Aug. 6, 1968 F. UNGERER 3,395,559

STRAIGHTENING MACHINE

Filed Dec. 27, 1965

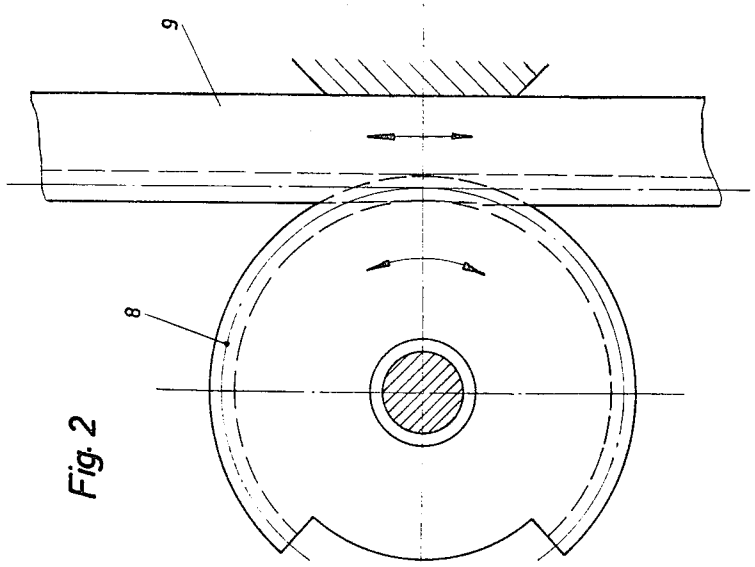

Fig. 2

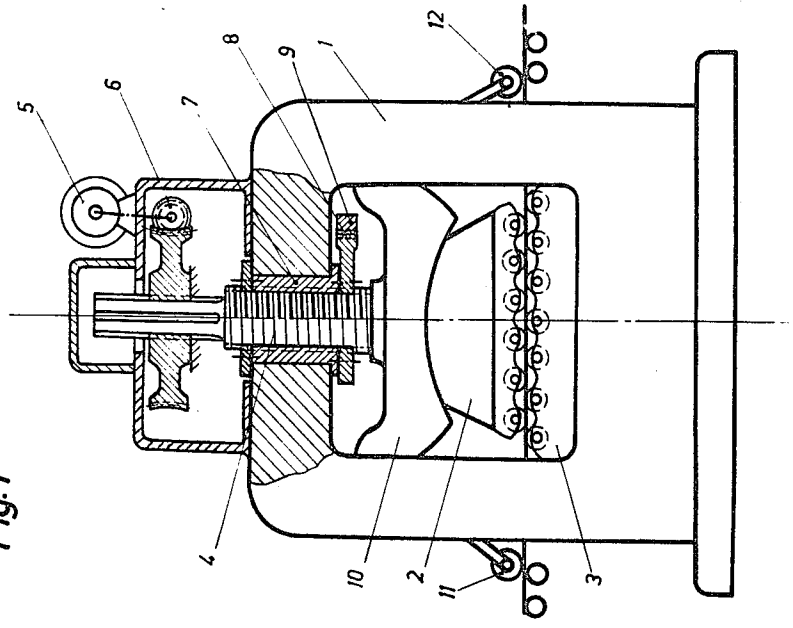

Fig. 1

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STRAIGHTENING MACHINE

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ABSTRACT OF THE DISCLOSURE

A straightening machine in which a metal strip is passed between upper and lower roll means to be straightened and which is provided with means for adjusting the position of one of the roll means toward and away from the other roll means for adjusting the straightening gap between the roll means and which includes further means independent of said first-mentioned means for quickly adjusting this gap to let connected ends of metal strips, thicker than the strips, pass between the upper and lower roll means without imparting undue stresses to the strip connections or the components of the straightening machine.

This invention relates to a straightening machine which comprises adjustable upper rolls and which is mainly intended for straightening spliced strip metal.

In modern strip finishing processes, strip sections of larger or smaller length are overlapped and joined by spot welding to ensure a continuous feeding of the strip. This is also required for metal strip which is finished by a passage through baths, such as tin or zinc baths. The strip straightening machines which are included in such strip treating lines had previously to be opened before the approach of these varied riveted lap joints and after the passage of said joints the machine had to be reset to the nip required for straightening. This adjustment was effected with the aid of a positioning motor. An operator is required for controlling this operation and must also adjust the pressure required for straightening. During the slow lifting and lowering of the set of upper rolls, a great length of strip passes without being straightened. These strip lengths cannot be used. If such a lap joint is overlooked, there will be a dangerous increase in pressure at the straightening machine and this increase in pressure will trip the overload releases so that the straightening operation and the continuous feeding of the strip are discontinued. This results in losses of material and time. The overlapped margins are raised under pressure and may then give rise to further damage. For this reason, it has been proposed to provide additional means for adjusting the set of lower rolls. Such additional adjusting means are complicated, require a large amount of additional space and are not sufficiently fast and effective in operation.

In a straightening machine which comprises adjustable upper rolls and, for the adjustment of said rolls, thrust screws mounted in the machine frame by nuts and a gearmotor for operating said screws, these disadvantages are eliminated according to the invention by the provision of means by which the nuts mounted in the frame can be rotated independently of the gearmotor so that the thrust screws and with them the upper rolls can be lifted and lowered at high speed. This operation is suitably controlled by sensing means which are responsive to the metal strip. With this arrangement, the approach of a lap joint causes automatically a fast lifting of the set of upper rolls and the departure of such joint causes automatically a lowering of said set of upper rolls until the preset

straightening pressure has been achieved. When there is a certain change in gage between succeeding strip metal sections, the straightening pressure can be readjusted in the usual manner by means of the positioning motor and independently of the high-speed stroke. For the usual setting of the straightening pressure, the thrust screws for the set of upper rolls comprise, in known manner, worm wheels mounted on splined shafts and are mounted in the machine frame in nuts so that they are adjustable by a rotation. According to the invention, these nuts are rotatably mounted in the frame and provided with a pinion rim so that they can be driven by a meshing rack for a high-speed adjustment. In this case, the splined shaft prevents a rotation of the thrust screws subjected to said high-speed adjustment. This feature enables a conversion of existing straightening machines to embody the arrangement of the invention. Existing straightening machines suitable for this conversion are those which include nuts mounted in the frame. It is sufficient to rotatably mount said nuts and provide them with a rack drive.

Specifically, the thrust screws for the upper rolls may be adjustable in known manner by a positioning motor through worm gearing and may be capable of a high-speed adjustment by means of the nuts which are mounted in the machine frame and provided with a pinion rim in mesh with a rack. The pinion rims lie on one side or on both sides of a common rack, which is preferably hydraulically operated.

An embodiment of the straightening machine according to the invention is shown by way of example on the drawing, in which

FIG. 1 is an elevation showing a straightening machine according to the invention and

FIG. 2 is an enlarged fragmentary elevation showing a portion of the embodiment of FIG. 1.

As is apparent from the drawing, the straightening machine comprises a machine frame **1**, which supports the sets of upper and lower rolls **2** and **3**. In known manner, the set of the upper rolls **2** is vertically adjustable by the positioning motor **5** by means of a worm gearing **6** and thrust screws **4** to set the roll nip and straightening pressure. According to the invention, the thrust screws **4** are mounted in the machine frame **1** by means of rotatable nuts **7**, which carry pinion rims **8**. The pinion rims **8** are adjusted by a rack **9**, which is, e.g., hydraulically driven. This results in a high-speed stroke of the set of upper rolls **2**, which are connected by the bearing body **10** to the thrust screws **4**. The feelers **11**, **12** control by electric means the operation of the hydraulic rams. Alternatively, a photoelectric control may be provided. For this purpose, the metal strip is punched before the riveted joint, or a light control is used which employs rays and responds to the increase in the thickness of the strip. Where two thrust screws are employed, the continuous rack engages the same on the same side. If the set of upper rolls is operated by four thrust screws, each side of the rack is suitably in mesh with two pinion rims for driving such screws.

What is claimed is:

1. A straightening machine comprising, in combination, a frame; at least one nut mounted on said frame turnably about its axis and immovably in axial direction; a thrust screw for each nut coaxially arranged with the same and in threaded engagement therewith; a pair of oppositely arranged roll means, one of said roll means being turnably mounted on said frame and the other of said roll means being carried by said thrust screw movable in direction of said axis toward and away from said one roll means; screw drive means connected to said thrust screw for rotating the same about its axis relative to said nut for moving said other roll means in said direction toward and away from said one roll means; and nut drive

means connected to said nut for rotating the same about its axis for moving said other roll means independently of said screw drive means also in said direction toward and away from said one roll means.

2. A straightening machine as defined in claim 1, wherein each of said roll means comprises a plurality of rolls arranged substantially in a plane extending substantially normal to said axis and rotatable about substantially parallel spaced axes, the axes of said one roll means being displaced in direction transverse to said axes to those of the rolls of said other roll means.

3. A straightening machine as defined in claim 2, wherein said axis of said nut is substantially vertical, and wherein said other roll means is arranged above said one roll means.

4. A straightening machine as defined in claim 1, wherein said thrust screw is connected to said screw drive means for rotation about said axis and movable in axial direction.

5. A straightening machine as defined in claim 1 for straightening strip metal passing between said pair of roll means, said strip metal having marks spaced in longitudinal direction of said strip metal, said machine including further sensing means for sensing marks and cooperating with said nut drive means for controlling the latter in response to said marks.

6. A straightening machine as defined in claim 1,

wherein each nut is formed with a pinion rim, and wherein said nut drive means comprises rack means in mesh with said pinion rim.

7. A straightening machine as defined in claim 1, wherein each nut is formed with a pinion rim, and wherein said nut drive means comprise a single rack in mesh with the pinion rim of each nut and hydraulic means for driving said rack.

8. A straightening machine as defined in claim 1, wherein said screw drive means comprise a positioning motor and transmission means between said motor and said thrust screw.

9. A straightening machine as defined in claim 8, wherein said transmission means includes worm gearing.

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