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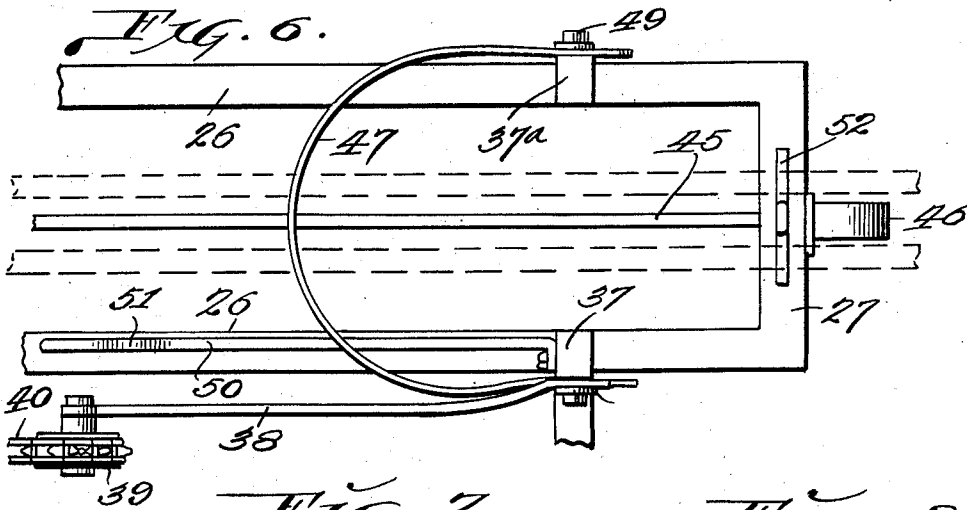
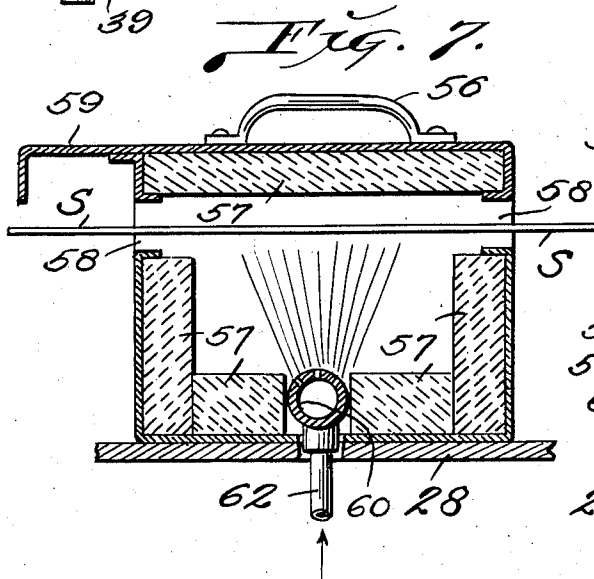
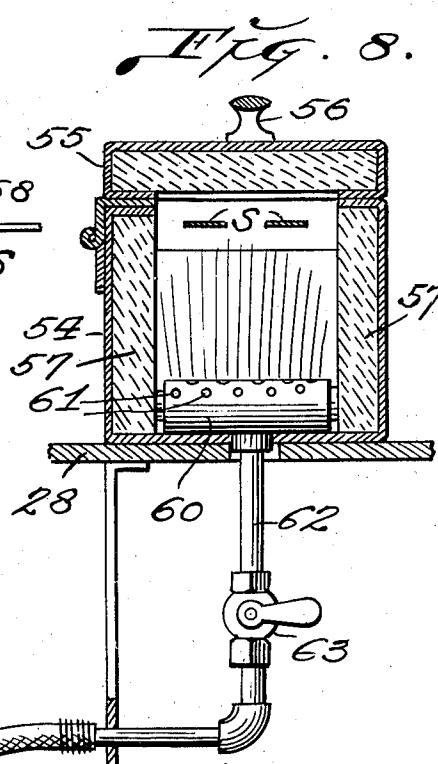
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2,274,072

SPRING STEEL HEATING, SEVERING, AND FORMING MACHINE

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SPRING STEEL HEATING, SEVERING, AND FORMING MACHINE

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My invention relates generally to an apparatus for heating, severing and forming spring steel and the machine herein illustrated and described is especially designed for severing a large coil of tape or ribbon-like metal of resilient metal, preferably steel, into sections of uniform length and shaping the ends of said sections so that the same when coiled to form spiral springs may be used in the conventional forms of spring sash balances although, it is to be understood that springs produced by my improved machine may have their end portions shaped so as to be used with various mechanical structures that require spiral springs.

The principal objects of my invention are, to provide a simple and efficient machine that includes a furnace that encloses and travels forwardly at the same speed with the strip or strips of resilient steel that are acted upon by the machine so as to heat relatively short portions of the steel tape or ribbon, in order that the same may be readily severed and shaped by the dies of a punch press.

Further objects of my invention are, to provide simple and efficient means for imparting reciprocatory movement to the furnace that heats the spring steel, which means includes an endless conveyor, preferably a sprocket chain, that is effective in moving the furnace forwardly at the same speed of travel of the steel tape to the punch press and which furnace reciprocatory means includes spring actuated means for bringing about a quick return of the furnace to its rearward limit of travel.

Further objects of my invention are, to provide automatic means for effecting a driving engagement between the furnace and that portion of the endless conveyor or sprocket chain that moves toward the punch press and for effecting an automatic release of the furnace from said endless conveyor when the latter reaches its forward limit of travel, further, to provide a shock absorber for the reciprocating furnace as it reaches its rearward limit of movement and further, to provide resilient means that functions as a brake to yieldingly engage and stop the furnace as it rebounds as a result of its impact with the shock absorber.

A further object of my invention is, to provide a machine of the character referred to that is entirely automatic in operation so that after having been started it requires no attention on the part of an operator.

With the foregoing and other objects in view, my invention consists in certain novel features

of construction and arrangement of parts that will be hereinafter more fully described and claimed and illustrated in the accompanying drawings in which:

Fig. 1 is a top plan view of a machine constructed in accordance with my invention.

Fig. 2 is an enlarged cross section taken on the line 2—2 of Fig. 1.

Fig. 3 is an enlarged top plan view of the reciprocating furnace and the carriage upon which said furnace is mounted.

Fig. 4 is a cross section taken on the line 4—4 of Fig. 3.

Fig. 5 is a cross section taken on the line 5—5 of Fig. 3.

Fig. 6 is an enlarged plan view taken looking in the direction indicated by the arrow 6 in Fig. 1.

Fig. 7 is a vertical longitudinal section taken on the line 7—7 of Fig. 3.

Fig. 8 is an enlarged cross section taken on the line 8—8 of Fig. 3.

Referring by numerals to the accompanying drawings which illustrate a preferred embodiment of my invention, 10 designates a conventional punch press having dies 11 and 12 that are adapted to simultaneously sever and bend the end portions of the ribbon-like strips of resilient metal that are fed to the press.

No claim is made to the punch press and the dies associated therewith as there are various punch presses readily obtainable in the open market that are adapted for use in connection with the steel tape heating means and, the dies associated with said punch press are formed so as to give the desired shape to the severed ends of the steel tape.

Where the sections of resilient metal are utilized as spiral springs for spring sash balances, the ends of said sections are generally bent to form hooks for attachment to parts of the spring sash balances and, in some instances the ends of said sections may be provided with apertures that are formed by the dies.

Punch press 10 is mounted on a suitable supporting frame 13 and mounted on said frame 13 adjacent the press are bearings 16 for a pair of shafts 17 and 18. Shaft 18 which is shorter than shaft 17 is positioned above said shaft 17 and, mounted on said shafts are pinions 19 of uniform size so that the two shafts rotate at the same speed so as to feed the ribbon or tape-like strips S of resilient metal into the punch press between its dies 11 and 12.

Mounted on the shafts 17 and 18 are rollers 20

of uniform size that act to feed the strips of steel into the punch press.

Mounted on the end of shaft 18 opposite the end that receives one of the pinions 19 is a sprocket wheel 21 and, mounted on the corresponding end of the shaft 17 is a belt wheel 22. A smaller belt wheel or pulley 23 is mounted on the driving shaft 24 of the punch press and, connecting the wheels or pulleys 22 and 23 is a belt 25.

Mounted on frame 13 immediately adjacent the bearings 16 and extending a substantial distance away from said frame are parallel rails 26 which, together with supporting legs or an upright frame 27 constitute a frame that supports the reciprocating furnace and the parts associated therewith.

The furnace is carried on a horizontally disposed plate 28 that is supported by small wheels 29, the latter traveling on the tops of rails 26 and, formed on one side of said plate is a forwardly projecting arm 30. Mounted on the intermediate portion of this arm 30 is a housing 31 open at both ends and, hinged on a pin 32 that passes transversely through said housing is an arm 33 that projects through the forward open end of said housing and said arm being provided adjacent its forward down-turned end with a transverse shoulder 34.

Formed integral with and depending from the forward portion of arm 33 is an arm 35, to the lower end of which is connected one end of a retractile spring 36, the other end being connected to the forward end of the arm 30.

A support 37 projects outwardly and upwardly from one of the side rails 26 and extending forwardly from the upper end of said arm is a horizontally disposed rail 38 and journaled for rotation in the forward end of this rail is a sprocket wheel 39.

Mounted for operation on the sprocket wheels 21 and 39 is a sprocket chain 40 and carried by one of the links thereof is a depending block or lug 41. The lower or under running portion of the sprocket chain passes through the upper portion of the housing 31 so that at a certain or predetermined time during the operation of the machine, the depending lug 41 will engage the shoulder 34 on arm 33 and thus move the furnace supporting plate 21 forwardly toward the punch press.

Projecting from frame 15 is a bracket 42 positioned so that it is directly in the path of travel of the lower end of the depending arm 35 and thus, as the furnace carrying plate 28 approaches the frame 15 that supports the punch press the lower end of said arm 35 will engage bracket 42 so as to swing arm 35 on pin 32, thus effecting disengagement between the shoulder 34 on arm 33 and the lug 41 that is carried by the sprocket chain.

This action takes place as the furnace supporting plate reaches the forward end of its travel and as such disengagement takes place, the plate will be automatically retracted or drawn back to its starting position by means that includes a cable 43 or like flexible member. One end of this cable is connected to plate 28 or to the arm 30 and the other end being connected to frame 15.

Cable 43 passes through a pulley 44 that is connected to one end of a spiral spring 45 that is practically identical with the spiral springs used in spring sash balances and said spring being adapted to wind onto a shaft or drum contained within a housing 46 and the latter being secured

to supporting frame 27. The tendency of this spring 45 is to wind spirally into the housing 46 and to resist unwinding movement so that after the furnace carrying plate has been disengaged from the sprocket chain, the spring will act to retract the furnace carrying plate or move the same to its starting position.

This retracting movement of the furnace carrying plate due to the pull of the spring as it winds into the housing 46 is more rapid than the forward movement of the furnace carrying plate and, to stop the plate at the end of its rearward travel a shock absorber 47 is mounted on top of the rails 26 adjacent the end frame 27.

This shock absorber consists of a horizontally disposed U-shaped member formed of resilient metal, preferably steel, and its ends are adjustably clamped to the standard 37 on one end of the rails 26 and a similar standard 37a that is mounted on the other one of the rails 26.

The ends of this buffer spring are provided with short longitudinally disposed slots 48 and passing therethrough and seated in the standards 37 and 37a are clamping screws or bolts 49.

As a result of this construction, the shock absorber may be adjusted toward or away from the furnace carrying plate.

As the furnace carrying plate approaches the end of its rearward movement, the bearing for the wheels 29 on the rear end of the plate strikes against the intermediate portion of spring 47, with the result that the shock resulting from contact between the plate and the spring will be absorbed by the latter.

To eliminate any rebound of the furnace carrying plate as a result of its contact with the shock absorber, a spring 50 is mounted on one or both of the rails 26. This spring comprises a flat strip of resilient metal having one end fixed to rail 26, the other end free and with an upward bow 51 at its center.

Thus, as the rear end of plate 28 makes contact with the shock absorber 47, the under face of said plate will contact with and press downwardly on the bowed portion 51 of spring 50, thus eliminating rebound of the plate and bringing the same to a stop.

Projecting upwardly from end frame 27 is a substantially T-shaped standard 52 and a somewhat similar standard 53 projects upwardly from the rear portion of plate 28.

These standards provide supports for the strips S of resilient material as they pass on to the machine through the furnace carried by plate 28 between the feed rollers 20 into the punch press between the dies or punches 11 and 12.

The furnace that is mounted on plate 28 comprises a box-shaped structure 54, preferably formed of sheet metal, and the upper end of which is normally closed by a cover 55 also formed of sheet metal and, the latter being provided on its top with a handle 56. The body 54 of the furnace and the cover 55 are lined with blocks or slabs 57 of refractory material, for instance, fireclay, asbestos, or the like.

The upper portions of the end walls of the body 54 are cut away to form openings 58 for the accommodation of the metal strips S and above the opening that serves as an exit for the metal strips, a portion of the top 55 is extended and bent downwardly to form a flame and heat retarding member 59.

Arranged in the bottom of the body 54 is a burner 60, preferably a tube having its ends plugged and provided in its upper portion with

jet openings 61 and, connected to the under side of this burner is a tube 62 in which is located a valve 63 for controlling the flow of combustible gas or gases to the burner.

A flexible tube 64 that leads from a suitable source of gaseous fuel supply is connected to the lower end of tube 62.

In the operation of my improved spring steel heating, severing and forming machine, shaft 24 of the punch press is continuously rotated and belt 25 operating on pulley 23 drives pulley 22 and shaft 17 and through pinions 19, shaft 18 is driven at the same speed with shaft 17 and the feed rollers 20 draw the strip or strips S across the top of the machine through the furnace. At a certain point in the operation of the punch press, the upper die or punch 11 moves downwardly and in conjunction with the lower die the strip or strips of resilient metal previously heated by the furnace, will be severed and the ends immediately adjacent the cut will be given the desired shape.

As shaft 18 is rotated, sprocket wheel 21 will impart movement to the sprocket chain 40 so that the under running portion thereof moves from sprocket wheel 39 forwardly over the plate 28 through the housing 31 toward the punch press.

At its rearward limit of travel the plate 28 is positioned against shock absorber 47 above spring 50 and, as the lug 41 that is carried by the sprocket chain 40 engages against the shoulder 34 on arm 33 the furnace supporting carriage, including plate 28, will be moved forwardly with the under running portion of said sprocket chain.

The speed of this travel is the same as the speed of travel of the resilient strips S and thus, as the furnace travels forwardly those portions of the metal strips within the furnace will be quickly and thoroughly heated by the jets of combustible gas or gases issuing from the burner 60.

It is to be understood that the gas delivered to burner 60 is under a certain degree of pressure so that the jets of ignited gas issuing from the jet openings function as blow flames to very quickly heat the relatively short portions of the resilient strips that occupy the furnace.

As the carriage approaches its forward limit of movement, the lower end of arm 35 engages bracket 42, thus swinging arm 33 downward against the resistance offered by spring 36, with the result that lug 41 mounted on the sprocket chain is disengaged from arm 33 and, at this point the downward travel of the carriage ceases and the heated portions of the resilient strips pass forward between the feed rollers 20 and thence into position between the dies 11 and 12, which later sever the strips and shape the severed ends as heretofore described.

During the forward travel of the furnace supporting carriage, the upper portion of the cable 43 is drawn forward, thereby pulling a portion of the coil spring 45 out of its housing 46, consequently storing energy in that portion of the coil spring that remains within the housing and, immediately after the shoulder 34 on arm 33 has released lug 41 the energy stored in the coil spring 45 will act through cable 43 to return the carriage to its rearward limit of movement, so as to be in position to be again picked up by the lug 41 as the same subsequently passes through housing 31 and re-engages shoulder 34. At the end of the rearward travel of the carriage, the shock absorber 47 yieldingly stops the carriage and any

tendency of rebound resulting from the impact of the carriage with the shock absorber will be absorbed by spring 50 which engages the under face of plate 28.

Thus, the bowed portion 51 of spring 50 functions as a yielding or resilient brake to slow down the movement of the plate 55 as the latter approaches and contacts with shock absorber 47 and such braking action counteracts all tendency of the plate to rebound after striking said shock absorber 47.

In order that the operation of the entire structure including the steel strip feeding and heating means and the punch press may be entirely automatic, one of the links of chain 40 a short distance to the rear of the lug 41 that engages the shoulder 34 to move the furnace toward the punch press is provided with a short laterally projecting finger 40a and, as this finger passes upwardly around the sprocket wheel 21 it engages and actuates a lever 10a that projects from the punch press and the actuation of which lever causes the die or punch 11 to move downward and thereby cut and shape the strips that pass between the dies 11 and 12.

Thus it will be seen that I have provided a spring steel heating, severing and forming machine that is relatively simple in construction, inexpensive of manufacture and very effective in performing the functions for which it is intended.

The machine is entirely automatic in operation and by varying the lengths of the sprocket chain and the arm 38 that carries sprocket wheel 39, the machine may be readily adjusted so as to produce resilient strips of different lengths.

It will be understood that minor changes in the size, form and construction of the various parts of my improved spring steel heating, severing and forming machine, may be made and substituted for those herein shown and described, without departing from the spirit of my invention, the scope of which is set forth in the appended claims.

I claim as my invention:

1. In a machine for heating and feeding metal tape a support, a pair of rollers for drawing tape lengthwise of said support, a carriage mounted for reciprocating movement on said support, a furnace mounted on said carriage, an endless flexible member mounted for operation on said support and arranged to operate at the same speed as said tape drawing rollers and means for effecting a driving engagement between said carriage and that portion of the flexible member that moves toward the tape feeding rollers.

2. A machine for heating and feeding metal tape as set forth in claim 1 and with means for automatically disconnecting the carriage from said endless flexible member as said carriage reaches a pre-determined point in its forward travel.

3. A machine for heating and feeding metal tape as set forth in claim 1, with means for automatically disconnecting the carriage from said endless flexible member as said carriage reaches a pre-determined point in its forward travel and means for automatically moving the carriage rearwardly after the driving connection between the carriage and the endless flexible member has been broken.

4. A machine for heating and feeding metal tape as set forth in claim 1, with means for automatically disconnecting the carriage from said

endless flexible member as said carriage reaches a pre-determined point in its forward travel, means for automatically moving the carriage rearwardly after the driving connection between the carriage and the endless flexible member has been broken and a shock absorber for engaging said carriage at the termination of its rearward travel.

5. A metal tape heating and feeding machine as set forth in claim 1, with means for automatically disconnecting the carriage from said endless flexible member as said carriage reaches a pre-determined point in its forward travel, means for automatically moving the carriage rearwardly after the driving connection between the carriage and the endless flexible member has been broken, a shock absorber for engaging said carriage at the termination of its rearward travel and yielding pressure means with which said carriage engages as it makes contact with said shock absorber for preventing rebound of said carriage.

6. In a machine for heating and feeding metal tape, means for continuously feeding a ribbon-like strip of resilient material forwardly, a carriage mounted to move toward and away from said strip feeding means, a heater carried by said carriage, means including an endless flexible member for causing said carriage to move toward the feeding means at the same speed with that of the moving strip of resilient metal, means for terminating the forward travel of the carriage at a predetermined point adjacent the feeding means, means for imparting retractive movement to said carriage immediately following the termination of its forward travel and shock absorbing means with which said carriage engages at the termination of its retractive movement.

7. A machine for heating and feeding metal tape as set forth in claim 6, and with means for counteracting rebound of the carriage as it engages said shock absorber.

8. In a machine for heating and feeding metal tape, a support, a pair of rollers mounted for operation at the forward end of said support, an endless flexible member mounted for operation on said support and adapted to travel at the same speed as that of said rollers, a carriage mounted for reciprocatory movement on said support, means for automatically effecting driving engagement between said carriage and that portion of the endless flexible member that travels toward said rollers, means for automatically disconnecting the driving engagement between said carriage and endless flexible member as said carriage reaches a point adjacent said rollers, a furnace carried by said carriage and said furnace being provided with openings for the accommodation of the metal tape passing therethrough.

9. A machine for heating and feeding metal tape as set forth in claim 8 and with means for imparting retractive movement to said carriage at the termination of its forward movement toward said rollers.

10. A machine for heating and feeding metal tape as set forth in claim 8, with means for imparting retractive movement to said carriage at the termination of its forward movement toward said rollers and shock absorbing means with which said carriage engages at the termination of its retractive movement.

11. A machine for heating and feeding metal tape as set forth in claim 8, with means for imparting retractive movement to said carriage at the termination of its forward movement toward said rollers, shock absorbing means with which said carriage engages at the termination of its retractive movement and a resilient brake for engaging said carriage as it contacts with said shock absorber.

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