April 15, 1952 E. T. LORIG 2,593,157

APPARATUS FOR POSITIONING STRIPS

Filed June 4, 1949 2 SHEETS--SHEET 1

FIG. 1

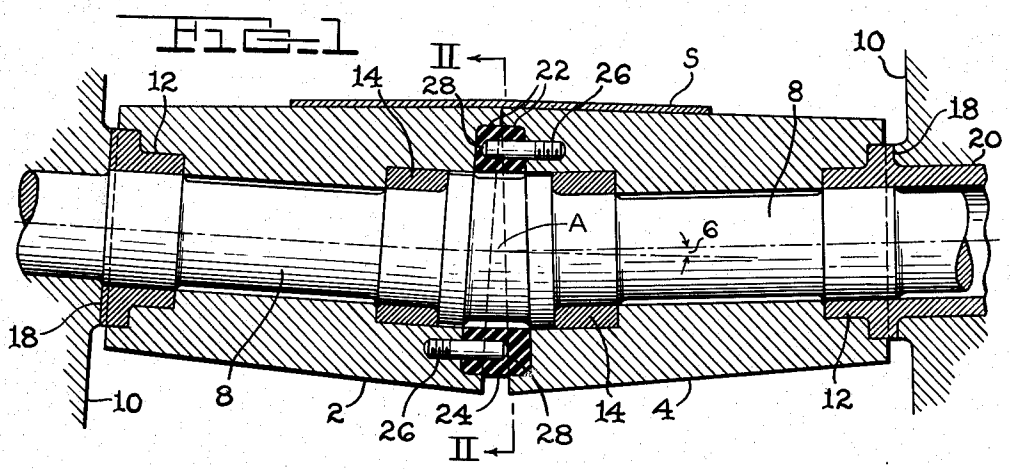


FIG. 3

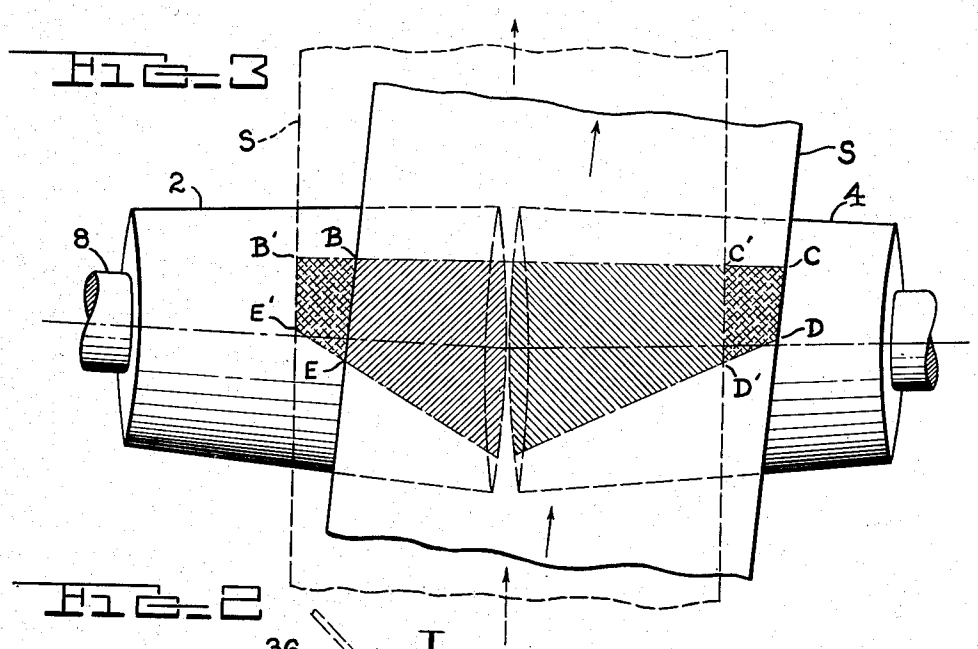
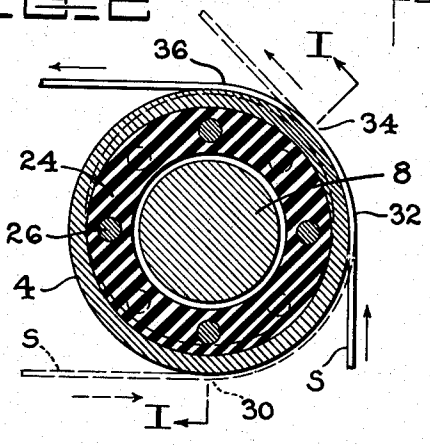


FIG. 2



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APPARATUS FOR POSITIONING STRIPS

Filed June 4, 1949 2 SHEETS--SHEET 2

FIG. 4

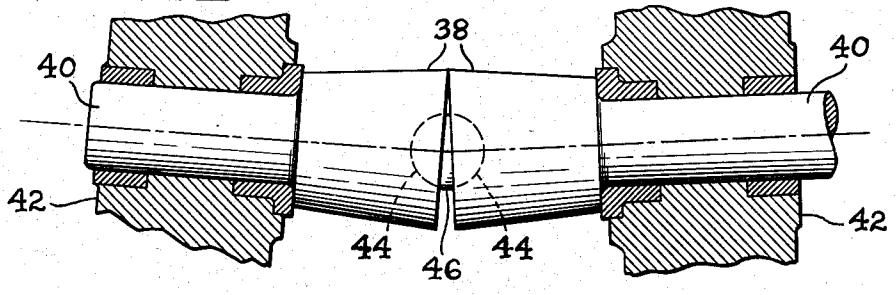


FIG. 5

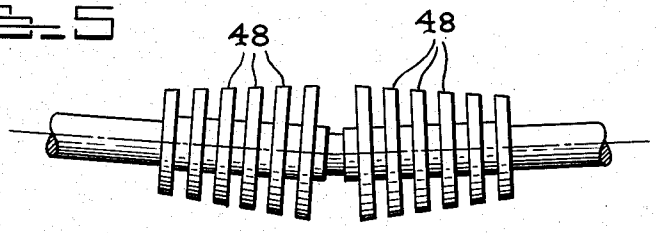


FIG. 6

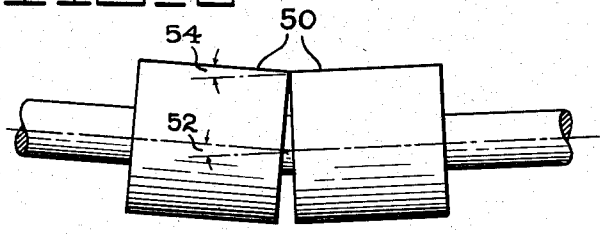


FIG. 7

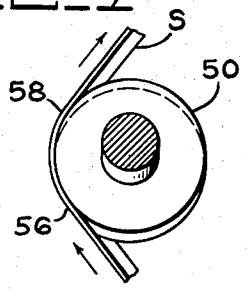


FIG. 8

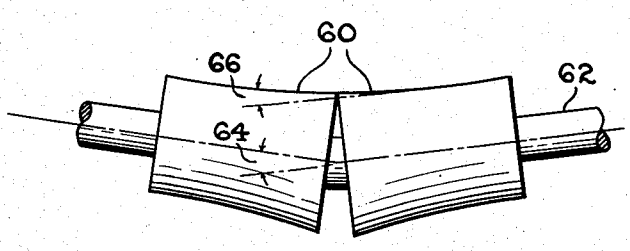
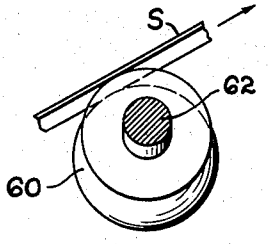


FIG. 9



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UNITED STATES PATENT OFFICE

2,593,157

APPARATUS FOR POSITIONING STRIP

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Application June 4, 1949, Serial No. 97,218

6 Claims. (Cl. 271—2.6)

1

This invention relates to apparatus for automatically centering and aligning moving objects, especially strip and strip-like materials. In the processing of metal strip, the strip is conveyed over rolls in the uncoiled condition. When the strip is conveyed over a roll to the processing equipment there is likelihood that the strip will be fed at a slight angle to the roll. Because of this, the strip will work its way across the face of the roll. In addition, camber or lateral curvature will be present in the finished strip due to rolling difficulties. This causes the strip to approach the roll at an angle which also causes the strip to move across the face of the roll. In order to keep the strip in the desired path of travel, various expedients have been resorted to. One of the most common is the use of stationary or rotatable side guides against which the edges of the strip bear. In some instances side guides have been used in conjunction with looper pits to force the strip back on the desired center line. Abnormally high strip tension has also been used in an attempt to keep the workpiece aligned. The workpiece has also been periodically slipped or slewed back into the approximate proper position on the roll. All of the above methods of centering strip tend to abrade and mutilate the strip edges and in some instances cause the edges of the strip to be stretched beyond the elastic limit of the metal. Diagonal or lateral surface scratches are also formed on finely finished flat products of all kinds, these scratches being detrimental to subsequent operations and together with edge damage causes scraping of a large percentage of the material being processed. The same problem also exists in belt conveyors and belts used in conjunction with belt pullies. If the belt is made of rubber or other relatively soft material, it is more easily damaged. In addition to the methods of aligning strip mentioned above, crown rolls have been used to center materials having a low modulus of elasticity such as textiles, rubber and composition belts.

The above problem of centering and aligning also exists in conjunction with rotatably supporting coils of strip as the strip is fed to processing equipment.

It is therefore an object of my invention to provide apparatus for automatically centering moving objects, such as strip, without damage thereto.

Another object is to provide such apparatus which does not depend upon contact with the edge of the strip or abnormal tensioning of the strip to keep the strip in center alignment.

2

These and other objects will be more apparent after referring to the following description and attached drawings, in which:

Figure 1 is a sectional view of one specific embodiment of my device taken on the line I—I of Figure 2;

Figure 2 is a sectional view taken on line II—II of Figure 1;

Figure 3 is a sectional view taken on line III—III of Figure 2;

Figure 4 is a schematic view, partly in section, showing a second embodiment of my invention;

Figure 5 is a schematic view showing a third embodiment of my invention;

Figure 6 is a schematic view showing a fourth embodiment of my invention;

Figure 7 is an end view of Figure 6;

Figure 8 is a schematic view showing a fifth embodiment of my invention; and

Figure 9 is an end view of Figure 8.

Referring more particularly to the drawings the reference numerals 2 and 4 relate to a pair of proposed rotatable rolls which take the place of the rolls commonly used in processing lines or in conjunction with belt conveyors or the like. The strip or strip-like material S passes over the rolls in the direction shown by the arrows. I have found that by arranging these rolls at an angle to one another with their axes of rotation intersecting at a point A between the rolls, and diverging away from the direction of strip approach to the rolls that the center line of the strip will be maintained on the center line between the rolls. Furthermore, if the strip is originally off-center it will be quickly centered. The angle 6 between the center lines may be as small as 0 degrees 5 minutes (0° 5'). While cylindrical rolls may be used I have found that the centering effect is increased by the use of frusto-conical rolls, as shown. The rolls may be constructed of any suitable material and may be coated with rubber or other plastic material, if desired.

As shown in Figure 1, the rolls 2 and 4 are mounted on a bent fixed shaft 8 which is mounted in a housing 10. The rolls 2 and 4 are provided with bushings or bearings 12 and 14 attached thereto by a press fit. The bushings 12 and 14 may be replaced by roller bearings, but in either event the bearings will be supported on the shaft 8. Thrust on the rolls is taken by surfaces 18 on the housing 10. If it is desired to positively drive the rolls, an extension 20 connected to the right hand bushing 12, is provided. It is also necessary that the rolls 2 and 4 rotate in unison. For this purpose, the adjacent ends of the rolls

are provided with grooves 22 for receiving a resilient gasket 24 made of rubber, neoprene, or other resilient material. This gasket acts as a coupling between the two rolls to synchronize their speed and also acts as a seal. Synchronization can be secured by friction alone or by providing a plurality of pins 26 having one end extending into holes 28 in the gasket 24. The other ends of the pins are screwed into rolls 2 and 4 alternately. If desired for certain applications, the rolls 2 and 4 can be made integral of rubber or other resilient material. In such case the center of the roll would flex as it revolves. This construction is in effect the same as that described above and the term "opposed rotatable rolls" as used in the specification and claims is to be construed as including such a construction.

As shown in Figure 2, the strip S may lead onto the centering rolls anywhere between points 30 and 32 and leave the centering roll any place between points 34 and 36. In other instances there will be only line contact between the rolls and the object passing thereover.

Figure 3 shows the position of the strip S in broken lines centered on the rolls 2 and 4 while an off-center position is shown in solid lines. The shaded area BCDE shows the portion of the strip S contacting the rolls 2 and 4 when it is off-center on the rolls and the shaded area B'C'D'E' shows the portion of the strip S contacting the rolls when it is on-center.

Figure 4 shows a slightly different modification of my invention in which a pair of conical rolls 38 is provided with rotatable shafts 40 mounted in a fixed housing 42. The adjacent ends of the rolls are provided with hemispherical openings 44 for receiving a sphere 46 which assists in maintaining alignment of the rolls and also synchronizes the speed thereof. The arrangement of the rolls 38 is otherwise the same as the arrangement of rolls 2 and 4. In either case the rolls may be positively driven or may be rotated by means of the strip or other object passing thereover.

Figure 5 shows another embodiment of my invention which differs from the first two embodiments merely in having the centering rolls made up of a plurality of disks 48 which rotate in unison.

Figures 6 and 7 show another embodiment of my invention which is particularly adapted for use with flexible material such as rubber. In this embodiment the rolls 50 are of substantially uniform diameter throughout their breadth, but may have a very slight taper in which case the included angle 52 between the axes of rotation of the rolls is slightly greater than the included angle 54 between the faces of the rolls. As shown in Figure 7, the strip S contacts the roll between points 56 and 58.

Figures 8 and 9 disclose another embodiment of my invention which may be used in conjunction with a belt conveyor. In this embodiment the rolls 60 have a slightly curved face and are driven in synchronism in any suitable manner. The rolls are mounted on a fixed non-rotatable shaft 62. The included angle 64 between the axis of rotation is preferably greater than the mean included angularity 66 of the two rolls 60.

While several embodiments of my invention have been shown and described, it is apparent that other adaptations and modifications may be made without departing from the scope of the following claims.

I claim:

1. Apparatus for automatically centering a moving object comprising a pair of fixed spaced apart bearings, a shaft mounted in each of said bearings and extending toward the other bearing, said shafts being arranged at an angle to one another with their axes intersecting at a point between the bearings and diverging away from the direction of approach of the object, the axes of said shafts being arranged at an angle to a plane parallel to the path of movement of the object, a pair of opposed rotatable rolls over which the object passes one mounted on each shaft, and a connection between said rolls for positively causing them to rotate at the same angular velocity.

2. Apparatus for automatically centering a moving object according to claim 1 in which the rolls are frusto-conical with the large diameter ends thereof being adjacent each other.

3. Apparatus for automatically centering a moving object comprising a pair of fixed spaced apart bearings, a shaft mounted in each of said bearings and extending toward the other bearing, said shafts being arranged at an angle to one another with their axes intersecting at a point between the bearings and diverging away from the direction of approach of the object, the axes of said shafts being arranged at an angle to a plane parallel to the path of movement of the object, a pair of opposed rotatable rolls over which the object passes one mounted on each shaft, and a connector extending between the adjacent end of the rolls to positively cause them to rotate at the same angular velocity.

4. Apparatus for automatically centering a moving object according to claim 3 in which the rolls are frusto-conical with the large diameter ends thereof being adjacent each other.

5. Apparatus for automatically centering a moving object comprising a pair of fixed spaced apart bearings, a shaft mounted in each of said bearings and extending toward the other bearing, said shafts being arranged at an angle to one another with their axes intersecting at a point between the bearings and diverging away from the direction of approach of the object, the axes of said shafts being arranged at an angle to a plane parallel to the path of movement of the object, a pair of opposed rolls over which the object passes one rotatably mounted on each shaft, and a connector extending between the adjacent end of the rolls to positively cause them to rotate at the same angular velocity.

6. Apparatus for automatically centering a moving object according to claim 5 in which the rolls are frusto-conical with the large diameter ends thereof being adjacent each other.

EDWIN T. LORIG.

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