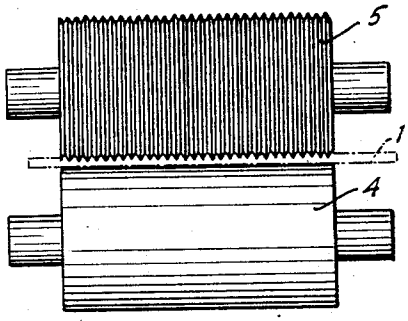
Nov. 19, 1935. M. VOGEL 2,021,274

SHEET METAL STAPLE STRIP FOR USE IN STAPLING MACHINES

Filed Feb. 27, 1934

Fig. 4.



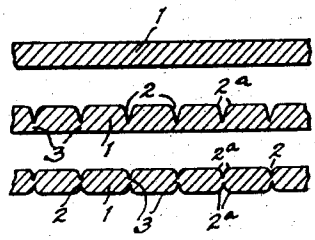


Fig. 1.

Fig. 2.

Fig. 3.

Fig. 7.

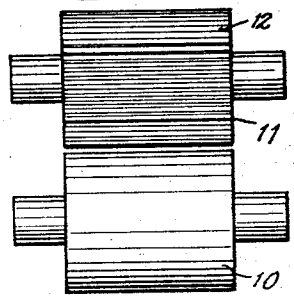


Fig. 8.

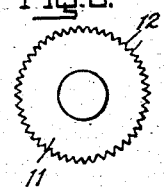


Fig. 5.

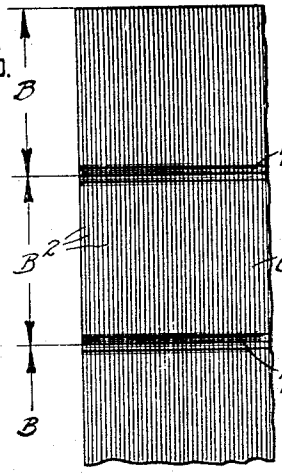


Fig. 6.

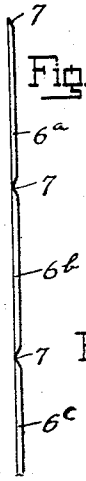


Fig. 9.

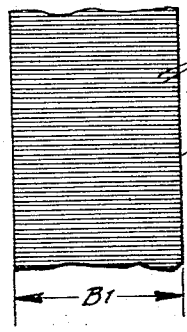


Fig. 10.

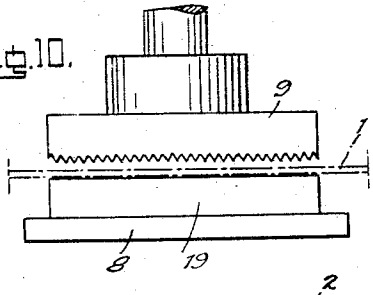


Fig. 11.

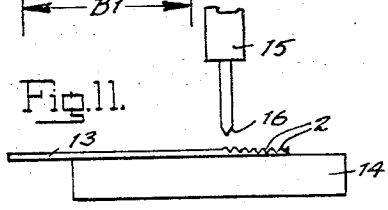


Fig. 12.

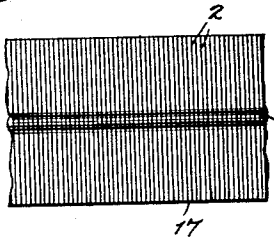


Fig. 13.

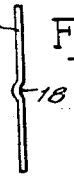
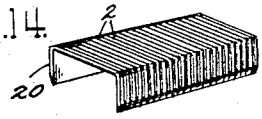


Fig. 14.



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UNITED STATES PATENT OFFICE

2,021,274

SHEET METAL STAPLE STRIP FOR USE IN STAPLING MACHINES

Max Vogel, Frankfort-on-the-Main, Germany

Application February 27, 1934, Serial No. 713,124
In Germany December 28, 1933

11 Claims. (Cl. 85—17)

The present invention relates to an improved sheet metal staple strip for use in stapling machines and process of producing the same, the staple strip consisting of a series of integrally connected preformed staple sections, and which strip is adapted to be inserted in a stapling machine which separates the individual sections from the strip and forces them through paper or other material to be stapled. The staple strip, according to the invention, may either be placed in the machine flat, that is, with the staple forming sections in out-stretched relation, in which case the staple machine will be designed to bend the sections as they are separated and forced through the paper or other material, or the staple strip may be given a U-shape in cross section in the usual manner heretofore employed in connection with staple strips.

It has been the practice heretofore to produce staple strips by connecting a series of individual staples by means of soldering metal, adhesive substance, as glue, or by tape, and it has also been the practice to produce staple strips from sheet metal by forming the same in a blanking or cutting die, in which case small connecting portions have been provided between the individual staples to retain them in strip form. These previous methods of producing staple strips have not only been complicated but the staples have certain disadvantages. In the case of staples formed from wire these are relatively expensive and present difficulties in joining them in a strip. Staple strips formed from sheet metal, as heretofore produced, had the disadvantage that in cutting the metal to produce the individual staples a sharp rough edge or bur was formed, upon which persons using the staples were apt to cut themselves. Also the connecting portion between the staple sections formed a rough edged projection upon the edge of the staple section when the latter was separated from the strip, which was highly objectionable. These sharp rough edges furthermore interfered with the proper feeding of the strip in the stapling machine.

The present invention has for its object to produce a staple strip from sheet metal of very simple and inexpensive construction, and which will not have the disadvantages of the previously known staple strips. It is particularly proposed to press a series of grooves into sheet metal material, this material being either in the form of a plate or a strip, in such manner that the staple forming sections have a smooth profile free from rough edges or burs, and which sections are integrally joined together along a very thin connection, this connection being in the central plane of the deepest part of the groove and extending the full length of the staple forming section, so that the separation of the staples take place by dividing the actual staple sections rather than by cutting through a bridging connecting portion, as heretofore. In producing the staple forming sections the groove is formed by a pressing or rolling action which displaces the metal to produce the desired smooth profile on the staple forming section and produces a furrow between the staple forming sections, the deepest point of which is the line of separation along which the individual staple sections are adapted to be severed. It is proposed to provide grooves either on one side of the material, or on both sides, in which latter case the grooves will be aligned and the weakened connections will be intermediate the upper and lower surfaces of the sheet. When forming the staple strips from relatively wide plates of sheet metal the width of the metal will preferably correspond to the length of a staple strip, and the grooves will be produced lengthwise of the plate and transversely to the length of the staple strip, the strips being then cut off at right angles to the grooves in sections corresponding to the length of an out-stretched staple. In forming the strips from strip sheet metal the width of the strip will correspond to the width of an out-stretched staple and the groove will extend transversely of the strip. In this latter case the strip may be cut into normal strip lengths, that is, a given number of staple forming sections to each strip length, or it may be in the form of a roll to be fed into the stapling machine in this manner.

It is further proposed to provide staple strips having sharpened edges forming points on the ends of the staple forming sections. It is further proposed to provide guide means extending longitudinally of the staple forming strip to guide it in the stapling machine, so that the edges of the sections may be out of frictional engagement with the machine, and by which arrangement the strips may be maintained in perfect alignment in the stapling machine.

With the above and other objects in view, embodiments of the invention are shown in the accompanying drawing and these embodiments will be hereinafter more fully described with reference thereto, and the invention will be finally pointed out in the claims.

In the drawing:

Fig. 1 is a cross section of a piece of sheet metal before the staple strip forming operation.

Fig. 2 is a cross section showing the formed

staple sections of the staple strip in which the grooves are produced at one side only.

Fig. 3 is a cross section showing the formed staple sections of the staple strip in which the grooves are produced at both sides.

Fig. 4 is an elevation of a pair of cylinder rolls for producing staple strips according to the invention, the grooves extending lengthwise of the sheet metal.

Fig. 5 is a plan view of the upper side of a piece of sheet metal as produced by the cylinders shown in Fig. 4.

Fig. 6 is an edge view thereof.

Fig. 7 is a front view of a pair of cylinders for producing transverse grooves in a strip of sheet metal, according to my invention.

Fig. 8 is an end view of the upper cylinder shown in Fig. 7.

Fig. 9 is a plan view of the strip as produced by the cylinders shown in Fig. 7.

Fig. 10 is a front view of a press adapted for forming grooves in sheet metal, according to my invention.

Fig. 11 is a side view of a hammer-die for producing transverse grooves in a strip of sheet metal, according to my invention.

Fig. 12 is a top view of a staple strip provided with longitudinal guide means, according to my invention.

Fig. 13 is an end view thereof.

Fig. 14 is a perspective view of one end of a staple strip, according to my invention, and having a U-shape in cross-section.

The set of metal forming rolls shown in Fig. 4 consists of a plain bottom cylinder **4**, and a top cylinder **5** having a series of circumferential groove rolling teeth or ribs suitably shaped to press or roll grooves **2** in the sheet metal plate or strip **1**, as shown in Fig. 2, the cylinders, as will be understood, being mounted in suitable bearings and driven by gearing in the usual manner. The sheet metal plate or strip **1** is fed between the cylinders **4** and **5** and the grooves **2** are produced therein lengthwise, leaving a thin connecting section **3** which may be easily broken. The strip or plate **1** is preferably of a width corresponding to the length of a strip of staple sections, say, for example, 100 staple sections to a strip, and of a length which is a multiple of the width of a staple strip. As shown in Fig. 5, the piece **6** having the staple sections preformed therein by the grooves **2** can be separated into strip sections **6a**, **6b**, **6c**, etc., by means of a suitable cutting tool, the width B of these strips corresponding to the length of an out-stretched staple. The cutting tool is so shaped as to produce beveled cutting edges on the edges of the strips, as at **7**, these edges forming points on the individual staple sections to facilitate their insertion through paper or the like.

The teeth or ribs of the cylinder **5** are of such cross-sectional shape that in pressing the grooves **2** in the sheet **1** the metal is displaced laterally, and the staple forming section between the grooves is of rounded or arched profile, as at **2a**, and is entirely free of sharp rough edges or burs. Furthermore the pressing of the grooves **2** to displace the metal laterally surface hardens the side surfaces and base of the grooves thereby imparting added strength to the staple sections as well as to the thin section **3** between them with the result that it is possible to use a much softer metal than would be the case if such surface hardening did not occur. The staple when separated from the strip will therefore present a smooth surface which will not injure or cut the hands of persons handling the same. In this respect the sheet metal staples according to my invention are similar to circular cross-section wire staples heretofore in use. The smooth surface also insures proper feeding in the stapling machines as there are no rough edges or burs to obstruct it. The arched cross-sectional shape also has the advantage of imparting longitudinal stiffening or reinforcing to the staple sections, so that they will be less likely to buckle, and a softer metal may be used than would be required where there is no such reinforcement.

In Figs. 7 to 9 I have shown a method of producing grooves **2** transversely of a strip of sheet metal, having a width B^1 corresponding to the length of an out-stretched staple, although the strip may if desired be multiple of the width B^1 in which case they are cut into widths B^1, after the grooving operation. In this case the forming rolls consist of a lower plain cylinder **10** and an upper cylinder **11** having groove forming teeth or ribs **12** extending parallel to the axis of the cylinder. The strip **6** may be cut into suitable strip-lengths, or may be furnished in the form of a roll, as will be understood.

Instead of using cylinders, the forming operation may be preformed by means of a press, as shown in Fig. 10, comprising a fixed base **8** and a reciprocating head **9** having groove forming teeth, the material **1** being supported upon a counter-plate **19** mounted on the base.

In Fig. 11 I have shown a groove forming apparatus consisting of a plate **14**, and a reciprocating head **15** carrying a hammer-die **16** adapted to successively produce the grooves **2** in the material **13** as the latter is intermittently fed over the base **14**.

In making aligned grooves **2** in both sides of the strip, as shown in Fig. 3, both cylinders of the forming rolls will be provided with teeth, that is in producing lengthwise grooves upper and lower cylinders **5** will be employed, and in producing crosswise grooves upper and lower cylinders **11** will be employed. In the press shown in Fig. 10 the counter-plate **19** will be replaced by a plate similar to the head **9**.

As shown in Figs. 12 and 13 the staple strips **17** formed according to my invention may be provided with one or more embossed ribs **18** extending lengthwise of the strip, and which will serve to guide the strip in the stapling machine, without contact of the edges with the guide-way in the machine, it being understood that a suitable track or groove will be provided in the guide way to receive this rib. The rib **18** furthermore stiffens the staple strip lengthwise.

As shown in Fig. 14 the staple strip **20**, formed according to my invention is given a U-shape in cross-section.

The staple strips according to my invention may if desired be covered with lacquer or other suitable coating, for protection against rust and atmospheric conditions, and to give any desired color or finish, or the sheet metal material may be suitably coated or finished for this purpose before forming.

Having thus described my invention what I claim and desire to secure by Letters Patent is:—

1. A staple strip for insertion in a stapling machine comprising a sheet metal strip having parallel upper and lower sides and having spaced grooves pressed therein forming staple sections between adjacent grooves, the metal displaced in the pressing of said grooves forming portions of

the sides of said staple sections, the deepest point of said grooves forming an integral weakened connection between adjacent staple sections extending the full length of said staple sections and along which the staple sections may be separated.

2. A staple strip for insertion in a stapling machine comprising a sheet metal strip having parallel upper and lower sides and having spaced grooves pressed therein forming staple sections between adjacent grooves, the metal displaced in the pressing of said grooves forming portions of the sides of said staple sections, the sides of said grooves diverging from their deepest point, the deepest point of said grooves forming an integral weakened connection between adjacent staple sections extending the full length of said staple sections and along which the staple sections may be separated.

3. A staple strip for insertion in a stapling machine comprising a sheet metal strip having parallel upper and lower sides and having spaced grooves pressed therein forming staple sections between adjacent grooves, the metal displaced in the pressing of said grooves forming portions of the sides of said staple sections, the sides of said grooves having a rounded connection with the surface of said staple sections between said grooves, the deepest point of said grooves forming an integral weakened connection between adjacent staple sections extending the full length of said staple sections and along which the staple sections may be separated.

4. A staple strip for insertion in a stapling machine comprising a sheet metal strip having parallel upper and lower sides and having spaced grooves pressed therein at each side in alignment with each other forming staple sections between adjacent grooves, the metal displaced in the pressing of said grooves forming portions of the sides of said staple sections, the deepest points of said grooves forming an integral weakened connection between adjacent staple sections extending the full length of said staple sections and along which the staple sections may be separated.

5. A staple strip for insertion in a stapling machine comprising a sheet metal strip having parallel upper and lower sides and having spaced grooves pressed therein forming staple sections between adjacent grooves, the metal displaced in the pressing of said grooves forming portions of the sides of said staple sections, the deepest points of said grooves forming an integral weakened connection between adjacent staple sections extending the full length of said staple sections and along which the staple sections may be separated, and longitudinal guide means extending lengthwise of said strip and at right angles to said staple section.

6. A staple strip for insertion in a stapling machine comprising a sheet metal strip having parallel upper and lower sides and having spaced grooves pressed therein forming staple sections between adjacent grooves, the metal displaced in the pressing of said grooves forming portions of the sides of said staple sections, the deepest points of said grooves forming an integral weakened connection between adjacent staple sections extending the full length of said staple sections and along which the staple sections may be separated, and a longitudinal embossed guide rib extending lengthwise of said strip and at right angles to said staple sections.

7. A staple strip for insertion in a stapling machine comprising a sheet metal strip having parallel upper and lower sides and having spaced grooves pressed therein forming staple sections between adjacent grooves, the metal displaced in the pressing of said grooves forming portions of the sides of said staple sections, the deepest point of said grooves forming an integral weakened connection between adjacent staple sections extending the full length of said staple sections and along which the staple sections may be separated, said strip being bent along parallel longitudinal lines into U-shape.

8. A staple strip for insertion in a stapling machine comprising a sheet metal strip having parallel upper and lower sides and having spaced grooves pressed therein forming staple sections between adjacent grooves, the metal displaced in the pressing of said grooves forming portions of the sides of said staple sections, the deepest point of said grooves forming an integral weakened connection between adjacent staple sections extending the full length of said staple sections and along which the staple sections may be separated, said strip adapted to be rolled lengthwise into a roll.

9. A staple strip for insertion in a stapling machine comprising a sheet metal strip having parallel upper and lower sides and having spaced grooves pressed therein forming staple sections between adjacent grooves, the pressing of said grooves surface hardening the side surfaces and bases of said grooves and the metal displaced in the pressing forming portions of the side of said staple sections, the deepest point of said grooves forming an integral weakened connection between adjacent staple sections extending the full length of said staple sections and along which the staple sections may be separated.

10. A staple strip for insertion in a stapling machine comprising a sheet metal strip having parallel upper and lower sides and having spaced grooves pressed therein of uniform depth throughout their length and forming stapling sections between adjacent grooves, the metal displaced in the pressing of said grooves forming portions of the sides of said staple sections, the deepest point of said grooves forming an integral weakened connection between adjacent staple sections of uniform thickness throughout its length and extending the full length of said staple sections and along which the staple sections may be separated.

11. A staple strip for insertion in a stapling machine comprising a sheet metal strip having parallel upper and lower sides and having spaced grooves pressed therein forming staple sections between adjacent grooves, the metal displaced in the pressing of said grooves forming portions of the sides of said staple sections, the sides of said grooves meeting at a point whereby the deepest point of said grooves forms an integral weakened connection between adjacent staple sections extending the full length of said staple sections and along which the staple sections may be separated, the plane of separation being substantially continuous with the side surfaces of said grooves.

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