and movable with the respective feed wheels 288 are intermeshing gears 290 by means of which the feed wheels are concurrently rotated by actuation of the shaft 273, and secured also to the feed wheels are two friction wheels 292, the upper of which is peripherally flattened or mutilated, as at 293. While the curved surfaces of the friction wheels are in contact the lower feed wheel is depressed against the resilient action of the arm 283 in a manner to free the wire from the bite of the feed wheels, but when the mutilated surface of the upper friction wheel is in contact with the surface of the lower friction wheel the latter wheel is raised by the resilient action of the arm 283. Thus the wire is engaged by the two feed wheels and thereby intermittently advanced a limited distance to project its free end beyond the cutter head and in the upward path of the moving mandrel. The projecting wire portion, which is equal to a wire length for the formation of a staple, overlies the mandrel in the plane of the lower end of the staple former, such end being grooved for the passage of the projecting wire.

Fixed to the stationary block 241 is a vertical bar 294 having a depending cutter member 295 adjacent one side of the staple former and in close relation to the top of the beveled face of the perforated cutter member 278 so as to overhang the path of the projecting end of the wire. The member 295 is wedge-shaped in cross-section, its beveled face corresponding with and being substantially in the vertical plane of the beveled face of the movable cutter member.

The cutter bearing end of the lever 280 rests upon one arm 296 of a bell crank which is fulcrumed on a bracket 297 in the housing 212, the other arm 298 of the bell crank having a roll 299 which is held in contact with a suitable cam 300 fast on the driven shaft 369. The contour of the cam 300 is such that at a determined interval the bell crank is actuated to effect the oscillation of the lever 280 and the cutter member 278, the beveled edge of which latter in its upward stroke co-acts with the opposing beveled edge of the fixed cutter member 295 to sever the projecting end of the wire at an acute angle. (See Fig. 6). Immediately the wire is severed the mandrel in its upper orbital travel impinges against the opposing midportion of the wire length and carries it forcibly into the staple former, thus bending the wire into the form of a conventional staple which is securely yet slidably held in such former. In the continued orbital movement of the mandrel it recedes from the staple former and the staple preparatory to a similar forming action on the next succeeding wire length presented to the path of the mandrel.

When the staple has been formed and posi-

tioned in the staple former the inserting plunger 217 descends and drives the staple into any underlying material presented thereto.

In the initial downward movement of the plunger 217 the cutter lever 280 is positively lowered at proper intervals by the impact thereon of a depending finger 301 which is secured at its upper end to the slide 247 and is slidable in a lateral extension 302 of the stationary block 241 at the bottom of the vertical guideway 238 of the frame structure. (See Fig. 1.)

It is to be understood that my invention is not limited to the particular construction disclosed, as the mechanism may be modified within the principle of the invention and the scope of the appended claims.

I claim—

1. The combination with a staple driving plunger and a stationary staple former through which the plunger reciprocates, of a mandrel movable under, into and from the staple former through a determined continuous orbital path, means for actuating said mandrel in timed relation to the plunger, means for intermittently projecting the free end of a wire across said mandrel when the mandrel is under the staple former, and means for severing the projecting end of the wire preparatory to the movement of the mandrel into the staple former, whereby in the entrant travel of the mandrel the severed wire is carried into the stationary staple former and therein bent to staple form.

2. The combination with a staple driving plunger and a stationary staple former through which the plunger reciprocates, of a mandrel movable in a vertical orbital path under, into and from the staple former while moving in the same general direction, means for actuating said mandrel in timed relation to the plunger, means for intermittently projecting the free end of a wire across said mandrel when the mandrel is under the staple former, and means for severing the projecting end of the wire preparatory to the movement of the mandrel into the staple former, whereby in the entrant travel of the mandrel the severed wire is carried into the stationary staple former and therein bent to staple form.

3. The combination with a staple driving plunger and a stationary staple former through which the plunger reciprocates, of a mandrel movable under, into and from the staple former through a determined continuous path, a continuously rotating crank for actuating said mandrel in an orbital path and in timed relation to the plunger, means for intermittently projecting the free end of a wire across said mandrel when the mandrel is under the staple former, and means for severing the projecting end of the wire preparatory to the movement of the mandrel into the staple former, whereby in the entrant travel of the mandrel the severed wire is carried into the stationary staple former and therein bent to staple form, said last-named means including coaxing fixed and movable cutter members adjacent the staple former, and means for actuating the movable cutter member.

4. The combination with a staple driving plunger and a stationary staple former through which the plunger reciprocates, of a mandrel movable under, into and from the staple former through a determined continuous orbital path, means for actuating said mandrel in timed relation to the plunger, means for intermittently projecting the free end of a wire across said mandrel when the mandrel is under the staple former, and means

for severing the projecting end of the wire preparatory to the movement of the mandrel into the staple former, whereby in the entrant travel of the mandrel the severed wire is carried into the stationary staple former and therein bent to staple form, said last-named means including coacting fixed and movable cutter members adjacent the staple former, and means including a bell crank and cam for actuating the movable cutter member.

5. The combination with a staple driving plunger and a stationary staple former through which the plunger reciprocates, of a mandrel movable under, into and from the staple former, said mandrel being mounted on one end of a lever, slidable guide means for the other end of the lever, a shaft, a crank on the shaft connected to the

mandrel lever between the mandrel and the guide, means for continuously rotating the said shaft for moving the mandrel into and from the staple former, means for actuating said mandrel in timed relation to the plunger, a cutter member in fixed relation to the staple former, a complementary movable cutter member having a wire guide, means for intermittently projecting the free end of a wire through and beyond the said guide and across said mandrel when the mandrel is under the staple former, and means for actuating said movable cutter in timed relation to the plunger and the mandrel whereby during the entrant travel of the mandrel the projecting wire portion is severed and carried into the stationary staple former.

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