Aug. 17, 1954 A. WOLOSIANSKI 2,686,356

DEVICE FOR MECHANICALLY LOADING EXACT NUMBERS OF METAL FINS OR LAMINATIONS ON TUBES OR RODS

Filed April 20, 1950 3 Sheets-Sheet 1

Fig. 1

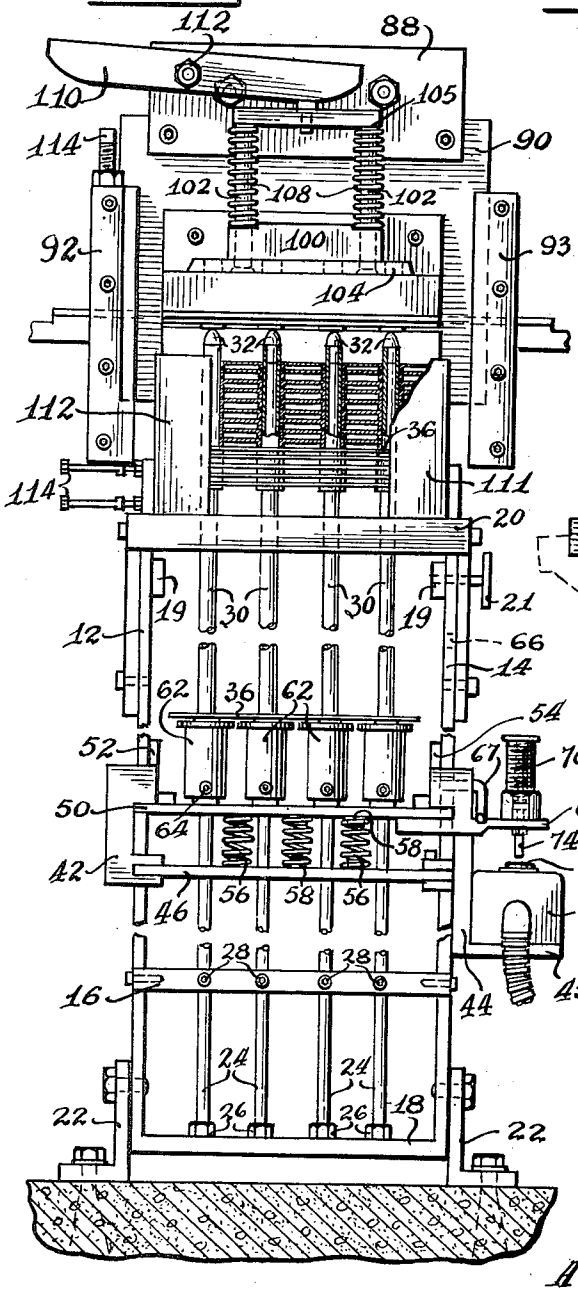
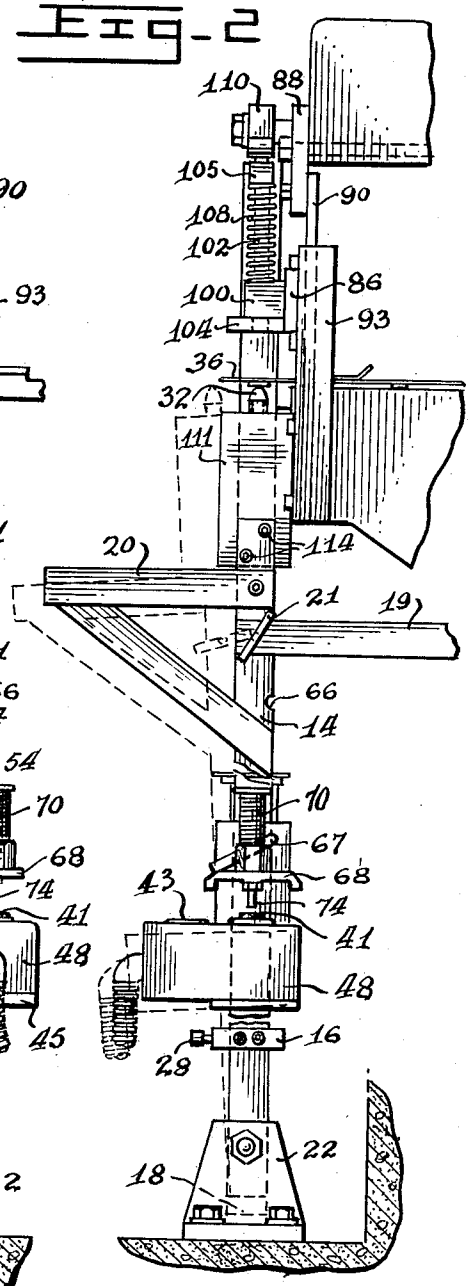


Fig. 2



Inventor
Aleksander Wolosianski
By Alan Swaley
Attorney

Aug. 17, 1954 A. WOLOSIANSKI 2,686,356

DEVICE FOR MECHANICALLY LOADING EXACT NUMBERS OF METAL FINS OR LAMINATIONS ON TUBES OR RODS

Filed April 20, 1950 3 Sheets-Sheet 2

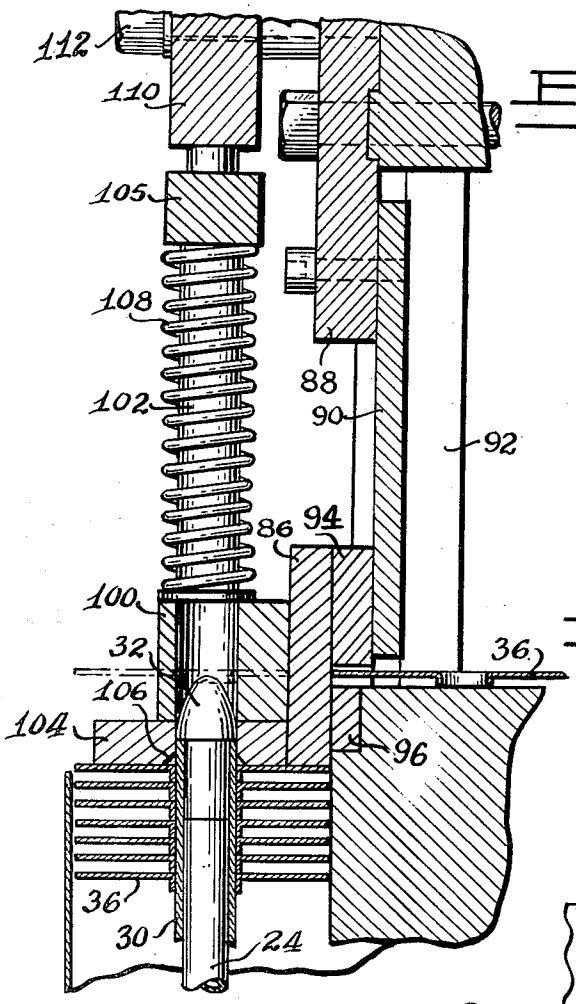


Fig. 3

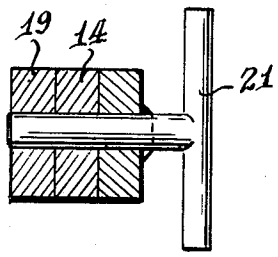


Fig. 5

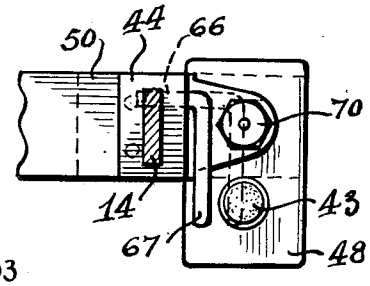


Fig. 6

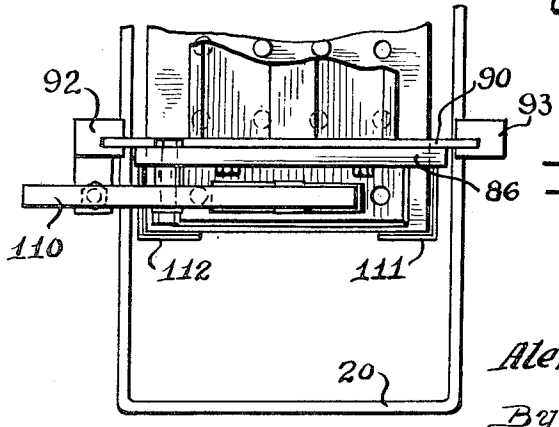


Fig. 4

Inventor
Aleksander Wolosianski
By Alan Swabey
Attorney

Aug. 17, 1954 A. WOLOSIANSKI 2,686,356

DEVICE FOR MECHANICALLY LOADING EXACT NUMBERS OF METAL FINS OR LAMINATIONS ON TUBES OR RODS

Filed April 20, 1950 3 Sheets-Sheet 3

Fig. 7

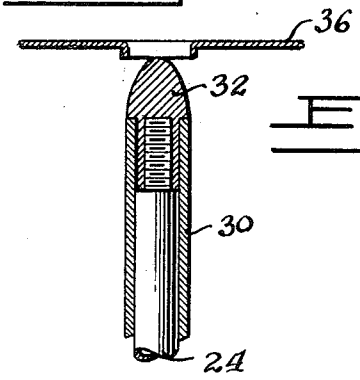
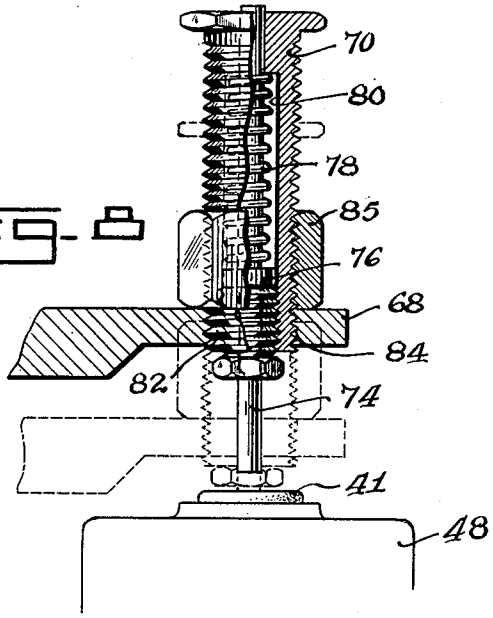


Fig. 8



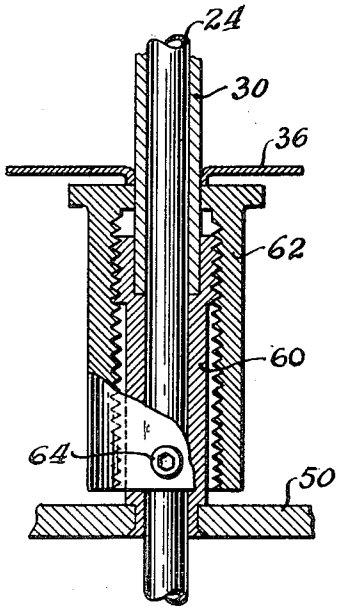


Fig. 9

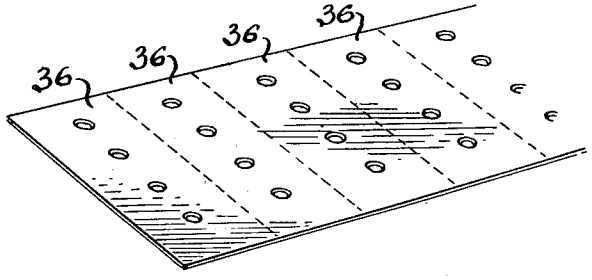


Fig. 10

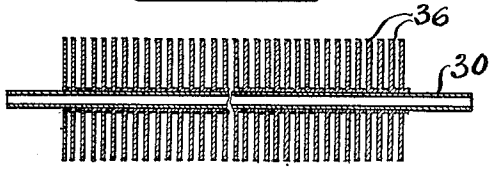


Fig. 11

Inventor
Aleksander Wolosianski
By Alan Swabey
Attorney

Patented Aug. 17, 1954

2,686,356

UNITED STATES PATENT OFFICE

2,686,356

DEVICE FOR MECHANICALLY LOADING EXACT NUMBERS OF METAL FINS OR LAMINATIONS ON TUBES OR RODS

Aleksander Wolosianski, Montreal, Quebec, Canada, assignor, by mesne assignments, to National Heating Products Sales Limited, Montreal, Quebec, Canada

Application April 20, 1950, Serial No. 157,153

1 Claim. (Cl. 29—202)

1

Introduction

This invention relates to sheet metal working machines and more particularly to apparatus of this nature that is utilized to manufacture heat exchange units.

Heat exchange apparatus of the radiator or convector type generally include, as heat radiating or condensing units, tubes or rods on which are mounted a plurality of perforated metal plates or fins. The making of such units in production quantities presents a considerable problem to the manufacturer as the fins must be strung in equally spaced apart relationship on the tubes, and the correct number of fins must be placed on each tube. The spacing of the fins and the number required vary according to the size of the unit being constructed and the particular radiating or absorbing qualities desired. Machines have been designed for this purpose, but most of these are complete units which can be utilized only for this purpose and moreover are items of considerable expense to the manufacturer as they are mainly of complicated structure involving the use of complex systems of cams, sprockets, chains and spacers. The present invention aims to provide a novel apparatus to perform this operation that is simple and economical in design and which can be attached to any standard metal working machine having an automatic strip feed for example a metal stamping machine, or dieing machine.

Applicant's development

The invention is an apparatus for mechanically loading exact numbers of metal fins on tubes or rods that is designed as an attachment for a metal working machine.

According to the invention, the apparatus includes means wherein the working movement of the machine to which it is attached actuates a shear to sever the individual plates or fins from a strip or roll of material as it is passed through the stamping machine for perforation. Plate loading mechanism is also provided that acts in conjunction with the shear to place the individual plates or fins on the tubes, and adjustable tube supporting means are provided to support the tubes in loading and unloading position relative to the loading mechanism. Automatic stopping means are provided on the tube supporting means whereby the stamping machine to which the apparatus is attached is stopped when a predetermined number of plates have been loaded on the tubes.

More specifically, a preferred construction of

2

the apparatus includes a plate loading and shearing mechanism that is adapted to be attached directly to the metal stamping machine. According to the invention this apparatus is secured to the machine by attachment to a drive plate that is bolted directly on to the head of the stamping machine. Vertical shear guiding members are also provided that are attached to the machine so as to maintain alignment of shear and loading mechanism relative to the machine bed.

A shear slide is attached to the drive plate and a shearing plate attached to the shear slide so that the downward motion of the head of the stamping machine also actuates the shear slide and shear to sever individual fins or plates from the strip of material as fed through the stamping machine for perforation. The loading mechanism is also supported by the drive plate and means are provided between the drive plate and loading mechanism whereby a ramming plate is actuated simultaneously with the movement of the shear to urge the severed plates downwards into engagement with the tubes or rods that are to be loaded. A loading cage is mounted on the upper end of a tube supporting and positioning frame so that the plates are maintained in correct alignment as they are being forced downward onto the tubes. The tube supporting and positioning frame that supports the tubes relative to the loading cage and loading mechanism for loading is positioned directly below the loading mechanism so as to support the tubes in substantially vertical alignment. Preferably the tube supporting frame is hingedly mounted on a securely anchored base so that it can be swung down for loading of tubes and unloading of completed units and upwards to a vertical position so as to support the tubes in fin receiving position. A pair of frame support standards are bolted to the stamping machine and the supporting frame is engaged with these standards to retain it in the upright position. The tube supporting frame is adjustable to suit various lengths of tubes or rods, and is adapted to support a plurality of tubes for simultaneous loading. An adjustable tube supporting carriage is slidably mounted on this frame and is adapted to hold the tubes in spaced apart relationship to receive the plates or fins as they are delivered by the ramming plate of the loading mechanism. Means are provided on the carriage and frame whereby the stamping machine and loading mechanism are stopped when a predetermined number of plates have been loaded on the tubes and also to stop the stamping machine if the loading apparatus should jam.

Having thus generally described the nature of

the invention particular reference will be made to the accompanying drawings, and in which:

Figure 1 is a front elevation partially in section of a preferred construction of the apparatus as it may be attached to a metal stamping machine.

Figure 2 is a side elevation of the apparatus as shown in Figure 1.

Figure 3 is an enlarged diagrammatic view partially in section of the preferred arrangement of loading ram and shear.

Figure 4 is a top view of a portion of the apparatus corresponding to Figures 1 and 2 illustrating in plan the relative positions of the shear and ramming plate.

Figure 5 is an enlarged detail view partially in section illustrating the supporting frame locking pin.

Figure 6 is an enlarged detail view illustrating the locking means of the sliding carriage.

Figure 7 is an enlarged detail view in section illustrating a portion of a tube and rod with a locating metal nose in position.

Figure 8 is an enlarged detail view partially in section of the arm and plunger of the automatic stopping device.

Figure 9 is an enlarged detail view partially in section of one of the adjustable pillar supporting members on the sliding carriage.

Figure 10 is a diagrammatic view of a strip of perforated metal plate as it would appear prior to cutting and loading.

Figure 11 is a diagrammatic view of a section of tubing completely loaded with metal fins to form a unit for a radiator or convector.

With particular reference to the drawings illustrating a preferred construction of the device, the main tube supporting frame consists essentially of two vertical frame members 12 and 14 linked by two horizontal plates 16 and 18 at the bottom and a U-shaped bar 20 at the top. This frame is hinged at the base to a pair of angles 22, which are preferably securely anchored, for example, to a concrete foundation as is shown in Figure 1, and is retained in vertical position by engagement with a pair of frame supporting members 19 that are bolted to the lower portion of the stamping machine. A locking pin 21 is slidably mounted in the frame and is adapted to engage in a hole in supporting member 19, so that the frame can be swung up or down as required as indicated in dotted lines in Figure 2.

The bottom plate 18 of the supporting frame is provided with a plurality of tapped holes and the required number of tube supporting rods 24 are screwed into these holes (for example four rods as is illustrated in Figure 1). The rods 24 are provided with locknuts 26 so that they can be locked into position on the plate 18 at the required height and are secured in the alignment required by set screws 28 in the second horizontal plate 16 through which they pass. The rods 24 have a diameter slightly less than the inside diameter of the tubes 30 which are to be loaded so that the tubes 30 can be slid over the rods. When the tubes are in loading position, the rods 24 are tipped by hardened metal noses 32 whose largest outside diameter corresponds to the outside diameter of the tubes 30 so as to provide a guide for the perforated plates or fins 36 as they are loaded onto the tubes 30.

Sliding carriage

An adjustable tube supporting carriage is slidably mounted on the vertical frame members 12 and 14 by bearing blocks 42 and 44 which are joined by a horizontal plate 46.

The block 44 includes a right angle extension 45 and an electrical push button switch 41 is mounted on this portion of the block to form a part of the automatic stopping means as will be described in more detail later.

The carriage also supports a platform made up of a horizontal plate 50 which includes openings through which the rods 24 pass. Bearing angles 52, 54 are attached to the plate 50 adjacent each end and bear against the inner surface of the vertical frames 12 and 14 to slidably fit between the blocks 42, 44 so that the platform can move in the axial direction of the rods 24. The plate 50 is held above the plate 46 by springs 56 centered between the rods 24. The springs 56 are retained in position by spring guides 58 which engage the springs 56 at either end and are fastened to the plates 46, 50.

Threaded bushings 60 are mounted in the openings in the plate 50 and are bored so as to provide a sliding fit for the rods 24 (see Figure 9). The upper end of the bushings 60 are counterbored to provide a seat for the end of the tubes 30 and threaded over each of the bushings 60 is a sleeve 62 which is tapped for most of its length so that the sleeve 62 can be adjusted vertically on the bushing 60. The sleeves 62 are adapted to guide the tubes 30 into the recess in the top of the bushings 60 and are provided with set screws 64 so that they can be locked into position at the required height. The sleeves 62 also act as adjustable stops for controlling the distance between the end of the tube 30 and the first perforated plate 36 as is shown in Figure 9.

The sliding carriage can be adjusted to any height depending on the length of the tubes that are to be loaded. Notches 66 are provided on the vertical frame member 14 at spaced apart intervals and a locking pin 67 slidably mounted on the block 44 is adapted to be pushed into engagement with any of the notches 66 to hold the carriage at the required height (see Figure 6).

Automatic stopping mechanism

An outwardly extending bracket 68 is secured to the plate 50 and a plunger 70 mounted on the bracket 68 is adapted to contact the electrical switch 40 when the plate 50 is urged downwards between the frame members 12 and 14.

The plunger 70 is preferably of a cylindrical form and includes an opening in which is slidably mounted a plunger rod 74. The plunger rod 74 includes an outwardly extending collar 76 which serves as a seat for a spring 78 mounted on the rod 74 and the plunger 70 is bored internally to provide a chamber 80 to house the spring and rod. The spring 78 and rod 74 are retained in position within the plunger 70 by a threaded plug 82 through which the rod 74 passes. The plunger 70 is threaded exteriorly and is mounted in a tapped opening 84 in the bracket 68 so that it can be adjusted vertically to vary the length of the plunger rod 74 extending beyond the bracket 68, and locked at the required height by a locknut 85. In operation the plunger rod 74 presses down on the push button 41 of the electrical switch 40 which is connected by a suitable circuit to the motor of the stamping machine. This cuts off the motor of the stamping machine and any additional strokes of the machine caused by the residual inertia of its fly wheel are taken care of by the spring 78 which takes up the extra pressure

which would otherwise be exerted on the push button 41. An additional manual starting button 43 is also provided so that the stamping machine may be started by the operator from adjacent the loading mechanism.

Plate shearing and loading mechanism

The shearing plate 86 and the plate loading portion of the apparatus are attached to the head of the machine in the following manner. A drive plate 83 is secured to the head of the machine by suitable bolts as shown in Figure 3, and a shear slide plate 90 is bolted to this plate. A pair of vertical shear guide members 92—93 are bolted to the machine so as to maintain the shear slide plate 90 in correct alignment with the bed of the machine. The shear plate 86 together with a packing block 94 is bolted to the shear slide plate 90 so that the shear plate 86 is maintained at the correct distance from the bed of the machine to provide the shearing action. Preferably, a hardened plate 96 is attached to or set into the edge of the bed of the machine so as to provide a shearing edge.

The plate loading mechanism consists of a block 100 that is fastened to the shear plate 86 by suitable bolts or screws. Through the block 100 pass two connecting rods 102 that are attached to a ramming plate 104 that is positioned below the block 100. A striking plate 105 is fastened to the upper ends of the connecting rods 102 by set screws and a pair of springs 108 are mounted on the connecting rods 102 between the block 100 and the striking plate 105. A lever 110 is pivotally mounted on a bolt 112 mounted in the drive plate 83 and an adjustable stop 114 is mounted on the top of the vertical shear guide member 92. As the shear slide 90 moves downward with the down stroke of the stamping machine the lever 110 strikes the stop 114 at the same moment the shear plate 86 cuts off the stamped plate. As the shear continues past the cutting edge 96 the lever 110 pivots about the bolt 112 and bears down on the striking plate 105. Additional downward motion is transmitted to the ramming plate 104 through the connecting rods 102 and the ramming plate 104 passes the edge of the shear plate 86 to force the cut off plate into a loading cage and over the metal noses 32 that are positioned on top of the tube supporting rods 24. The ramming plate 104 has drilled holes 106 that are slightly larger than the outside diameter of the tubes to be loaded so that the rod noses 32 can pass through the plate 104 as the plate moves down on them. When the downward stroke of the machine is completed and the shear slide 90 moves upward, the lever 110 releases its pressure on the striking plate 105 and the springs 108 return the ramming plate 104 back up to its original position relative to the shear. The loading cage is made up of two opposed plate guiding members 111 and 112. The member 111 is rigidly attached to the upper end of the vertical frame member 14 of the tube supporting frame and the member 112 is adjustably secured to the upper end of the vertical frame member 12 by set screws 114. This allows the member 112 to be moved towards or away from the member 111 to vary the size of the loading cage for various sizes of stamped plates.

Operation

To load the device the locking pin 21 is removed and the tube supporting frame first slung down to a sloping or horizontal position. Tubes of the desired length are slid onto the rods 24, engaged in the bushings 60 of the sliding carriage and the tube noses 32 are fitted into place. A stamped fin is then fitted over all the tube noses 32 and pushed down into the loading cage. In this position the stamped part acts as a locating brace, centering the tube noses 32 exactly in place to receive the stamped plates as they emerge from the stamping machine. The frame is then swung back into vertical position relative to the loading mechanism and locked in place on the frame supporting standards 19 with the locking pin 21.

The stamping machine is started and as each finished stamped part is sheared off by the shear plate 86 the lever 110 actuates the ramming plate 104 to force the stamped plate into the loading cage and over the tube noses 32. When the stamped parts have filled the entire length of the tubes, the next stroke of the ramming plate 104 transmits its downward force through the accumulated parts to the bushing sleeves 62 thus forcing downwards the sleeves 62 the bushings 60 and the plate 50 to which they are attached.

As the plate 50 moves down the plunger 70 mounted on the bracket 68 is also moved downward so that the plunger rod 74 contacts the push button 47 of the electrical switch 48 and cuts off the stamping machine motor.

A protective feature is incorporated that stops the machine should the loading apparatus be jammed or any undue pressure be exerted on the device. Any undue pressure on the tubes is transmitted through the bushings 60 in which the tubes rest, to the plate 50, plunger rod 74 and push button switch 41 thus shutting off the stamping machine.

While the present apparatus has been illustrated and described as being utilized for the purpose of stringing perforated metal fins on tubes for heat exchange units it is also contemplated that with slight modifications it could also be used to string laminations, washers, or similar continuously stamped products onto rods, bolts, wire, or other rigid linking members.

I claim:

As an attachment for a power driven metal stamping machine a loading apparatus for stringing perforated metal plates on elongated tubes comprising in combination, a plate loading mechanism having a main supporting plate adapted for connection to said machine power drive, spaced apart guide plates, and a resiliently biased ramming plate mounted on said supporting plate for reciprocal movement relative thereto in alignment with and between said guide plates; and a multiple tube supporting and positioning frame positioned below said plate loading mechanism, said tube supporting frame being hingedly connected to and extending upwardly from a base disposed beneath said plate loading mechanism and including a pair of vertical bars linked by a pair of horizontal plates at the bottom and a substantially U-shaped bar at the top so as to retain said vertical bars in spaced apart parallel relationship, a plurality of elongated rods mounted in said tube supporting frame bottom horizontal plate so as to extend longitudinally in alignment with and between said tube supporting frame vertical bars, said elongated rods being adapted to internally support throughout their length tubes mounted thereon, a tube supporting carriage including a pair of spaced apart blocks mounted for adjust-

able retention on said spaced apart tube supporting frame vertical bars, a first horizontal plate connected to and extending between said blocks and including openings through which said elongated tube supporting rods pass and a second horizontal plate mounted between said blocks above said first plate for sliding movement relative thereto, said second horizontal plate being supported above said first horizontal plate by a plurality of springs mounted therebetween, and a plurality of adjustable pillar bushings mounted on said upper horizontal plate with one of said bushings surrounding each of said elongated rods and each being adapted to support a tube end in axial alignment relative to said loading mechanism, and power drive stop means mounted on said tube supporting frame and stop engaging means mounted on said upper horizontal plate adapted to engage said stop means, whereby said plate loading mechanism is

stopped when a predetermined number of perforated plates have been loaded on tubes mounted on said supporting rods and pillar bushings.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
1,193,787	Holmes	Aug. 8, 1916
1,426,759	Nickol	Aug. 22, 1922
1,588,174	Dewald	June 8, 1926
1,599,792	Sage	Sept. 14, 1926
1,735,609	Frederick	Nov. 12, 1926
1,657,101	Zeitlin	Jan. 24, 1928
1,818,593	Walworth	Aug. 11, 1931

FOREIGN PATENTS

Number	Country	Date
606,494	France	Mar. 9, 1926